GOVERNMENT OF ANDHRA PRADESH

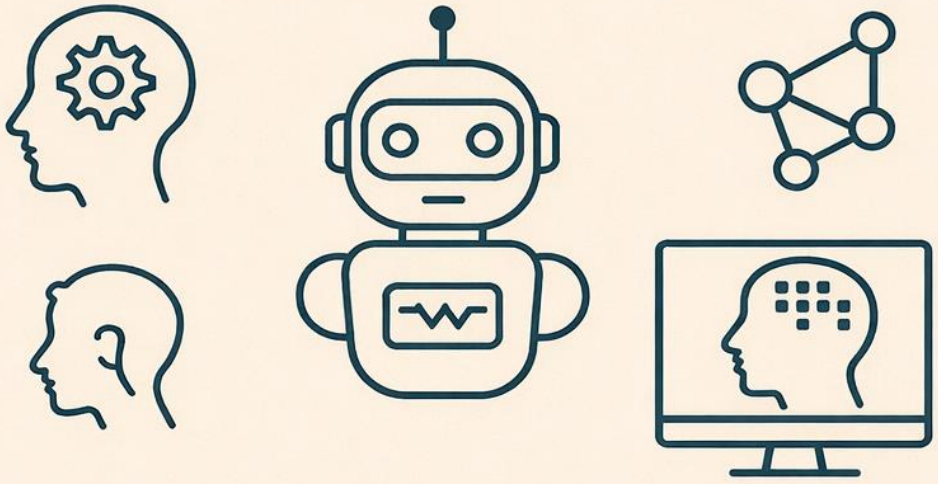
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

Andhra Pradesh :: Mangalagiri

FUTURE READINESS

INDUSTRY 4.0/ COMPETENCY 5.0

C-26 CURRICULUM



DIPLOMA IN
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

For Polytechnic Diploma courses in Andhra Pradesh

Transforming Learners into Future Technologists

GOVERNMENT OF ANDHRA PRADESH

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

ANDHRA PRADESH :: AMARAVATI

3 YEAR DIPLOMA ENGINEERING IN
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CURRICULUM -2026 (C-26)

1. PREAMBLE

The world is evolving rapidly, and education must evolve with it. In today's dynamic environment, our approach to learning must equip students not only with knowledge but also with the practical experience in innovation, critical thinking ability and problem-solving mindset required to excel in both academic and professional spheres.

At the heart of the new curriculum, lies the belief that education should be student-centric, fostering curiosity, creativity and a lifelong passion for learning. The State Board of Technical Education and Training (SBTET), Andhra Pradesh aims to create a safe, supportive, and inclusive learning environment where every student is encouraged to reach their fullest potential. This curriculum is designed to provide a strong foundation for lifelong growth and employability, ensuring that learners graduate not only with a diploma but also with the competence and confidence to thrive in a rapidly changing world.

The SBTET, A.P. has consistently strived to meet the aspirations of all stakeholders i.e., students, parents, industries, academia and society at large by keeping its diploma programmes relevant to emerging technologies and industrial advancements. To this end, SBTET, A.P. has regularly reviewed and updated its curricula through a systematic, evidence-based and consultative process.

Building on the success of earlier curriculum and responding to the demands of new-age technologies, SBTET, A.P. resolved to update the Polytechnic C-23 curriculum and introduce the new curriculum (C-26), aligning it with global technological trends, skill-development goals, and industry expectations. The revision process was initiated in November 2024, with comprehensive feedback collected from all stakeholders i.e., students, parents, industry experts, academia, alumni, faculty, heads of sections and principals across the state.

A pivotal meeting was convened under the chairmanship of Sri. Gummala Ganesh Kumar, I.A.S., Director of Technical Education & Chairman, SBTET, A.P. to discuss the revamping of the curriculum with an emphasis on industry relevance, academic flexibility, skill orientation and employability.

Further, Sri. Gummala Ganesh Kumar, I.A.S., reiterated the importance of industrial exposure, project-based learning, and practical training in bridging the gap between classroom learning and industry requirements. He highlighted the need to make the curriculum more innovative, flexible, and technology-driven to prepare students for emerging fields such as Artificial Intelligence (AI), Machine Learning (ML), Quantum Computing, Internet of Things (IoT), Drone Technology, and Industry 4.0.

To ensure a holistic and futuristic approach, two regional workshops were conducted with industry experts, academic experts from higher-level institutes and subject experts at Tirupati and Visakhapatnam. The Programme-wise expert committees comprising members from industry, higher-education institutions and polytechnic faculty were constituted. In the subsequent workshops conducted, these committees explored strategies to integrate the following key components into the curriculum, with the objective of enhancing employability and industry readiness:

- Internet of Things (IoT) for all programmes
- A balanced ratio of theory and practical components
- Emerging technologies such as Artificial Intelligence (AI), Machine Learning (ML), Quantum Computing, and Drone Technology
- Industry 4.0 and 5G Technologies
- Introduction of elective courses to provide flexibility and promote specialization in emerging domains
- Inclusion of audit courses to encourage innovative and holistic development, ethics, environmental awareness, entrepreneurship and lifelong learning beyond the core curriculum
- Adoption of Practicum-based Learning, wherein certain courses are designed to be taught through hands-on, activity-oriented, and

experiential methods instead of the conventional lecture mode, enabling students to apply concepts directly through practice and experimentation

A series of workshops, consultations, and validation meetings with subject experts, industrialists, and academicians were conducted to comprehensively review and refine the draft curriculum. The final version was further vetted by industry professionals and academicians from reputed higher-education institutions to ensure academic rigor, practical relevance, and alignment with current and emerging industry needs.

The Curriculum 2026 (C–26) has been developed through the active participation of polytechnic faculty, industry representatives, and expert committees, following an Outcome-Based Education (OBE) framework in accordance with NBA guidelines.

This new curriculum reflects the collective vision of educators, industry experts, and policymakers to develop competent, innovative, ethical and highly employable diploma graduates. It equips learners with the skills, attitudes and mindset needed to embrace future challenges driven by AI, Quantum Computing, IoT, Industry 4.0, 5G and sustainable technologies.

The C–26 Curriculum has been approved by the Board Members, SBTET, Andhra Pradesh, for implementation from the academic year 2026–27.

2. KEY FEATURES OF THE CURRICULUM C-26

- Skill-first and practice-driven curriculum approach
- Integration of core engineering fundamentals with emerging technologies
- Focus on developing industry-ready diploma engineers
- Emphasis on real-world problem-solving skills
- Balanced distribution of theory, laboratory work, mini-projects, and internships
- Strong focus on formative and summative assessments
- Continuous evaluation framework aligned with OBE norms
- Course Outcomes mapped to Program Outcomes and PSOs
- Inclusion of skill electives and industry-relevant modules
- Progressive integration of modern and 21st-century technologies across semesters
- Emphasis on programming, intelligent systems, and data-driven approaches
- Exposure to industry-standard tools, platforms, and development environments
- Alignment of technical skills with current industry requirements
- Increased emphasis on hands-on and experiential learning
- Mandatory mini-projects, case studies, and laboratory-based learning
- Real life problem-solving and application-oriented assignments
- Integration of MOOCs and industry-supported online learning platforms
- Development of communication and interpersonal skills
- Emphasis on digital literacy and professional ethics
- Promotion of teamwork, leadership, and entrepreneurial mindset
- Focus on holistic student development and workplace readiness

3. ACKNOWLEDGEMENTS

The members of the working group sincerely thank Sri Gummala Ganesh Kumar, I.A.S., Director of Technical Education and Chairman of SBTET, Andhra Pradesh, and Sri Kona Sasidhar, I.A.S., Principal Secretary, Skills Development and Training Department, for their valuable guidance and support during the revision of the C-23 Curriculum and the development of the new C-26 Curriculum.

We are also thankful to SBTET, Andhra Pradesh, Mangalagiri, for organizing a series of workshops at different stages. These workshops brought together teachers from polytechnics, experts from reputed national Institutes, universities, engineering colleges and professionals from industry. Their discussions and feedback helped to review the C-23 Curriculum and design the improved C-26 Curriculum.

We express our gratitude to Sri G.V.V. Satyanarayana Murty, Secretary, SBTET, Andhra Pradesh, Sri V. Padma Rao, Joint Director of Technical Education, Sri A. Ravi Kumar, Joint Secretary (Academic), SBTET, Andhra Pradesh and all officers from the Directorate of Technical Education and State Board of Technical Education and Training, Andhra Pradesh, for their encouragement and continuous support.

Finally, we sincerely thank all faculty members from various polytechnics across the state who contributed to this endeavour. Their ideas, teamwork, and commitment played a key role in shaping the C-26 Curriculum successfully.

4. RULES AND REGULATIONS

4.1 Duration and Pattern of Diploma Programmes

All Diploma Programmes approved by AICTE are of three years duration.

- The first year follows a yearly system.
- The remaining period (two years) follows a semester system.
- A run-through system is followed for all Diploma Programmes, as per eligibility rules.

4.2 Procedure for Admission into the Diploma Programmes:

Selection of candidates is governed by the rules and regulations laid down in this regard from time to time.

a. Candidates who wish to seek admission into any of the Diploma Programmes will have to appear for the Common Entrance Test for admissions into polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Mangalagiri. Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into polytechnics (POLYCET).

The candidates seeking admission should have passed/appeared for S.S.C. examination, conducted by the Board of Secondary Education, Andhra Pradesh, or equivalent examination thereto, by the time of applying for the Common Entrance Test for admission into polytechnics (POLYCET). In case of candidates whose results of their qualifying examinations are pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission.

b. Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

c. For admission into Diploma in Pharmacy programme for which entry qualification is 10+2 (MPC/BiPC), candidates need not appear for POLYCET. A separate notification will be issued for admission into this Programme.

4.3 Medium of Instruction

The medium of instruction and examination for all Diploma programmes shall be English

4.4 Permanent Identification Number (PIN)

Every student is given a Permanent Identification Number (PIN) at the time of admission.

This number is used to record and maintain the student's academic and examination details throughout the Diploma along with APAAR ID.

4.5 Number of Working Days per Semester/Year:

a) The academic year for all the programmes shall be in accordance with the academic calendar.
b) The working days in a week shall be from Monday to Saturday.
c) There shall be 7 periods of 50 minutes duration each on all working days.
d) The minimum number of working days for each semester/year shall be 90/180 days excluding examination days. If the prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes and complete the syllabus.
e) The timings of the institutions shall be preferably from 9:30 a.m. to 4:30 p.m.

4.6 Eligibility (Attendance to appear for the Summative Assessment)

a) A candidate shall be permitted to appear for the Summative Assessment in all programmes, if he or she has attended a minimum of 75% of working days during the year/semester.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or first year may be granted on medical grounds.
c) A stipulated fee shall be payable towards condonation for shortage of attendance.

d) Candidates having less than 65% attendance shall be detained.

e) Students whose shortage of attendance is not condoned in any semester / year and who have not paid the condonation fee in time are not eligible to take the Summative Assessment of that semester/year and they will be detained. They may seek readmission for that semester/year (when offered) in the next subsequent academic semester/year.

f) For Industrial Training:

i) During Industrial Training, the candidate shall put in a minimum of 90% attendance.

ii) If the student fails to secure 90% attendance during industrial training, the student shall reappear for industrial training at his own expense.

4.7 Readmission Rules

Readmission shall be granted to eligible candidates by the respective Principal/Regional Joint Director/Director of Technical Education.

a) (i) Within 15 days after commencement of class work in any semester.

(ii) For Industrial Training: before commencement of the Industrial Training.

b) Within 30 days after commencement of class work in any year (including D. Pharmacy Programme or first year course work in Engineering and Non-Engineering Diploma streams). Otherwise, such cases shall not be considered for readmission for that year and they are advised to seek readmission in the next eligible academic year.

c) The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year/semester, as officially announced by CTE but not from the day on which he/she has actually reported to the class work.

d) A candidate detained in any year or semester shall be allowed readmission to the same year/semester only in the subsequent academic year. This provision shall equally apply to the industrial training also.

4.8 Scheme of Evaluation

a) First Year:

Theory Courses: 70 marks for the Summative Assessment (3 hours) + 30 marks for Formative Assessment.

Laboratory/Drawing Courses: 60 or 30 marks for the Summative Assessment (3 hours) + 40 or 20 marks for Formative Assessment as per the allocated marks to that course.

b) III to V Semesters:

Theory Courses: 70 marks for the Summative Assessment (3 hours) + 30 marks for

Formative Assessment.

Laboratory/Drawing Courses: 60 or 30 marks for the Summative Assessment + 40 or 20 formative assessment as per the allocated marks to the course.

4.9 Formative Assessment Scheme:

Formative Assessment shall be conducted for awarding marks on the dates specified and it consists of two components namely, Assessment through Unit Tests and Continuous Internal Assessment (CIA).

Total Formative Assessment Marks (30) =Unit Test (20) + CIA (10)

a) Theory Courses:

Three-unit tests shall be conducted for I year and two Unit Tests for semesters. Unit test shall be of 90 minutes duration and for a maximum of 40 marks for each test.

S. No.	Type of Assessment	Weightage Assigned	Remarks
	Formative Assessment (30 Marks)		
1	Formative Assessment through Unit Tests (UT): 20 Marks		
	Testing of knowledge through Unit Tests for Year - UT1+UT2+UT3 for Semester - UT1 + UT2	20	Each Unit test shall be conducted for 40 marks and scaled down to 20. Average of all the unit tests will be taken as Unit Test marks
2	Formative Assessment through Continuous Internal Assessment (CIA) :10 Marks		
	1. Assignments	05*	All activities shall be recorded. Relevant records are to be
	2. Dynamic Learning		

	Activities: Project Work/ Seminar /Group Discussion, Quizzes etc.	05**	filed and secured for further scrutiny of higher authorities
	T O T A L	30	

**At least one assignment should be completed for each unit which carries 10 marks. The total assignment marks should be scaled down to 5.*

***At least one dynamic learning activity is to be conducted which carries 10 marks. The total marks should be scaled down to 5.*

b) Practical Courses:

Award of marks for Formative Assessment shall be as follows:

i) Drawing Courses:

Distribution of Marks for the Formative Assessment				
First Year (Total: 40 Marks)			Semesters (Total: 40 Marks)	
Max: 20 Marks	Max: 20 Marks		Max: 20 Marks	Max: 20 Marks
From the average of THREE Unit Tests.	From the average of Assessments of Regular Class work Exercises.		From the average of TWO Unit Tests.	From the average of Assessment of Regular Class work Exercises.

- Each Unit Test will be conducted for a duration of 120 minutes with maximum marks of 40 and scaled down to 20 Marks.

ii) Laboratory Courses:

a) Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40 marks in each Laboratory Course. The procedure for evaluation for Laboratory Courses, other than Drawing courses:

i. Formative Assessment for Laboratory Course shall be done on the basis of tasks performed by the student in the laboratory.

ii. Question paper for Formative Assessment shall be task-based and shall be designed to assess practical skills, procedures, and application of concepts.

b) Formative Assessment in Laboratory courses shall be done during the course of study and marks shall be awarded by the concerned teacher. Formative Assessment for laboratory courses can be

done for 40 marks

Sl. No.	Type of Assessment	Weightage Assigned	Remarks
	Formative Assessment: 40 Marks		
1	Formative Assessment through Unit Tests (UT): 20 Marks		
	Practical & Theory evaluation: Testing of knowledge through Unit Tests for Year - UT1+UT2+UT3 for Semester - UT1 + UT2	20	Each Unit test shall be conducted for 20 Marks. Average of all the Tests will be taken as Unit Test marks
2	Formative Assessment through Continuous Internal Assessment (CIA) :20 Marks		
	Experiment wise observations, individual laboratory performance	20	
	T O T A L	40	

c) For laboratory examinations, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of the Section, preferably choosing a qualified person from the list given below in order of preference. Appointment order copy shall be filed and secured.

i) Near by Industries.

ii) Govt./Semi Govt organizations like R & B, PWD, PR, Railways, BSNL, APSRTC, APSEB etc.

iii) Govt./ University Engineering Colleges.

iv) Senior Faculty from nearby Polytechnics.

Internal examiner shall be the person concerned with Formative Assessment as mentioned in (b) above. The Summative Assessment shall be held along with all theory papers in respect of drawing courses.

In case of drawing course earmarked as Practicum (practical course) the Summative Assessment shall be held along with practical papers.

d) Question Paper for Practical Examination: Question paper should

cover the experiments / exercise prescribed to test various skills like handling, manipulating, testing, troubleshooting, repair, assembling and dismantling etc. from more than one experiment / exercise

e) Records pertaining to Formative Assessment marks of both theory and practical Courses are to be maintained for official inspection. All the evaluation formats/proformas shall be maintained as per the instructions issued by SBTET, A.P. from time to time

iii) Practicum Theory Courses:

Assessment for Practicum theory courses can be done for 30 marks

Sl. No.	Type of Assessment	Weightage Assigned	Remarks
	Formative Assessment (30 Marks)		
1	Formative Assessment through Unit Tests (UT): 20 Marks		
	Theory & Practical evaluation: Testing of knowledge through Unit Tests for Year - UT1+UT2+UT3 for Semester - UT1 + UT2	20	Each Test shall be conducted for 40 Marks (Theory:30 Marks Practical:10 Marks) and scaled down to 20. Average of all the Tests will be taken as Unit Test marks
2	Formative Assessment through Continuous Internal Assessment (CIA) :10 Marks		
	a) Assignments	05*	All activities shall be recorded. Relevant records are to be filed and secured for further scrutiny of higher authorities
	b) Dynamic Learning Activities: Project Work/ Seminar/Group Discussion, Quizzes etc.	05**	
	TOTAL	30	

**At least one assignment should be completed for each unit which carries 10 marks. The total assignment marks should be scaled down to 5.*

***At least one dynamic learning activity is to be conducted which carries 10 marks. The total marks should be scaled down to 5.*

iv) Practicum Practical Courses:

Assessment for Practicum practical courses can be done for 40 marks

Sl. No.	Type of Assessment	Weightage Assigned	Remarks
	Formative Assessment: 40 Marks		
1	Formative Assessment through Unit Tests (UT): 20 Marks		
	Practical & Theory evaluation: Testing of knowledge through Unit Tests for Year - UT1+UT2+UT3 for Semester - UT1 + UT2	20	Each Test shall be conducted for 40 marks (Theory:10marks Practical:30marks) and scaled down to 20. Average of all the Tests will be taken as Unit Test marks.
2	Formative Assessment through Continuous Internal Assessment (CIA) :10 Marks		
	Experiment wise observations, individual laboratory performance	20	
	T O T A L	40	

v) Activity Periods:

1.	a) Library	All activities shall be duly recorded & the relevant documents shall be filed and securely maintained for scrutiny by higher authorities. 0.5 or 1 Credits shall be awarded to the successful candidates for each semester/year accordingly.
	b) IPSGM/Sports & Games	
	c) Extra-curricular activities (NSS / NCC/ Clean & Green of Campus etc.)	

vi) Industrial Training:

In case of Industrial Training, SOP will be circulated by SBTET, A.P from time to time. The Formative Assessment and Summative Assessment shall be done as illustrated in the following table:

Assessment No	Upon completion of	Conducted by	Based on	Max Marks
Pre-Assessment	15 days to 30 days from the commencement of training	Mentor faculty member visits the industry 15 days to 30 days from the commencement of training and		

		will submit a detailed report to the principal outlining each candidate's details and observed work culture		
1 (Formative Assessment)	Mid Semester Assessment after three months (at industry)	1.The mentor faculty member concerned 2. Industry Training In charge	Learning outcomes as given in the scheme of assessment, for Industrial Training	120
2 (Formative Assessment)	Last month of training (at industry)	1. The mentor faculty member concerned 2. Industry Training In charge	Learning outcomes as given in the scheme of assessment, for Industrial Training	120
3 (Summative Assessment)	After completion of the training (at Institution)	1.The faculty member concerned, 2.HoS concerned 3.An external examiner from Industry	1.Demonstration of any one of the skills listed in learning outcomes	30
			2.Training Report	20
			3. Viva Voce	10
TOTAL				300

Each staff member shall be assigned a batch of students 10 to 15 as a mentor faculty for making assessment during industrial training.

vii) Project Work:

The guidelines to be followed for Project work are as follows:

- ✓ The Project Title and Abstract must be approved by a committee comprising the Principal, Head of the Section (HoS) and the concerned faculty members
- ✓ Students should be encouraged to undertake project work with the potential for publication in academic and professional journals

The Formative Assessment consisting of 40% of the total marks shall be distributed as follows:

Assessment	To be conducted at	Marks (Evaluated for)
Review-1	After the completion of 4 weeks from the start of the semester	10
Review-2	After the completion of 10 weeks from the start of the semester	15
Review-3	After the completion of 14 weeks from the start of the semester	15

The Summative Assessment consisting of 60% of the total marks shall be distributed as follows:

Assessment	To be conducted	Conducted by	Based on	Max Marks
Summative	After completion of the Project work	1.Project Guide 2.HoS concerned 3.An external examiner	1.Demonstration of skill relevant to the Project	30
			2. Project Report	20
			3. Viva Voce	10
TOTAL				60

4.10 Minimum Pass Marks

a) Theory Courses:

To pass a theory course, a candidate must secure a minimum of 35% in the Summative Assessment (i.e., Min 25 Marks) and a combined minimum of 35% from both the Formative and Summative Assessment marks put together.

b) Practical Courses:

For passing a practical Course, a candidate has to secure a minimum of 50% in Summative Assessment and a combined minimum of 50% of both Formative and Summative Assessment marks put together. In case of D.C.C.P., the pass mark for Typewriting and Shorthand is 45% in the Summative Assessment. There are no marks for formative assessment in case of Typewriting and Shorthand courses in D.C.C.P programme.

c) Industrial Training:

The Industrial training shall carry 300 marks and pass marks is 50% in each assessment at industry (Mid semester Assessment and second assessment) i.e 120 marks out of 240 and in final summative

assessment 30 marks out of 60 marks at institution level put together i.e. 150 marks out of 300 marks.

d)The courses successfully completed shall be awarded the allotted credits and the corresponding grade shall be assigned based on the percentage of marks secured.

4.11 Provision for Improvement

Improvement is allowed only after he / she has completed all the courses from First Year to Final semester of the Diploma.

a) Improvement is allowed in any 4 (Four) courses of the Diploma Programme.

b) The student can avail the improvement chance only once and it must be taken within the two examinations immediately following the completion of their Diploma. However, the duration including Improvement examination shall not exceed FIVE years from the year of first admission.

c) No improvement is allowed in Practical / Lab Courses or Project work or Industrial Training assessment. However, improvement in drawing Course(s) is allowed.

d) If improvement is not achieved, the marks obtained in the previous Examinations hold good.

e) Improvement is not allowed in respect of the candidates who are punished under Mal-Practice in any examination.

f) Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.

g) All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters including Consolidated Marks Memo(CMM) and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks including CMM and Original Diploma Certificate will be issued, else the submitted originals will be returned.

4.12 Rules of Promotion:

i. A candidate shall be permitted to appear for first year examination provided he / she has 75% attendance (which can be condoned on medical grounds up to 10%) i.e. attendance after condonation on medical grounds should not be less than 65% and has to pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts in the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first-year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training, AP from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and paid the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester. A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester and pays the examination fee.

iv A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester. A candidate is eligible to appear for the 5th semester examination if he/she puts the required percentage of attendance in the 5th semester and pays the examination fee.

v A candidate shall be sent to Industrial Training/6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee /promotion fee as prescribed by SBTET. A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-Voce) only if he/ she puts the required

percentage of attendance, i.e., 90% in the 6th semester Industrial Training and pays the examination fee.

vi Industrial Training shall be treated as the 6th semester, irrespective of whether the training is undertaken during the 5th or 6th semester.

For IVC & ITI Lateral Entry students:

i) A candidate shall be permitted to appear for Third semester examination provided he/she puts in 75% attendance (which can be condoned on medical grounds up to 10%) and pays the examination fee for third semester.

ii) A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pays the examination fee. A candidate who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by SBTET, A.P from time to time before commencement of 4th semester. A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester and pays the examination fee.

iii) A candidate shall be promoted to 5th semester provided he / she put the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester. A candidate is eligible to appear for the 5th semester examination if he/she puts the required percentage of attendance in the 5th semester and pays the examination fee.

iv) A candidate shall be sent to Industrial Training/VI semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee /promotion fee as prescribed by SBTET. A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-Voce) only if he / she puts the required percentage of attendance, i.e., 90% in the 6th semester Industrial Training and pays the examination fee.

4.13 Student Performance Evaluation

Successful candidates shall be awarded the Diploma under the following CGPA.

CGPA secured	Division
CGPA ≥ 7.5	First Class with Distinction (who completed Diploma within 3 years)
7.5 > CGPA ≥ 6	First Class
CGPA < 6	Second Class

Note: Candidate should acquire 120 credits to award diploma**.**

Awarding Grade and Grade Points

Students will be awarded Grades and Grade Points considering their Percentage of Marks Evaluated in each Theory and Practical Courses and the Conversion of Percentage of Marks obtained in the Examinations to the Grade Points and Awarding Grades for Every Course is tabulated as shown below:

For Theory Courses		
Percentage of Marks	**Grade Points, GP (10)**	**Grade Awarded**
Above 90	10	A+
From 81 to 90	09	A
From 71 to 80	08	B+
From 61 to 70	07	B
From 51 to 60	06	C+
From 41 to 50	05	C
From 35 to 40	04	D
Below 35	0	F (FAIL)

For Practical Courses		
Percentage of Marks	**Grade Points, GP (10)**	**Grade Awarded**
Above 90	10	A+
From 81 to 90	09	A
From 71 to 80	08	B+
From 61 to 70	07	B
From 51 to 60	06	C+
Equal to 50	05	C
Below 50	0	F (FAIL)

The merit level of a student would be indicated by

1. “Semester Grade Point Average (SGPA) ” for the Year or for a Semester.

2. “Cumulative Grade Point Average (CGPA)” for awarding Diploma.

Conversion Formula, EP = Equivalent Percentage = [CGPA Obtained] x 10

4.14 Examination Fee Schedule

Examination fees are as per the notifications issued by the State Board of Technical Education and Training (SBTET), Andhra Pradesh, from time to time.

4.15 Structure of Examination Question Paper

I. Formative Assessment:

a) Theory Courses

For First Year: Three Unit Tests.

For semesters: Two Unit Tests.

Each test shall be of 90 minutes duration, carrying a maximum of 40 marks and will consist of Part A and Part B

Part A (16 Marks):

1. Objective Type Questions:

Multiple Choice Questions / True or False / Fill in the Blanks- 4 × 1 marks = 4 marks

2. Short Answer Questions:

Four questions - 4 × 3 marks = 12 marks

Part B (24 Marks):

Essay-Type Questions: (Attempt any 3 out of 4) 3 × 8 marks = 24 marks

Total Marks:4 + 12 + 24 = 40 marks

Computation of Marks

First Year: Average of 3 tests

Semester System: Average of 2 tests

The marks obtained out of 40 shall be scaled down to 20 and treated as the Unit Test marks for each course.

b) Drawing Courses (both Conventional/Hybrid) :

First Year:

Three-unit tests shall be conducted for 40 marks. The duration of each test is 120 minutes

The question paper pattern is as follows:

Part A: Answer all 4 question, 4 X 5M =20M.

Part B: Answer any 2 questions out of 4, 2 X 10M =20M.

Semesters:

Two-unit tests shall be conducted for 40 marks. The duration of each test is 120 minutes

The question paper pattern is as follows:

Part A: Answer all 4 questions, 4 X 5M =20M.

Part B: Answer one question out of two 1 X 20M =20M.

The marks obtained for 40 shall be scaled down to 20 marks and the average of 3tests/2tests shall be taken as final Unit test marks for the course. Remaining 20 marks are given by the teacher based on the performance of the student during regular class work of that course.

c) Laboratory/Workshops:

Fifty percent of the total marks shall be allotted to continuous assessment in labs/workshops and the remaining fifty percent shall be derived from two tests

d) Assessment of Practicum Courses:

i)Practicum Theory Course (out of 30 Marks)

Theory and Practical Assessment: 20 Marks

Continuous Internal Assessment: 10 Marks

Total Marks for the course = 20+10= 30 Marks

ii) Practicum Practical Course (out of 40 Marks)

Practical & Theory Assessment: 20 Marks

Continuous Internal Assessment: 20 Marks

Total Marks for the course = 20+20 = 40 Marks

II. Summative Assessment:

The question paper for theory examination is patterned in such a manner that the weightage of periods/marks allotted for each of the topics for a particular course be considered. Summative Assessment paper is of 3 hours duration.

a) Each theory paper has Section A (short answers) and Section B (essay questions).

Section A: Answer 10 out of 12 questions, Total = 10 × 3M = 30M

Section B: Answer 5 out of 8 questions, Total = 5 × 8M = 40M

Total theory marks for Summative Assessment = 70 Marks.

b) Drawing Course:

I year

Section A: 4 questions 4 X 5M = 20 marks (all to be answered).

Section B: answer 4 questions out of 6 questions. 4 × 10M = 40 marks.

Drawing Courses - III Semester to V Semester

As per the weightage of marks given in blueprint of the respective course

c) Practical Examinations:

For practical with total 60 marks: Experiment/exercise = 50 marks; Viva-voce = 10 marks; Total = 60.

For practical with total 30 marks: Experiment/exercise = 25 marks; Viva-voce = 5 marks; Total = 30.

Question papers for practical are drawn by lottery and cover required skills. Changes to the pattern will be notified in advance.

d) Note on Laboratory Evaluation:

Laboratory teaching shall be task/competency based and the Semester-end question papers should follow SBTET norms.

4.16 Issue of Memorandum of Marks

All candidates who appear for the Summative Assessment will be issued memorandum of marks without any payment of fee. However, candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo. After successful completion of all courses, Consolidated Memorandum of Marks will be issued.

4.17 Maximum Period for Completion of Diploma

The maximum period to complete a Diploma is twice the duration of the course from the date of first admission (this includes any periods of detention or discontinuation). After this period, students will forfeit the right to complete the Diploma and will not be allowed to appear for exams. This applies to all the Diploma Programmes.

4.18 Eligibility for Award of Diploma

A candidate is eligible for the Diploma if:

i) They have pursued the course for not less than 3 years and not more

than 6 years.

ii) Students must complete all the required courses. Those who fail to fulfil the requirements within the maximum permissible period shall forfeit their seat and will not be eligible for readmission

For IVC & ITI Lateral Entry students:

i) They must pursue the course for not less than 2 years and not more than 4 years.

ii)They must complete all required courses. Failure to meet the requirements within the maximum permissible period shall result in forfeiture of the seat, and the student will not be eligible for readmission.

Note: As and when a new curriculum is introduced in future, existing curriculum students under C-26 scheme shall write their backlog courses if any in the new curriculum equivalent courses decided by the SBTET, AP.

4.19 Malpractice Cases:

If any candidate resorts to Malpractice during examinations, he / she shall be booked and the punishment shall be awarded as per SBTET,AP rules and regulations in vogue.

4.20. Discrepancies/ Pleas:

Any Discrepancy /Plea regarding results etc., shall be represented to the SBTET, AP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

4.21. General

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training, AP are within the jurisdiction of Mangalagiri, Guntur District Andhra Pradesh only.

iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P., Mangalagiri is final.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

VISION

Develop Artificial Intelligence and machine learning Engineers to be technologically adept, innovative, self-motivated and responsible citizen with human values, high quality skills and to contribute significantly towards ever changing Artificial Intelligence and Machine learning Technologies.

MISSION

M1	To provide opportunity to Diploma students who are capable of playing pivotal role in wide aspects of Artificial Intelligence and Machine learning Technologies.
M2	To make the students understand basic concepts underlie in Computer Engineering and able to apply them creatively in the fields of Artificial Intelligence and Machine learning Technologies.
M3	To train the student sensitive to the Environment, safety and economic context.
M4	To produce technically skilled students through intensive training in Artificial Intelligence and Machine learning Technologies tools and applications and to prepare the students for professional career and further research.

PROGRAMME EDUCATIONAL OBJECTIVIES (PEOs)	
Artificial Intelligence and Machine learning Engineering programme is ever changing to transform students into competent professionals with qualities, ethics and human values. On completion of the programme, the students should have acquired the following characteristics	
PE01	To produce best Diploma in Artificial Intelligence and Machine learning technicians by correlating growing need of the industries in modern topics with the academic input and giving the technical knowledge for further learning.
PE02	To prepare the students as productive Artificial Intelligence and Machine learning Engineers, possessing supportive and leadership skill in multi-disciplinary domains, expertise in Practical orientation, Communication Skills and latest developments.
PEO3	To give the depth of related skills and expertise in a single field, and the ability to collaborate with other disciplines and work at the Supervisory cadre.
PEO4	To promote the students in professionalism, by successful completion of the Diploma IN Artificial Intelligence and Machine learning by emphasizing Field Practices in industry-oriented activities.
	To sensitize the students on social and economic commitment

PEO5	and to inculcate a nature to guard the values of community and protect environment.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	Foundation of Computer System: Ability to understand the principles and working of computer systems and can assess the hardware and software aspects of computer systems.
PSO2	Foundations of Artificial Intelligence and Machine learning : Ability to understand the structure and development methodologies of Artificial Intelligence and Machine learning possess professional skills and knowledge of usage of Python in Artificial Intelligence and Machine learning. Familiarity and practical competence with a broad range of Python programming language and open source platforms
PSO3	Foundation of Mathematical concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm, methodologies in developing computer related problem solutions as well as apply them in establishing new firms in small scale with the help of experience gained as part of industrial training.

PROGRAMME OUTCOMES (POs)

PO1	**Basic and Discipline Specific Knowledge:** To apply knowledge of mathematics, science and engineering fundamentals and engineering specialization to Engineering Problems.
PO2	**Problem Analysis:** Identify and analyse well-defined engineering problems using codified standard methods mechanical engineering problems for meaningful solutions
PO3	**Design/Development of Solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specific needs.
PO4	**Engineering tools, Experimentation and Testing:** Apply modern engineering tools and appropriate techniques to conduct standard tests and measurements.
PO5	**Engineering Practices for Society, Sustainability and Environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
PO6	**Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7	**Life-long Learning:** Ability to analyse individual needs and engaging updating in the context of technological changes.

NOTE :

In some of the courses PO5,PO6 and PO7 strength is between 1 and 2, to strengthen them, the following remedial measures for all the courses are suggested.

Short fall in PO	**Remedial Measures**
PO5	By conducting 1)Guest lectures on motivational aspects and ethics. 2) Concerned teacher will educate the students to follow ethics and morals in developing solutions. 3) providing access to Online courses like Swayam program. 4)seminars by senior students to the junior students to assimilate the methods followed by them to the juniors. 5)Head of section will frequently visit and observe the activities being followed by the students to correct their behaviour and to inculcate morals and ethics.
PO6	They can achieve this from industrial training module scheduled in 6th semester of this curriculum by observing, analysing and applying the mathematical and scientific fundamentals in solving the real time problems that will arise in day to day activities in industry.
PO7	1) Providing access to Online courses like Swayam program. 2) By utilizing Learning Management System(LMS) established by SBTET 3) By subscribing e-magazines/ print magazines to the institute library and made them accessible to the students. 4)By arranging Guest lectures from the technical experts.

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
FIRST YEAR

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Year	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM101T	English Essentials	3	-	N	90	4	3	30	70	100
26AM102T	Engineering Mathematics-I	6	-	N	180	6	3	30	70	100
26AM103T	Engineering Physics	3	-	N	90	4	3	30	70	100
26AM104T	Engineering Chemistry	3	-	N	90	4	3	30	70	100
26AM105T	Python Programming	6	-	N	180	6	3	30	70	100
AUDIT COURSE										
26AM106A	Coding Fundamentals	2	-	Y	60	-	-	-	-	-
PRACTICAL COURSES										
26AM107L	Python Programming Lab	-	6	N	180	6	3	40	60	100
26AM108L	Computer Hardware Lab	-	4	N	120	3	3	40	60	100
26AM109L	Physics Lab	-	3	N	90	1.5	3	20	30	50
26AM110L	Chemistry Lab	-		N		1.5	3	20	30	50
26AM111L	Computer & Digital Skills lab	-	3	N	90	3	3	40	60	100
26AM112C	Student Centric Activities	-	3	N	90	1	-	-	-	-
	TOTAL	**23**	**19**	-	**1260**	**40**	-	**310**	**590**	**900**
Note 1: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games										

* **Note 2**: For the Physics laboratory half of the first-year students of each programme will attend, while the remaining half will attend the chemistry laboratory. Thus, both laboratories will be engaged simultaneously during the three-hour lab session.

Note 3: 26AM101T, 26AM102T, 26AM103T, 26AM104T, 26AM109L, 26AM110L, and 26AM111L are common to all programmes. All the first year courses are common with computer allied branches i.e. CME/CCB/CCN/CAI/CIOT

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III SEMESTER

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Semester	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM301T	Data Structures using Python	6	-	N	90	4	3	30	70	100
26AM302T	Database Management Systems	6	-	N	90	4	3	30	70	100
26AM303T	Operating Systems	6	-	N	90	4	3	30	70	100
ELECTIVE COURSES										
26AM304E	Engineering Mathematics-II	3	-	N	45	2	3	30	70	100
26AM305E	Digital Electronics									
26AM306E	Computer rganization									
AUDIT COURSE										
26AM307A	Multimedia	2	-	Y	30	-	-	-	-	-
PRACTICAL COURSES										
26AM308L	Data Structures using Python Lab	-	6	N	90	2	3	40	60	100
26AM309L	DBMS Lab	-	6	N	60	2	3	40	60	100
26AM310L	LINUX Practicals	-	4	Y	60	1.5	3	40	60	100
26AM311C	Student Centric Activities	-	3	N	45	0.5	-	-	-	-
	TOTAL	**23**	**19**	-	**630**	**20**	-	**240**	**460**	**700**

Note 1: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games

Note 2: 26AM304E is common elective to all programmes.
26AM301T, 308L are common with CME/CCB/CCN/CAI
26AM302T, 305E, 309L, 310L are common with CME/CCB/CCN/CAI/CIOT
26AM307A is common with CME/CCB/CAI
26AM303T, 306E are common with CME/CCB/CCN/CAI

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV SEMESTER

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Semester	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM401T	Web Technologies	6	-	N	90	3.5	3	30	70	100
26AM402T	Artificial Intelligence	6	-	N	90	3.5	3	30	70	100
26AM403T	Machine Learning	6	-	N	90	3.5	3	30	70	100
ELECTIVE COURSES										
26AM404E	Computer Vision	3	-	N	45	2	3	30	70	100
26AM405E	Computer Networks									
AUDIT COURSE										
26AM406A	Troubleshooting of Computer Networks	2	-	Y	30	-	-	-	-	-
PRACTICAL COURSES										
26AM407L	Web Technologies Lab	-	6	N	90	2.5	3	40	60	100
26AM408L	Communication & Employability Skills	-	4	N	60	2	3	40	60	100
26AM409L	AI using PROLOG Lab	-	6	N	90	2.5	3	40	60	100
26AM410C	Student Centric Activities	-	3	N	45	0.5	-	-	-	-
	TOTAL	**23**	**19**	-	**630**	**20**	-	**240**	**460**	**700**

Note: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games

Note 2: 26AM408L is common laboratory to all programmes.
26AM401T,407L are common with CCB/CME/CAI/CCN
26AM402T,409L are common with CAI
26AM404E is common with CAI
26AM406A is common with CCB/CIOT/CAI/CME

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V SEMESTER

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Semester	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM501T	Basics of Quantum Computing	6	-	N	90	4	3	30	70	100
26AM502T	Software Engineering	6	-	N	90	4	3	30	70	100
26AM503T	Natural Language Processing	6	-	N	90	4	3	30	70	100
ELECTIVE COURSES										
26AM504E	Data Science	3	-	N	45	2	3	30	70	100
26AM505E	Artificial Neural Networks & Deep Learning									
AUDIT COURSE										
26AM506A	Pattern Recognition	2	-	Y	30	-	-	-	-	-
PRACTICAL COURSES										
26AM507L	NATURAL LANGUAGE PROCESSING using Python Lab	-	4	N	60	1.5	3	40	60	100
26AM508L	Machine Learning Lab	-	6	N	90	2	3	40	60	100
26AM509L	Project Work	-	6	N	90	2	3	40	60	100
26AM510C	Student Centric Activities	-	3	N	45	0.5	-	-	-	-
	TOTAL	**23**	**19**	-	**630**	**20**	-	**240**	**460**	**700**

Note 1: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games

Note 2: 26AM501T is common with CCB/CIOT/CAI/CME/CCN
26AM502T is common with CCB/CME
26AM503T is common with CAI
26AM506A, 26AM507L is common with CAI
26AM509L is common with CCB/CIOT/CAI/CME/CCN

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI-SEMESTER

Assessment No	Upon completion of	Conducted by	Based on	Max Marks
Pre-Assessment	15 Days to 30 Days from the commencement of training	Mentor faculty member visits the industry one month after commencement of training and will submit a detailed report to the principal outlining the each candidate's details and observed work culture		
1 (Formative Assessment)	Mid Semester Assessment (after three months - at industry	1.The mentor faculty member concerned 2. Industry Training In charge	Learning outcomes as given in the scheme of assessment, for Industrial Training	120
	COURSE-I	Registration at Nptel/Swayam/Moocs/course era/lectera/caltech/NASSCOM/APSKILL DEVELOPMENT/oxford/ hackerrank/udemy…etc.,	1.Learning 2.Mini Application development 3.Report preparation	
2 (Formative Assessment)	Last month of training (at industry)	1. The mentor faculty member concerned 2. Industry Training In charge	Learning outcomes as given in the scheme of assessment, for Industrial Training	120
	COURSE-II	Registration at Nptel/Swayam/Moocs/course era/lectera/caltech/NASSCOM/APSKILL DEVELOPMENT/oxford/ hackerrank/udemy…etc.,	1.Learning 2.Mini Application development 3.Report preparation	
3 (Summative Assessment)	After completion of the training (at Institution)	1.The faculty member concerned, 2.HoD concerned 3.An external examiner from Industry	1.Demonstration of any one of the skills listed in learning outcomes	30
			2.Training Report	20
			3. Viva Voce	10
TOTAL				**300**

The Industrial Training shall carry maximum 300 marks. Pass mark is 50% in first and second assessment put together and also 50% in final summative assessment at the institution level.

I Year

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
FIRST YEAR

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Year	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM101T	English Essentials	3	-	N	90	4	3	30	70	100
26AM102T	Engineering Mathematics-I	6	-	N	180	6	3	30	70	100
26AM103T	Engineering Physics	3	-	N	90	4	3	30	70	100
26AM104T	Engineering Chemistry	3	-	N	90	4	3	30	70	100
26AM105T	Python Programming	6	-	N	180	6	3	30	70	100
AUDIT COURSES										
26AM106A	Coding Fundamentals	2	-	Y	60	-	-	-	-	-
PRACTICAL COURSES										
26AM107L	Python Programming Lab	-	6	N	180	6	3	40	60	100
26AM108L	Computer Hardware Lab	-	4	N	120	3	3	40	60	100
26AM109L	Physics Lab	-	3	N	90	1.5	3	20	30	50
26AM110L	Chemistry Lab	-		N		1.5	3	20	30	50
26AM111L	Computer & Digital Skills lab	-	3	N	90	3	3	40	60	100
26AM112C	Student Centric Activities	-	3	N	90	1	-	-	-	-
	TOTAL	**23**	**19**	-	**1260**	**40**	-	**310**	**590**	**900**
Note 1: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games										

* **Note 2**: For the Physics laboratory half of the first-year students of each programme will attend, while the remaAMAMg half will attend the chemistry laboratory. Thus, both laboratories will be engaged simultaneously during the three-hour lab session.

Note 3: 26AM101T, 26AM102T, 26AM103T, 26AM104T, 26AM109L, 26AM110L, and 26AM111L are common to all programmes. All the first-year courses are common with computer allied branches i.e. CME/CCB/CCN/CAI/CIOT

ENGLISH ESSENTIALS

Course code	Course Title	No. Of periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM101T	ENGLISH ESSENTIALS	3	90	30	70	4

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions
1.	Exploring English	10	14	2	1
2.	The Better You!	10	11	3	1
3.	Drive to Destiny	10	14		1
4.	Renew, Rewire & Resolve	10	17	2	1
5.	Brains & Bots	10		1	
6	The Blue Planet: Mend or End	10	11	1	1
7	One World One Dream	10	11	1	1
8	The Net Norms	10	11	1	1
9	Managing Moods & Moments	10	11	1	1
	Total	90	100	12	8

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)	To inculcate knowledge of functional English and enrich vocabulary
(ii)	To impart effective listening, speaking, reading, and writing skills
(iii)	To sensitise the students on themes related to personality, technological advancements, sustainability, and human values

COURSE OUTCOMES

CO1	AM101.1	Learn and apply various English grammatical concepts to communicate in academic, professional, personal, and social contexts.
CO2	AM101.2	Use appropriate vocabulary in academic, professional and business correspondence, and on social media platforms.
CO3	AM101 .3	Listen/read and comprehend diverse academic, professional, and general listening and reading materials.
CO4	AM101 .4	Communicate effectively and fluently in oral and written forms in various life situations.
CO5	AM101 .5	Display scientific temper and universal human values; adopt technology for holistic development and harmonious living through one's demeanour and communication.

LEARNING OUTCOMES

1.0 Exploring English

1.1 To read and comprehend simple sentences in a short passage.

1.2 To apply rules of spelling, correct the misspelt words and use dictionary to enrich vocabulary

1.3 To identify various parts of speech suitable to the context and use articles & prepositions accurately.

1.4 To describe a given situation/picture using simple sentences.

1.5 To value the importance of English for employability.

2.0 The Better You!

2.1 To read and comprehend formal and informal conversations.

2.2 To use words suitable to the context in spoken and written communication.

2.3 To use the appropriate forms of verbs.

2.4 To engage in conversations in both formal and informal contexts.

2.5 To demonstrate a positive attitude in personal and academic spheres.

3.0 Drive To Destiny

3.1 To read and comprehend paragraphs for specific and general information, and distinguish different types of paragraphs

3.2 To distinguish word pairs and use them contextually.

3. 3 To frame sentences with proper subject-verb agreement.

3.4 To describe actions using appropriate tenses.

3.5 To set and achieve academic and personal goals.

4.0 Renew, Rewire & Resolve

4.1 To read and comprehend the content and structure of e-mails for different purposes.

4.2 To recognise the root words and use appropriate affixes contextually.

4.3 To use various kinds of sentences for different communicative situations.

4.4 To draft E-mails for academic and professional purposes.

4.5 To apply critical thinking and creativity for solving problems.

5.0 Brains & Bots

5.1 To read and comprehend the description of a process and the use of sequence markers.

5.2 To communicate effectively using phrasal verbs.

5.3 To use active and passive voice appropriately.

5.4 To describe processes and procedures using appropriate sentence forms.

55. To appraise the importance and use of robotics and artificial intelligence in human life.

6.0 The Blue Planet: Mend Or End!

6.1 To read and comprehend the content, structure and purpose of formal and In formal letters.

6.2 To describe using appropriate forms of adjectives

6.3 To substitute phrases or clauses with a single word.

6.4 To draft personal and professional letters.

6.5 To realise the importance of environmental protection and ensure sustainability.

7.0 One World - One Dream

7.1 To read and comprehend an essay and analyse its features

7.2 To identify and create shortened forms of words or phrases.

7.3 To report the expressions of the speaker with necessary grammatical changes.

7.4 To draft well-organised essays for academic and professional purposes.

7.5 To appraise the importance of inclusivity in society.

8.0 The Net Norms

8.1 To comprehend and analyse the given text for making notes and summarising.

8.2 To use contemporary language in informal communication.

8.3 To split or combine ideas using conjunctions for effective communication.

8.4 To make notes of textual information and summarise the information.

8.5 To demonstrate ideal behaviour on the internet.

9.0 Managing Moods & Moments

9.1 To read and comprehend different types of reports.

9.2 To analyse and evaluate grammatical errors.

9.3 To use words and phrases in sentences of your own.

9.4 To draft organised and comprehensive reports on experiments, events, visits and incidents.

9.5 To assess the reasons and manage stress and time effectively.

CO-PO/PSO MAPPING

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS01	PS02	PS03
CO1	POs 1 to 4 are not directly applicable to the English course. However, activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.					3	2	Programme Specific Outcomes are branch-specific with technical aspects that are not directly applicable to the English Language course.		
CO2						3	2			
CO3						3	2			
CO4						3	2			
CO5					2		2			
Average					2	3	2			

3-StronglyMapped 2-ModeratelyMapped 1-Slightly Mapped

Note: The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:
(i)Assignments (ii)Tutorials (iii)Seminars (iv)Guest Lectures (v)Group Discussions (vi) Quizzes (iv) Library Visits etc.,

COURSE CONTENT

1.0 Exploring English

Reading – Role play – Picture Interpretation – Sounds and Spellings – Parts of Speech – Articles and Prepositions

2.0 The Better You!

Reading – Dialogue Writing – Synonyms and Antonyms – Word order – Verbs

3.0 Drive to Destiny

Reading – Paragraph Writing – Homophones, Homonyms, Homographs – Concord – Tenses

4.0 Renew, Rewire & Resolve

Reading – E-mail Writing – Roots, Affixes – Kinds of Sentences

5.0 Brains & Bots

Reading – Describing Process – Phrasal Verbs – Voice

6.0 The Blue Planet: Mend or End!

Reading – Letter Writing – One-word Substitutes – Degrees of Comparison

7.0 One World - One Dream

Reading – Essay Writing – Abbreviations & Acronyms – Reported Speech

8.0 The Net Norms

Reading – Note making & Summarising – Gen-Z Vocabulary – Synthesis of Sentences

9.0 Managing Moods & Moments

Reading – Report Writing – Usage – Error Analysis

Note: The textbook "English Essentials" (A Textbook of English for I Year Engineering Diploma Courses - by SBTET, AP) is the prescribed text for this course. It comprises various language inputs and activities addressing the Learning outcomes specified in each unit. Every unit will have six major components: Listening, Speaking, Reading, Writing, Vocabulary, and Grammar. The activities will be designed as Individual, Pair and Group activities to facilitate self and peer learning.

REFERENCES

1. Martin Hewings, "*Advanced Grammar in Use",* Cambridge University Press (2007)
2. Murphy, Raymond, "*English Grammar in Use",* Cambridge University Press (2019)
3. Sidney Greenbaum, "*Oxford English Grammar"*, Oxford University Press (1996)

4. Wren and Martin (Revised by N.D.V. Prasad Rao) "*English Grammar and Composition*, Blackie ELT Books", S. Chand and Co. (2023)

5. Sarah Freeman, "*Strengthen Your Writing"*, MacMillan

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning Outcomes to be Covered
UnitTest–1	From1.1 to 3.5
UnitTest–2	From 4.1 to. 6.5
Unit Test – 3	From 7.1 to 9.5

ENGINEERING MATHEMATICS-1

Course code	Course Title	No. Of periods/ week	Total No of Periods / Year	FA Marks	SA Marks	Credits
26AM102T	ENGINEERING MATHEMATICS-I	6	180	30	70	6

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs Mapped
Unit - I: Algebra						
1	Partial Fractions	6	4	0	1/2	CO1
2	Matrices and Determinants	25	18	2	1&1/2	CO1
Unit - II: Trigonometry						
3	Trigonometric Ratios	4	0	0	0	CO2
4	Compound Angles	8	3	1	0	CO2
5	Multiple and Sub-multiple angles	8	3	1	0	CO2
6	Transformations	9	4	0	1/2	CO2
7	Inverse Trigonometric Functions	8	4	0	1/2	CO2
8	Trigonometric Equations	8	4	0	1/2	CO2
9	Properties of triangles	8	4	0	1/2	CO2
10	Complex Numbers	8	3	1	0	CO2
11	Hyperbolic functions	2	0	0	0	CO2
Unit III: Co-ordinate Geometry						
12	Straight Lines	8	3	1	0	CO3
13	Circles	8	4	0	1/2	CO3
14	Conic Sections	10	4	0	1/2	CO3
Unit – IV: Differential Calculus						
15	Limits and Continuity	6	3	1	0	CO4
16	Differentiation	28	17	3	1	CO4
Unit – V: Integral Calculus						
17	Indefinite integration	18	11	1	1	CO5
18	Definite integration	8	11	1	1	CO5
	Total	180	100	12	8	
			Marks	36	64	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able	
(i)	To apply the principles of Algebra, Trigonometry and Co-ordinate Geometry to real-time problems in engineering.
(ii)	To build the concepts of indefinite integrals and definite integrals.

COURSE OUTCOMES

CO1	AM102.1	Resolve partial fractions and solve problems on matrices and determinants.
CO2	AM102.2	Use the concept of trigonometric functions, their inverses and complex numbers.
CO3	AM102.3	Find the equations and properties of straight lines, circles and conic sections in coordinate system.
CO4	AM102.4	Evaluate the limits and derivatives of various functions and apply to engineering problems.
CO5	AM102.5	Integrate various functions using different methods and evaluate definite integrals.

LEARNING OUTCOMES

C.O. 1 Resolve partial fractions and solve problems on matrices and determinants.

L.O. 1.1 Define rational, proper and improper fractions of polynomials.

1.2 Explain the procedure of resolving proper fractions of the type $\frac{f(x)}{(ax+b)(cx+d)}$

1.3 Define a matrix and order of a matrix.

1.4 State various types of matrices with examples (emphasis on 3rd order square matrices).

1.5 Compute sum, difference, scalar multiplication and product of matrices. Illustrate the properties of these operations such as commutative, associative and distributive properties with examples and counter examples.

1.6 Define the transpose of a matrix and state its properties – examples.

1.7 Define symmetric and skew-symmetric matrices with examples. Resolve a square matrix into a sum of symmetric and skew-symmetric matrices with examples.

1.8 Define determinant of a square matrix; minor, co-factor of an element of a 3x3 square matrix with examples. Expand the determinant of a 3x3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve simple problems.

1.9 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrix and list properties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.

1.10 Solve a system of three linear equations in three unknowns using Cramer's rule.

C.O. 2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.

L.O. 2.1 Recall the trigonometric ratios and their values at specified angles.

2.2 Draw graphs of trigonometric functions - Explain periodicity of trigonometric functions.

2.3 Define compound angles and state the formulae of $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$ and $\cot(A \pm B)$.

2.4 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

2.5 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.

2.6 Solve simple problems using the identities on compound angles.

2.7 Derive the formulae of multiple angles 2A, 3A etc., and sub-multiple angle A/2 in terms of angle A of trigonometric functions.

2.8 Derive useful allied formulae like $\sin^2 A = \frac{1-\cos 2A}{2}$ etc.

2.9 Solve simple problems using the multiple and sub-multiple formulae.

2.10 Derive the formulae on transforming sum or difference of two trigonometric ratios intoa product and vice versa - examples on these formulae.

2.11 Solve problems by applying these formulae to sum or difference or product of two terms.

2.12 Explain the concept of inverse of a trigonometric function by selecting an appropriate domain and range.

2.13 Define inverses of six trigonometric functions along with their domains and ranges.

2.14 Derive relations between inverse trigonometric functions so that the given inverse trigonometric function can be expressed in terms of other inverse trigonometric functions with examples.

2.15 State various properties of inverse trigonometric functions and identities like $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$ etc.

2.16 Apply formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, *where* $x \geq 0, y \geq 0, xy < 1$ etc., to solve simple problems.

2.17 Explain what is meant by solution of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

2.18 Solve models of the type $a\sin^2 x + b\sin x + c = 0$ and $a\sin x + b\cos x + c = 0$.

2.19 State sine rule, cosine rule, tangent rule and projection rule and solve a triangle using these formulae.

2.20 List various formulae for area of a triangle with examples.

2.21 Define a complex number, its modulus, conjugate, amplitude and list their properties.

2.22 Define arithmetic operations on complex numbers with examples.

2.23 Represent the complex number in various forms like modulus-amplitude (polar) form and Exponential (Euler) form with examples.

2.24 Explain the concept of hyperbolic trigonometric functions and list appropriate formulae.

C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.

L.O. 3.1 Write different forms of a straight line – general form, point-slope form, slope-intercept form, two-point form, intercept form and normal form or perpendicular form.

3.2 Find distance of a point from a line, acute angle between two lines, intersectionof two non-parallel lines and distance between two parallel lines.

3.3 Define locus of a point and circle.

3.4 Write the general equation of a circle and find its centre and radius.

3.5 Find the equation of a circle, given (i) centre and radius, (ii)two ends of the diameter(iii) three non collinear points of type $(0,0),(a,0),(0,b)$.

3.6 Define a conic - Explain the terms focus, directrix, eccentricity, axes and latus-rectum of a conic.

3.7 Find the equation of a conic when focus, directrix and eccentricity are given.

3.8 Describe the properties of Parabola $y^2 = 4ax$.

C.O.4 Evaluate the limits and derivatives of various functions.

L.O. 4.1 Explain the concept of limit and meaning of $\lim_{x\to a} f(x)=l$ and state the properties of limits.

4.2 Evaluate the limits of the type $\lim_{x\to a}\frac{f(x)}{g(x)}$

4.3 State the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, **(**without proof) and solve simple problems using these standard limits.

4.4 Explain the concept of continuity of a function at a point and on an interval

4.5 State the concept of derivative of a function $y=f(x)$– definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also write standard notations to denote the derivative of a function.

4.6 Explain the significance of derivative in scientific and engineeringapplications.

4.7 Find the derivatives of standard algebraic, logarithmic, exponential andtrigonometric functions using the first principle.

4.8 Find the derivatives of hyperbolic and inverse hyperbolic functions.

4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with simple illustrative examples.

4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.

4.11 Explain the method of differentiation of parametric functions with examples.

4.12 Explain the procedure for finding the derivatives of implicit functions with examples.

4.13 Explain the need of taking logarithms for differentiating some functions of $[f(x)]^{g(x)}$ type – examples on logarithmic differentiation.

4.14 Explain the concept of finding the second order derivatives with examples.

4.15 Define maximum and minimum values of a function and find the maximum and minimum values for quadratic polynomials.

4.16 Explain the concept of functions of several variables, finding partial derivatives and difference between the ordinary and partial derivatives with simple examples.

C.O. 5 Integrate various functions using different methods and evaluate definite integrals.

L.O. 5.1 Explain the concept of Indefinite integral as an anti-derivative.

5.2. State the indefinite integral of standard functions and properties of $\int (u+v)\,dx$ and $\int k\,u\,dx$, where *u, v* are functions of x and k is constant.

5.3. Solve problems involving standard functions using these properties.

5.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(x)\,dx$, *where* $f(x)$ is in standard form.

ii) $\int [f(x)]^n f'(x)dx, n \neq -1.$

iii) $\int \frac{f'(x)}{f(x)}dx.$

5.5. Find the integrals of *tan x, cot x, sec x* and *cosec x* w.r.t. x.

5.6. Evaluate the Standard integrals of the functions of the type :

$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$

$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$

$iii)\ \sqrt{a^2+x^2}, \sqrt{a^2-x^2}, \sqrt{x^2-a^2}$

5.7. Evaluate integrals using decomposition method for integrand of the type $\frac{px+q}{(ax+b)(cx+d)}$.

5.8. Solve problems using integration by parts.

5.9 Use Bernoulli's rule to evaluate the integrals of the form $\int u.vdx$.

5.10. State the fundamental theorem of integral calculus.

5.11. Explain the concept of definite integral.

5.12. Solve simple problems on definite integrals.

5.13. State various properties of definite integrals.

5.14. Evaluate simple problems on definite integrals using these properties.

CO/PO – MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3				3	2	2
CO2	3	3	2	2				3	2	2
CO3	3	3	2	2				3	2	2
CO4	3	3	3	3				3	3	3

CO5	3	3	3	3				3	3	3
Avg.	3	2.8	2.4	2.6				3	2.4	2.4

3 = Strongly mapped (High), 2 = moderately mapped (Medium), 1 = slightly mapped (Low)

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.
For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.
For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

COURSE CONTENT

Unit-I: Algebra

1. **Partial Fractions:**Definitions of rational, proper and improper fractions of polynomials. Resolve rational fractions (proper fractions) of type $\frac{f(x)}{(ax+b)(cx+d)}$ into partial fractions.
2. **Matrices:** Definition of a matrix, types of matrices - Algebra of matrices, equality of two matrices, sum, difference, scalar multiplication and product of matrices. Transpose of a matrix, Symmetric, skew-symmetric matrices - Determinant of a square matrix, minor and cofactor of an element, Laplace's expansion, properties of determinants - Singular and non-singular matrices, Adjoint and multiplicative inverse of a square matrix - System of linear equations in 3 variables-Solutions by Cramer's rule.

Unit-II: Trigonometry

3. **Trigonometric ratios:**Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
4. **Compound angles:**Formulas of $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$, $\cot(A \pm B)$ and related identities.
5. **Multiple and sub-multiple angles:** Formulae for trigonometric ratios of multiple angles 2A, 3A and sub multiple angle A/2.
6. **Transformations:**Transformations of products into sums or differences and vice versa.
7. **Inverse trigonometric functions:**Definition, domains and ranges-basic properties.
8. **Trigonometric equations:**Concept of a solution, principal value and general solution of trigonometric equations: $\sin x = k$, $\cos x = k$ and $\tan x = k$, where k is a constant. Solutions of simple quadratic equations and equations of type $a\sin^2 x + b\sin x + c = 0$ and $a\sin x + b\cos x + c = 0$.
9. **Properties of triangles:**Relations between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle.
10. **Complex Numbers:**Definition of a complex number, modulus, conjugate and amplitude of a complex number- Arithmetic operations on complex numbers -

Modulus-Amplitude(polar) form,Exponential form (Euler form) of a complex number.

11. **Hyperbolic functions:**Definition of hyperbolic and inverse hyperbolic trigonometric functions- and list formulae.

UNIT-III: Coordinate geometry

12 **Straight lines:**Various forms of a straight line - Angle between two lines, perpendicular distance from a point to the straight line, point of intersection of non-parallel lines and distance between parallel lines.

13. **Circle:**Locus of a point, Circle definition-Circle equation given (i) centre and radius,(ii) two ends of a diameter (iii) three non-collinear points of type $(0,0),(a,0),(0,b)$ - General equation of a circle –its centre and radius.

14. **Conic sections**:Definition of a conic - Equation of a conic when focus, directrix and eccentricityare given - Properties of parabola in the standard form $y^2 = 4ax.$

UNIT-IV: Differential Calculus

15.**Concept of Limit:**Definition and Properties of Limits and Standard Limits - Continuity of a function at a point.

16.**Concept of derivative:**Definition (first principle)- different notations- Derivatives of standard algebraic, logarithmic, exponential, trigonometric, inverse trigonometric, hyperbolic and inverse hyperbolic functions - Derivatives of sum, difference, scalar multiplication, product, quotient of functions - Chain rule, derivatives of parametric functions, derivatives of implicit functions, logarithmic differentiation - Second order derivatives – Define maximum and minimum values of a function and find the maximum or minimum values for quadratic polynomial. Functions of several variables, first order partial derivatives.

UNIT-V: Integral Calculus

17. **Indefinite Integration:**Integration regarded as an anti-derivative – Indefinite integrals of standard functions. Properties of indefinite integrals. Integration by substitution or change of variable. Integrals of tan x, cot x, sec x and cosec x.

Evaluation of integrals which are of the following forms:

$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$

$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$

$iii)\ \sqrt{a^2+x^2}, \sqrt{a^2-x^2}, \sqrt{x^2-a^2}$

Integration by decomposition of the integrand into simple rational, algebraic functions - Integration by parts, Bernoulli's rule.

18. **Definite Integration:**Definite integral, fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals.

TEXTBOOK

1. Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

REFERENCES

1. Shanti Narayan, A Textbook of matrices, S.Chand& Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series.
3. G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.

4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum'sSeries.
5. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.

SUGGESTED E-LEARNING REFERENCES

1. https://www.khanacademy.org/
2. https://www.wolframalpha.com/
3. https://onlinecourses.nptel.ac.in/
4. http://tutorial.math.lamar.edu/

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning Outcomes to be Covered
Unit Test–1	From1.1to 2.11
Unit Test–2	From 2.12 to 3.8
Unit Test–3	From 4.1 to 5.14

ENGINEERING PHYSICS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM103T	ENGINEERING PHYSICS	3	90	30	70	4

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Units and Measurements	09	06	02	-	CO1
2.	Elements of Vectors	11	14	02	01	
3.	Mechanics	10	11	01	01	CO2
4.	Fundamentals of Astrodynamics	13	19	01	02	
5.	Energy and Thermal Physics	12	11	01	01	CO3
6.	Concepts of Acoustics	12	14	02	01	
7.	Electricity and Magnetism	13	14	02	01	CO4
8.	Modern Physics	10	11	01	01	
	Total	90	100	12	08	

COURSE OBJECTIVES

Upon completion of the course the student shall be able

(i)	To understand the basic concepts of physics for various Engineering applications as required for industries.
(ii)	To equip the students with the scientific advances in technology and make the student suitable for any industrial organization.

COURSE OUTCOMES

CO1	AM103.1	Familiarize with various physical quantities, their SI units and errors in measurements; Understand the concepts of vectors for solving engineering problems.
CO2	AM103.2	Solve problems in engineering using appropriate equations and formulae related to Mechanics; Understand the concepts of gravitation, planetary motion with reference to applications in satellites
CO3	AM103.3	Familiarize with the knowledge of various forms of energy, thermal physics and concepts of acoustics in relevance to the societal requirements.
CO4	AM103.4	Familiarize with the basic knowledge of electricity, magnetism and advances in Modern Physics such as photoelectric cell, optical fibers, superconductors and nanotechnology.

LEARNING OUTCOMES

1 UNITS AND MEASUREMENTS

1.1Introduction to Units and Measurements

1.2 Define the terms: a) Physical quantity b) Fundamental physical quantities and c)Derived physical quantities.

1.3 Explain the concept of units in measurement.

1.4 Define the term 'unit'.

1.5 Define fundamental units and derived units.

1.6State the SI units of fundamental quantities along with their symbols.

1.7State the common multiples and submultiples used in the SI system.

1.8 State the rules for writing SI units.

1.9 State the advantages of using SI units.

1.10 Differentiate between direct and indirect measurements.

1.11 Define accuracy and least count in the context of measurement.

1.12 Define error in measurement.

1.13 Define absolute, relative and percentage errors and state their respective

formulae.

1.14 Solve numerical problems on errors in measurements.

2 ELEMENTS OF VECTORS

2.1 Explain the concept of vectors.

2.2 Define scalar and vector quantities with relevant examples for each.

2.3 Represent a vector geometrically.

2.4 Define equal vectors, negative vector, unit vector, position vector, co-initial vectors, co-planar vectors.

2.5 Resolve a given vector into its rectangular components.

2.6 State and explain the triangle law of addition of vectors.

2.7 State the parallelogram law of addition of vectors.

2.8 Derive the expressions for the magnitude and direction of the resultant vector using the parallelogram law.

2.9 Illustrate applications of the parallelogram law of vectors using examples (i) Bow and arrow (ii) working of a sling (iii) Flying of a bird.

2.10 Define dot product (scalar product) of two vectors.

2.11 Explain (i) work done (ii) power as examples of dot product.

2.12 Define cross product (vector product) of two vectors.

2.13 Explain (i) linear velocity (ii) torque as examples of cross product.

2.14 Solve numerical problems on (i) resolution of vectors (ii) the Parallelogram law of vectors iii) dot product.

3 MECHANICS

3.1 Define linear momentum; Mentionits SI unit.

3.2 Define force.Mentionits SI unit.

3.3 Define torque.Mentionits SI unit.

3.4 Define concurrent forces, co-planar forces.

3.5 State and explain Lami's theorem.

3.6 State equations of motion of a body moving in a straight line with uniform acceleration.

3.7 Define projectile. Give examples.

3.8 Derive the equation for the path of an oblique projectile.

3.9 Define periodic motion.

3.10 Define Ideal Simple pendulum.

3.11 Write formula for the time period of a simple pendulum.

3.12 Solve numerical problems on equations of motion and simple pendulum.

4 FUNDAMENTALS OF ASTRODYNAMICS

4.1 Define acceleration due to gravity (g); Mention its SI unit.

4.2 State and explain Newton's universallaw of gravitation.

4.3 Define universal gravitational constant (G) and mention its value in SI unit.

4.4 Derive the relationship between acceleration due to gravity (g) and the universal gravitational constant (G).

4.5 State and explain Kepler's laws of planetary motion.

4.6 Define orbital velocity and state its formula.

4.7 Define escape velocity and state its formula.

4.8 Derive the relationship between escape velocity and orbital velocity.

4.9 Define the term 'satellite'.

4.10 Define natural and artificial satellites. Give examples for each.

4.11 Mention the applications of artificial satellites.

4.12 Solve numerical problems on (i) Newton's law of gravitation (ii) orbital velocity (iii) escape velocity.

5 ENERGY AND THERMAL PHYSICS

5.1 Define work done; Mention its SI unit.

5.2 Define power; Mention its SI unit.

5.3 Define energy; Mention its SI unit.

5.4 List various forms of energy.

5.5 Define potential energy; Give examples and derive its equation.

5.6 Define kinetic energy; Give examples and derive its equation.

5.7 Derive the relationship between kinetic energy and linear momentum.

5.8 State the law of conservation of energy;Give any two examples.

5.9 State Boyle's law; Write its equation.

5.10 State Charles's volume law; Write its equation.

5.11 State Charles's pressure law; Write its equation.

5.12 Define an Ideal gas.

5.13 Derive the ideal gas equation(PV = nRT).

5.14 Solve numerical problems on (i) Work done (ii) Potential energy (iii) Kinetic energy (iv) Relation betweenK.E. and momentum (v) Gas laws

6 CONCEPTS OF ACOUSTICS

6.1 Define longitudinal waves. Give examples.

6.2 Define transverse waves. Give examples.

6.3 Define sound.Mention SI unit for intensity of sound.

6.4 Define musical sound.

6.5 Define noise.

6.6 Distinguish between musical sound and noise.

6.7 Define noise pollution.

6.8 Explain the sources of noise pollution.

6.9 Explain the effects of noise pollution.

6.10 Explain methods of minimizing noise pollution.

6.11 Define Beats. Write formula for beat frequency.

6.12 State Doppler's Effect. Mention its applications.

6.13 Explain the concept of echo.

6.14 Mention the applications of echo.

6.15 Define reverberation and reverberation time.

6.16 Write Sabine's formula and name the parameters in it.

6.17 Solve numerical problems on echo.

7 ELECTRICITY AND MAGNETISM

7.1 State and explain Ohm's law.

7.2 Define electrical resistance; Mention its SI unit.

7.3 Define specific resistance (resistivity);Mention its SI unit.

7.4 State and explain Kirchhoff's Current Law.

7.5 State and explain Kirchhoff's Voltage Law.

7.6 Derive an expression for the balancing condition of Wheatstone's bridge with neat diagram.

7.7 Describe Meter bridge with necessary circuit diagram.

7.8 Write formula to find unknown resistance using meter bridge.

7.9 Explain the concept of magnetic field.

7.10 Define uniform and non-uniform magnetic fields.

7.11 Define magnetic pole strength; Mention its SI unit.

7.12Define magnetic moment; Mention its SI unit.

7.13 Define magnetic lines of force.

7.14 Write the properties of magnetic lines of force.

7.15 State Coulomb's inverse square law of magnetism. Write its equation.

7.16 Derive the expression for the moment of couple acting on a bar magnet placed in a uniform magnetic field.

7.17 Solve numerical problems on (i) Ohm's law (ii) Kirchhoff's first law (iii) Wheatstone bridge and Meter bridge (iv) Coulomb's inverse square law of magnetism.

8 MODERN PHYSICS

8.1 State and explain photoelectric effect.

8.2 Write Einstein's photoelectric equation and name the terms in it.

8.3 Explain the working of a photoelectric cell.

8.4 List the applications of the photoelectric cell.

8.5 Define critical angle.

8.6 Explain the phenomenon of total internal reflection.

8.7 Define optical fiber; Explain the principle and working of an optical fiber.

8.8 List the applications of optical fiber.

8.9 Define Superconductor and superconductivity.

8.10 List the applications of superconductors.

8.11 Define Nanotechnology and Nano materials.

8.12 Write applications of Nano materials.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1		1
CO2	3	2	1	1	1		2
CO3	3	2	1	1	1		2
CO4	3	2	1	1	3		2
Average	3	2	1	1	1.5		1.75

3 = stronglymapped, 2 = moderately mapped,1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

(i) Seminars (ii) Viva-voce (iii) Assignments (iv) Quiz competitions (v) Industrial visits (vi) Techfest (vii) Mini project (viii) Group discussions (ix) Virtual labs (x) Library visit for e-books

COURSE CONTENT

1. Units and measurements:

Introduction – Physical quantity – Fundamental and Derived quantities – Unit- Fundamental and derived units - SI system of units –Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Direct and indirect measurements – Accuracy and least count – Errors: Absolute, relative and percentage errors – Problems.

2. Elements of Vectors:

Introduction of Scalars and Vectors – Representation of a vector –Types of vectors - Resolution of vector into rectangular components – Triangle law of vectors - Parallelogram law of vectors- examples- derivation of magnitude and direction of resultant vector- Dot product- Cross product - Problems.

3. Mechanics:

Introduction to Mechanics – Momentum – force-torque. Concurrent and coplanar forces - Lami's theorem – equations of motion of a body moving in a straight line – projectile - path of projectile in oblique projection – periodic motion -Ideal simple pendulum- Time period of simple pendulum- Problems.

4. Fundamentals of Astrodynamics:

Concept of acceleration due to gravity (g) -Newton's law of gravitation- Universal Gravitational constant G – Relation between g and G- Kepler's laws of planetary motion – Orbital velocity and escape velocity – Satellites: Natural and artificial - Applications of artificial satellites – Problems.

5. Energy and thermal Physics:

Work done, Power and Energy - forms of energy - Potential energy - Kinetic energy- Momentum- K.E and Momentum relation – Law of Conservation of energy- Boyle's law - Charle's volume law -Charle's pressure law- Ideal Gas equation- Problems.

6. Concepts of Acoustics:

Longitudinal wave- transverse wave- musical sound - noise - Noise pollution – Causes, effects, Methods of minimizing noise pollution- Beats - Doppler's Effect - applications - Echo- Reverberation - Reverberation time- Sabine 's formula - Problems.

7. Electricity and Magnetism:

Ohm's law- Resistance - Specific resistance - Kirchoff's laws - Wheatstone's bridge- Meter Bridge.Concept of magnetic field- magnetic pole strength – Magnetic Moment- magnetic lines of force - Coulomb's inverse square law of magnetism– Torque acting on a bar magnet- Problems.

8. Modern Physics:

Photoelectric effect – Einstein photo electric equation – photoelectric cell – Applications of photoelectric cell – critical angle, Total internal reflection-Optical Fiber - Principle – working-Applications of optical fibers-Superconductivity–applications – Nanotechnology – applications.

REFERENCES

1. Intermediate physics - Volume - I & 2
2. Telugu Academy (English version)
3. Unified physics Volume 1, 2, 3 and 4 -Dr. S.L Guptha and Sanjeev Guptha
4. Concepts of Physics, Vol 1 & 2 -H.C. Verma
5. Text book of physics Volume I& II -Resnick & Holiday
6. Fundamentals of physics -Brijlal& Subramanyam
7. Text book of applied physics -Dhanpath Roy
8. NCERT Text Books of physics -Class XI & XII Standard
9. e-books/e-tools/websites/Learning Physics software/PhET Interactive Simulations

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit test	Learning outcomes to be covered
Unit test - 1	From 1.1 to 3.12
Unit test - 2	From 4.1 to 6.17
Unit test - 3	From 7.1 to 8.12

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM104T	ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES	3	90	30	70	4

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1	Basic Concepts of Chemistry	14	18	2	1.5	CO1
2	Solutions, Acids and Bases	14	18	2	1.5	CO1
3	Electrochemistry	12	11	1	1	CO2
4	Corrosion	8	11	1	1	CO2
5	Water Treatment	8	11	1	1	CO3
6	Polymers and Engineering Materials	10	11	1	1	CO4
7	Fuels and Alternative Energy Sources	6	3	1	0	CO4
8	EnvironmentalStudies	18	17	3	1	CO5
TOTAL		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i) To develop a fundamental understanding of core chemical principles and their relevance to a wide range of engineering applications.
(ii) To explore and analyze natural and anthropogenic environmental challenges through an interdisciplinary lens, incorporating physical, chemical and socio - cultural perspectives.
(iii) To reinforce theoretical concepts by conducting relevant xperiments/exercises

COURSE OUTCOMES

AM104.1	Explain the basics of atomic structure, chemical bonding, oxidation-reduction, mole concept, concentration expressing methods of solutions, acids-bases, pH and buffer solutions.
AM104.2	Explain electrolysis, Galvanic cell, batteries and corrosion.
AM104.3	Explain the chemistry involved in the treatment of hardness in water.
AM104.4	Explain the preparation and applications of polymers, and Understand the composition and uses of alloys, nano materials and green fuels.
AM104.5	Explain environmental concepts, pollution types, global issues, green chemistry principles and sustainable development goals.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-
CO2	3	1	1	1	1	-	1	-	-	-
CO3	3	1	1	1	1	-	1	-	-	-
CO4	3	1	1	-	1	-	1	-	-	-
CO5	3	1	-	-	1	1	1	-	-	-
Average	3	1	1	1	1	1	1	-	-	-

3 = Strongly mapped 2 =Moderately mapped 1 =Slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i).Seminars (ii).Tutorials(iii).Guest Lectures (iv).Assignments (v).Quiz Competitions, (vi). Industrial Visit (vii). Tech Fest (viii). Mini Project (ix). Group Discussions (x) Virtual Classes and (xi). Library Visit for e-books.

LEARNING OUTCOMES

1.0 Basic Concepts of Chemistry

1.1 Explain the charge, mass of fundamental particles of an atom (electron,proton and neutron).

1.2 Understand the concept of Atomicnumber and Mass number.

1.3 Calculate the number of electrons, number of protons and number of neutrons in atoms, if Atomic number and Mass number are given.

1.4 Explain the Postulates of Bohr's atomic theory and its limitations.

1.5 Explain the values andsignificance of four Quantum numbers.

1.6 Define Orbital of an atom and draw the shapes of s, p orbitals.
1.7 Distinguish between orbit and orbital.
1.8 Explain (i). Aufbau principle (ii). Hund's rule and (iii). Pauli's exclusion principle.
1.9 Write the Electronic configuration of elements up to Atomicnumber 20.
1.10 Explain the significance of chemical bonding.
1.11 Understand the concept of Octet rule.
1.12 Define Ionic bond and explain it in the formation of NaCl.
1.13 Define Covalent bond and explain it in the formation of H_2, O_2& N_2 molecules (Lewis Dot Method).
1.14 List out the Properties of Ionic compounds and Covalent compounds and distinguish between their properties.
1.15. Understand the electronic concept of oxidation, reduction and redox reactions.

2.0 Solutions, Acids and Bases

2.1 Define theterms: (i). Solution (ii). Solute and (iii). Solvent with examples.
2.2 Classifysolutions based on physical state of solvent with examples.
2.3 Define the terms: (i). Atomic weight, (ii). Molecular weight and (iii). Equivalent weight.
2.4 Calculate Molecular weight and Equivalent weight of the given Acids (HCl, H_2SO_4, H_3PO_4),Bases (NaOH,$Ca(OH)_2$,$Al(OH)_3$andSalts(NaCl,Na_2CO_3, $AlCl_3$).
2.5 Define Mole and solve numerical problems on Mole concept.
2.6 DefineMolarity, Normality and solve numerical problems on Molarity and Normality.
(a). CalculatetheMolarity &Normality, if Weight of solute and Volume of solution are given.
(b). Calculate the weight of solute, if Molarity or Normality with volume of solution are given.
2.7 Explain Arrhenius theory of Acids and Bases and give its limitations.
2.8 Define pH and mention its Significance.
2.9 Define buffer solution and classifybuffer solutions with examples. Give its applications.

3.0 Electrochemistry

3.1 Define the terms (i). Conductor (ii). Semi conductor (iii). Insulator. (iv).Electrolyte (Strong and Weak) and (v).Non-electrolyte. Give two examples for each.
3.2 Define Electrolysis and Explain electrolysis by taking an example of molten NaCl.
3.3 State the applications of electrolysis.
3.4 Understand Electrode potential and Standard reduction potential (SRP).
3.5 Define electrochemical series and state its significance.
3.6 Define Galvanic cell.Explain the construction and working of Galvaniccell.
3.7 Distinguish between electrolytic cell and galvanic cell.
3.8 Define battery and list the types of batteries with examples.

3.9 Explain the construction, working and applications of (i).Drycell (Leclanché cell) and (ii). Lithium-ionbattery.

4.0 Corrosion

4.1 Define the term corrosion.
4.2 State the factors which influencing the rate of corrosion.
4.3 Describe the formation of (a). Composition cell (b). Stress cell and (c). Concentration cell during corrosion.
4.4 Define rusting of iron and explain the mechanism of rusting of iron.
4.5 Explain the methods of prevention of corrosion by:
(a). Protective Coatings(through flow chart with examples) and
(b). Cathodic Protection Methods.((i). Sacrificial Anode Process and (ii).Impressed Voltage Process)

5.0 Water Treatment

5.1 Define soft water and hard water.
5.2 Define hardness of water and classify its types.
5.3 List out the salts that causing hardness of water (with Formulae).
5.4 State the disadvantages of using hard water in industries.
5.5 Define Degree of hardness and units of hardness (mg/Landppm).
5.6 Explain the method of softening of hard water by Ion exchange method (By indicative reactions).
5.7 Explainthe concept ofReverse Osmosis in removing hardness of water.
5.8 List out the applications and advantages of reverse osmosis technique.
5.9 List out the essential qualities of drinking water/potable water.
5.10 Explain Municipal treatment of water for drinking purpose (only flow chart).

6.0 Polymers and Engineering Materials.

6.1 Explain monomers, polymers and the concept of polymerization.
6.2 Describe the methods of polymerization (a). Addition Polymerization of Polythene and (b). Condensation Polymerization of Bakelite (Only flow chart).
6.3 Define plastic.Write the monomers and uses of plastics: (i).PVCand (ii) Nylon (6,6).
6.4 Define Biodegradable polymers. State applications of (i). PHBV and (ii). PBAT.
6.5 Define an alloy. Write the composition and applications of the following alloys:(i). Stainless Steel and (ii). Nitinol.
6.6 Define Nano Materials and State applications of (i). Graphene and (ii). Nano tubes.

7.0 Fuels and Alternative Energy Sources

7.1 Define the term fuel.
7.2 Classification of fuels as Natural fuels and Synthetic fuels.
7.3 Write the composition and uses of the following:
(i) LPG (ii) CNG and (iii). Power alcohol.
7.4 State the Renewable and Non-renewable energy sources with examples.

7.5 Define Green fuel. State the advantages and disadvantages of hydrogen as a green fuel.

8.0 Environmental Studies

8.1 Importance of environmental studies.

8.2 Define the following terms:
(i). Pollution, (ii). Pollutant, (iii). Sink, (iv). Receptor, (v). Particulate Matter, (vi). Dissolved Oxygen(DO)and (vii). Threshold Limit Value (TLV).

8.3 State the uses of forest resources.

8.4 Define deforestation. Explain the causes, effects and controlling methods of deforestation.

8.5 Define Air pollution. Explain the causes, effects and controlling methods of Air pollution.

8.6 Explain the global impacts of Air pollution: (i). Global Warming, (ii). Ozone Layer Depletion and (iii). Acid Rain.

8.7 DefineWater pollution.Explain the causes, effects and controlling methods of Water pollution.

8.8 Definee – pollution.Statethesourcesof e – pollution. Explain its health effects and its management.

8.9 Define Green Chemistry. List the Green Chemistry Principles.

8.10 Define Sustainable Development and List the Sustainable Development Goals.

COURSE CONTENT

1. Basic Concepts of Chemistry

Atomic Structure:

Introduction - Fundamental particles – their mass and charge – Atomic number and Mass number - definition with examples – calculation of electrons, protons and neutrons in atoms – Bohr's atomic theory and limitations - Quantum numbers –Orbital concept, shapes of s, p Orbitals – Distinguish between Orbit and Orbital – Aufbau principle -Hund's rule - Pauli's exclusion Principle- Electronic configuration of elements (Atomic number(Z) from 1 to 20).

Chemical Bonding:

Introduction – Octet rule - Types of chemical bonds – Ionic bond (NaCl) and Covalent bond (H_2, O_2& N_2 molecules) as examples – Properties of Ionic and Covalent compounds. Electronic concept of oxidation, reduction and redox reactions.

2. Solutions, Acids and Bases

Solutions:

Introduction – Idea of solute, solvent and solution - Types of solutions based on physical state of solvent – Atomic weight – Molecular weight, Equivalent Weight (Acids, Bases and Salts) - Mole concept – Numerical problems on Mole concept -

Methodsof expressing concentration of a solution – Molarity - Normality – Numerical problems on Molarity and Normality.

Acids and Bases:

Introduction - Arrhenius theory of acids and bases – pH Scale – its significance – Buffersolution – Definition – Types of buffer solutions with examples – its applications.

3. Electrochemistry

Introduction - Conductors, Semiconductors, Insulators with examples - Electrolytes (Strong and Weak) and Non-electrolytes– Definition – Examples – Electrolysis – Definition – Electrolysis of molten NaCl – Applications of electrolysis – Electrode potential - Standard reduction potential – Definition – Electrochemical series – Significance – Construction and working of Galvanic cell – Differences between Electrolytic cell and Galvanic cell - Batteries - Types of batteries – Definition and examples – construction, working and applications of: (i). Dry Cell (Leclanché Cell) and (ii). Lithium-ionbattery.

4. Corrosion

Introduction– Definition –Factors influencing the rate of corrosion – Composition cell, Stress celland Concentrationcell during corrosion –Rusting of iron and its mechanism – Prevention of corrosion - Protective Coating methods (flow chart with examples) – Cathodic Protection methods.

5. Water Treatment

Introduction – Soft and Hard water – Hardness of water – Types of hardness – salts responsible for hardness –Degree of hardness – Methods of expressing hardness (mg/L and ppm)–Disadvantages of using hardwater in industries - Softening of hard waterby Ion exchange method – Concept of Reverse Osmosis process – Applications and Advantages of Reverse Osmosis - Essential qualities of drinking water/potable water – Municipal treatment of water for drinking purpose (only flow chart).

6. Polymers and Engineering Materials

Polymers:

Introduction- Monomers - Polymers – Polymerization – Types of Polymerization – Addition polymerization (Polythene) and Condensation polymerization (only flow chart of Bakelite) - Plastics – monomers and uses of PVC and Nylon (6,6) - Biodegradable Polymers: (i). PHBV and (ii). PBAT (Composition and Uses).

Engineering Materials**:**

Alloys - Definition - Composition and applications of (i). Stainless Steel and (ii). Nitinol, Nano Materials – Definition - Applications of (i) Graphene and (ii). Nanotubes.

7. Fuels and Alternative Energy Sources

Introduction – Definition – Classification of fuels–Composition and uses of (i). LPG (ii).CNGand (iii).Poweralcohol - Renewable and Non-renewable energy sources – Advantages and disadvantages of Hydrogen as a green fuel.

8. Environmental Studies

Introduction - Importance of environmental studies – Important terms related toenvironment – Pollution, Pollutant, Sink, Receptor, Particulate Matter, Dissolved Oxygen (DO), Threshold Limit Value (TLV) - Uses of forest resources – Deforestation - Definition – causes, effects, controlling methods –Air pollution – Definition, causes, effects, controlling methods - Global impacts of Air pollution – Global warming, Ozone layer depletion, Acid rain – Water pollution – Definition, causes, effects, controlling methods – e - pollution, Definition, sources, effects, management - Green Chemistry – Definition – Principles of Green Chemistry – Sustainable Development – Definition – Goals.

REFERENCES

1. Jain&Jain : Engineering Chemistry
2. O.P.Agarwal,Hi-Tech. : Engineering Chemistry
3. B. K. Sharma : Engineering Chemistry
4. A. K.De : Engineering Chemistry
5. Mahua Basu & S. Xavier : Fundamentals of Environmental Studies
6. Anubha Kaushik & C.P Kaushik : Environmental Studies

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning out comes to be covered
Unit Test–1	From1.1 to 2.9
Unit Test–2	From 3.1 to 5.10
Unit Test–3	From 6.1 to 8.10

PYTHON PROGRAMMING

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM105T	PYTHON PROGRAMMING	6	180	30	70	6

TIME SCHEDULE

Chapter No.	Chapter/UnitTitle	No. of Periods	Marks	No.of Short Answer Questions	No. of Essay Type Questions	CO's Mapped
1.	Introductionton to Python Programming	40	14	02	01	CO1
2.	Control Flow and Loop statements	25	14	02	01	CO2
3.	Functions and Arrays	40	25	03	02	CO3
4.	Built-in Data Structures	35	22	02	02	CO4
5.	Python Libraries, File Handling and Exception handling.	40	25	03	02	CO5
	Total	**180**	100	12	08	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i) To know the fundamentals of Python programming and to understand syntax, scripting and program execution in 'Python'
(ii) To develop various python programs using control structures, functions & arrays
(iii) To develop programs using data structures
(iv) To Implement Python Libraries
(v) To implement file handling & exception handling concepts

COURSE OUTCOMES

CO1	AM105.1	Explain Basic concepts of Python programming as well as scripting, debugging and execution.
CO2	AM105.2	Develop Python programs using Control statements &Loops.
CO3	AM105.3	Develop Python programs using Functions and arrays.
CO4	AM105.4	Develop Python programs using Built-in Data structures.
CO5	AM105.5	Develop Python application programs using Python libraries, exceptions and Files,

LEARNING OUTCOMES

1.0 Introduction to python programming

1.1 Recite history of Python.
1.2 List Python features
1.3 List and Explain Applications of Python
1.4 Explain Python Integrated Development and Learning Environment (IDLE)
1.5 Explain process of Running Python Scripts.
1.6 Explain Identifiers, Keywords, Indentation & Variables
1.7 List and explain various data types
1.8 Explain declaration& initialization of variables.
1.9 Explain Input and Output statements.
1.10 Explain formatted input output.
1.11 State the usage of comments
1.12 List and explain various Operators.
1.13 Explain Boolean values.
1.14 Explain Operator precedence rules.
1.15 State the purpose of modules.
1.16 Define functions.
1.17 List types of functions
1.18 List and Explain Built-in Functions.
1.19 Explain the Steps in Developing a simple python program and execution.

2.0 Control Flow and Loop Statements

2.1 List and explain various Control Flow constructs.
  2.1.1 if
  2.1.2 if - else
  2.1.3 if – elif - else
2.2 List and explain various Loop Statements.
  2.2.1 For Loop
  2.2.2 while loop
2.3 Use break, continue & pass statements.
2.4 Implement the python programs using control structures

3.0 Functions and Arrays

3.1 Give introduction to functions
3.2 Use Function Arguments: Default arguments, Keyword arguments, Variable Length arguments, Anonymous Functions & Return Statement.
3.3 List and explain Scope of variables
3.4 Explain creation of modules.
3.5 Explain importing of modules.
3.6 Explain PythonVariables:Namespace and scoping
3.7 Explain Python Packages
3.8 List and Explain Strings: String slices, immutability
3.9 List and Explain String functions and methods.
3.10 Explain about String module.
3.11 Explain about Python Arrays.
3.12 Explain accessing of elements in an Array.
3.13 Explain Array methods.

4.0 Built-in DataStructures

4.1 Explain Python Lists.
4.2 Describe Basic List Operations.
4.3 Explain List Slices.
4.4 Explain List methods.
4.5 Explain List raversing.
4.6 Explain mutability.
4.7 Explain aliasing.
4.8 Explain Cloning of lists.
4.9 Explain List comprehension.
4.10 Tuples.
- 4.10.1 Explain Tuple assignment.
- 4.10.2 Explain Tuple as returnvalue.
- 4.10.3 Explain Tuple Comprehension

4.11 Dictionaries
- 4.11.1 Explain creation of dictionary.
- 4.11.2 Explain Dictionary operations and methods.
- 4.11.3 Explain Dictionary Comprehension.

4.12 Explain Sets.

5.0 Python Libraries, File Handling& Exception Handling

5.1 Give introduction to python library.
5.2 Import modules in a python program
5.3 Use Python standard library's functions and modules
5.4 Turtle, Random, Datetime, CSV, Numpy& Pandas
5.5 Create Python library
5.6 Give introduction to Files
5.7 Explain opening and closing Files
5.8 Explain reading and writing Files
5.9 Use Standard Input, Output and error streams
5.10 Explain exception handling
- 5.10.1 Define Error and Exception
- 5.10.2 State the difference between Error and Exception
- 5.10.3 Use user-defined exceptions.
- 5.10.4 Use try except block.
- 5.10.5 Explain raising exceptions.

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	1	2	2	1	
CO2	3	2	2	2	1	1	1	2	2	2
CO3	3	2	2	1	1	1		2	2	2
CO4	3	1	2	1	1	1	3	2	2	2
CO5	3	1	2	1	2	3	2	2	2	2
Average	3	1.4	2	1.2	1.2	1.4	2	2	1.8	2

3=stronglymapped,2=moderatelymapped,1=slightlymapped

COURSE CONTENT

UNIT–I: Introduction

Introduction to Python, installation, Applications, IDLE, Data types, variables, Input and Output statements, Operators, expressions, statements, precedence of operators, comments, modules, functions, types of functions, built-in functions, flow of python program execution.

UNIT–II: Control Flow and Loop Statements:

Control Flow - if, if-else, if – elif - else, for, while, break, continue, pass statements.s ample python programs using control flow and Loop statements.

UNIT–III: Functions and Arrays:

Introduction to Functions: Defining, Calling Functions, Passing Arguments, Types of function arguments -Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, FunctionReturning multiple values, Scope of the Variables in a Function – Global and Local Variables.

Modules: Creating modules, import statement, name spacing, Python Packages.

Strings: string slices, immutability, string functions and methods, string module.

Python arrays: Access the Elements of an Array, array methods.

UNIT–IV: Data Structures

Lists: list operations, list slices, list methods, list traversing, mutability, aliasing, cloning lists, list comprehension.

Tuples: tuple assignment, tuple as return value, tuple comprehension.

Dictionaries: operations and methods, comprehension.

sets.

UNIT – V: Python Libraries, File Handling and Exception Handling.

Python Libraries: Introduction, importing modules in python program, use python standard library functions and modules - Python libraries - Turtle, Random, Datetime, CSV, Numpy& Pandas.

File Handling: Open Files, File Processing and Closing a File.

Error and Exceptions: Difference between an error and Exception,

Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

REFERENCES

1. Python Programing by K. Nageswara Rao, Shaikh Akbar - Scitech Publications (India) Pvt.Ltd.
2. Python Programming:AModernApproach,VamsiKurama,Pearson
3. Learning Python, MarkLutz,Orielly
4. Think Python,Allen Downey,GreenTea Press
5. CorePythonProgramming,W.Chun, Pearson.
6. Introduction to Python, Kenneth A.Lambert, Cengage

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 2.1
Unit test-2	From 2.2 to 3.13
Unit test-3	From 4.1 to 5.15

CODING FUNDAMENTALS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM106A	CODING FUNDAMENTALS	2	60	-	-	-

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	COs Mapped
1.	Fundamentals of Computers	10	CO1
2.	Programming Methodology	15	CO2
3.	Introduction to coding	10	CO3
4.	Fun with functions	15	CO4
5.	Understanding arrays and collections	10	CO5
Total Periods		60	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i) To know the fundamentals of Computers
(ii) To familiarize with programming methodologies like algorithms and flowcharts
(iii) To understand coding basics
(iv) To familiarize with functions
(v) To familiarize with arrays and collections

COURSE OUTCOMES

CO1	AM106.1	Explain computer fundamentals
CO2	AM106.2	Explain various flowchart, algorithm methods
CO3	AM106.3	Explain the concept of coding and basics of coding
CO4	AM106.4	Explain the concept of functions, events and event handlers
CO5	AM106.5	Explain the arrays and collections

LEARNING OUTCOMES

1.0 Fundamentals of Digital Computer

1.1. Define various terms related to computers – Computer,Hardware, Software, Firmware, High Level Language, Low Level Language
1.2. Draw and explain block diagram of a computer in detail
1.3. Describe the current family of CPUs used in Computers.
1.4. State the use of storage devices used in a computer.
1.5. List the two types of memory used in a computer.

1.6. State the importance of cache memory.
1.7. Explain the generations of computers.
1.8. Classification of computers - based on a) size, b) processor.
1.9. State the importance of binary number system for use in Digital Computers

2.0 Implement Programming Methodology.
2.1. State the different steps involved in problem solving.
2.2. Define an algorithm.
2.3. List four characteristics of algorithm.
2.4. Define flowchart
2.5. Define a program
2.6. Differentiate between program and algorithm.
2.7. State the steps involved in algorithm development.
2.8. Differentiate between algorithm and flowchart.
2.9. Develop algorithms for simple problems.
2.10. Draw the various symbols used in flowcharts.
2.11. Draw flowcharts for simple problems.

3.0 Introduction to coding
3.1. Define coding.
3.2. Define Pseudocode
3.3. Explain the Process of writing code
3.4. Define variables.
3.5. Explain naming of variables
3.6. List Data types.
3.7. Explain operations on variables.
3.8. Explain AND,OR and NOT logical operators
3.9. State Combining of logical operators.
3.10. List different Relational operators
3.11. List Different control statements
3.12. Explain Nested control statements
3.13. Define loops
3.14. Explain Increment loops
3.15. List Different types of loops
3.16. State Entry criteria for a loop
3.17. State Exit criteria for a loop
3.18. Explain Break statement
3.19. Explain Continue statement
3.20 List Examples of sequential execution, selection and iteration
3.21 Define bug

4.0 Fun with functions
4.1 Define functions.
4.2 Examples of functions
4.3 List Advantages using functions
4.4 State different function parameters.
4.5 State about returning a value in a function.
4.6 Define an event.
4.7 List different event handlers.

5.0 Understanding arrays and collections
5.1. Explain collections.
5.2. Define arrays.
5.3 List various types of arrays with examples.
5.4 Explain the process of iterating over collections.

5.5 Explain modifying collections

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3							3	1	1
CO2	1	2	2	1		3		1	3	1
CO3	3	1		1		1	1	3	1	1
CO4	3		2	2	1		1	2	1	2
CO5	3		2		1	1	1	2	1	2
Average	2.6	1.5	2	1.33	1	1.67	1	2.2	1.4	1.4

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1.0 Fundamentals of Digital Computer

Computer,Hardware, Software, Firmware, High Level Language, Low Level Language- Block diagram of a digital computer, Clock speed and word length,Functional blocks of a CPU: ALU and Control unit, classification of computer memory, generations & classification of computers, binary number system.

2.0 Programming Methodology.

Steps involved in problem solving – Define an algorithm , Program - Characteristics of algorithm - Differentiate between program and algorithm- Steps involved in algorithm development - Differentiate algorithm and flowchart - Algorithms for simple problems - Symbols used in flowcharts -Flowcharts for simple problems.

3.0 Introduction to coding

Need for coding – correlate coding with real life examples - pseudo code – process of writing pseudo code – Define Variables - naming of variables-Different data types in variables- operations on variables –Different types of logical operators and their functions i.e AND , OR and NOT – combining logical AND , OR and NOT operators - different types of relational operators -Different types of control statements if,if-else - Nested control statements - loops in coding-increment loops-decrement loops – entry criteria-exit criteria-break statement-continue statement-sequential execution, selection and iteration-Define bug

4.0 Fun with functions

Functions-examples-user defined and built-in functions- Different function parameters-returning a value in a function - Events- Event Handlers

5.0 Understanding arrays and collections

Collections-Arrays – examples for arrays and collections-Process of iterating over collections-Modifying collections.

REFERENCES

1. Information Technology - Curtin.
2. Computer Science Theory & Application - E. Balaguruswamy, B. Sushila
3. Introduction to Computers (Special Indian Edition) - Peter Norton
4. How to solve it by computer-R.G.Dromey-Pearson Education
5.Introduction to coding-class VI,VII,VIII,IX,X by cbse academic https://cbseacademic.nic.in/web_material/codeingDS/classVI_Coding_Student_Handbook.pdf

PYTHON PROGRAMMING LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM107L	PYTHON PROGRAMMING LAB	6	180	40	60	6

TIME SCHEDULE

S. No.	Chapter/Unit Title	No. of Periods	COs Mapped
1.	Exercises on basics, expressions and operators.	30	CO1
2.	Exercises on control structures,	35	CO2
3.	Exercises on Functions and Arrays	35	CO3
4.	Exercises on Data structures	40	CO4
5.	Exercise on python libraries, file handling and exception handling	40	CO5
Total Periods		180	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)	To enable students to understand and execute basic Python programs using fundamental concepts such as expressions, operators, control structures, functions, and arrays.
(ii)	To develop the ability to design and implement Python programs using core data structures and user-defined functions for solving computational problems.
(iii)	To equip students with skills to develop Python applications using standard Python libraries, file handling techniques, and exception handling mechanisms.

COURSE OUTCOMES

CO1	AM107 .1	Execute Simple python programs (basics, expressions and operators)
CO2	AM107.2	Execute Python programs using control structures

CO3	AM107.3	Execute python programming using Functions, Arrays
CO4	AM107.4	Develop Python programs using Data structures
CO5	AM107.5	Develop Python programs using Python libraries, File handling and exception handling.

LEARNING OUTCOMES

1. Expressions and operators

1. Write and execute simple python Program.
2. Write a program to demonstrate various data types in Python
3. Write /execute simple 'Python' program: Develop minimum 2 programs using different data types (numbers, string, tuple, list, and dictionary).
4. Write a program to perform different Arithmetic Operations on numbers in Python
5. Write/execute simple 'Python program: Develop minimum 2 programs using Arithmetic Operators, exhibiting data type conversion.
6. Write a Python script that prints prime numbers less than 20.
7. (i)Write simple programs to convert U.S. dollars to Indian rupees.
   (ii)Write simple programs to convert bits to Mega bytes, Giga bytes and Tera bytes.
8. Write simple programs to calculate the area and perimeter of the square, and the volume & perimeter of the cone.

2. Control Structures:

9. Write program to:(i) determine whether a given number is odd or even.
   (ii) Find the greatest of the three numbers using conditional operators.
10. Write a program to : i) Find factorial of a given number. ii) Generate multiplication table upto 10 for numbers 1 to 5.
11. Write a python program to find factorial of a number using Recursion
12. Write a program to To print Factors of a given Number.

3. Functions and Arrays:

13. Write a program to: i) Find factorial of a given number. ii) Generate multiplication table upto 10 for numbers 1 to 5 using functions.
14. Write a program to: i) Find factorial of a given number using recursion.
    ii) Generate Fibonacci sequence up to 100 using recursion.

15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program
16. Write a python program to define a module and import a specific function in that module to another program
17. Write a program to create, concatenate and print a string and accessing sub-string from a given string

4. Data Structures:

18. Write a program to create a list, add element to list, delete element from the lists.
19. Write a program to Sort the list, reverse the list and counting elements in a list.
20. Write a program to demonstrate working with tuples in python.

5. Python Libraries, File handling and Exception handling

21. Write a program to Create dictionary, add element to dictionary, delete element from the dictionary.
22. Write a program to To calculate average, mean, median, and standard deviation of numbers in a list.
23. Write a program to:i)To create simple file and write “Hello World” in it.
    ii) To open a file in write mode and append Hello world at the end of a file.
24. Writea program to: i) To open a file in read mode and write its contents to another file but replace every occurrence of character ‘h’ ii) To open a file in read mode and print the number of occurrences of a character ‘a’.
25. Write a program that inputs a text file. The program should print all of the unique words in the file in an alphabetical order
26. Write a pandas program to load the CSV into a dataframe and perform arithmetic operations on the data loaded.
27. Write a program to create a 5 * 5 Numpy array with random integers between 1 and 100.
28. Write a python program to handle built-in exceptions (ZeroDivisionError, IndexError, NameError)

CO – PO / PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2			3		2
CO2	2	3	2					2		2
CO3	3	3	2	3		2	2	2		
CO4	2	2	2		2	3	1	2	3	
CO5	3	3	2		2	2	2	2	2	
Average	2.4	2.6	2	2	2	2.33	1.67	2.2	2.5	2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

KEY COMPETENCIES

S.No.	Name of the Experiment	Objectives	Key Competencies
1.	Write and execute simple python Program.	Write a simple python program to print Hello World! And debug and execute	• Know the usage of Python IDLE • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
2.	Write a program to demonstrate different number data types in Python	Write a simple python program using integer, float, string and debugand execute	• Know the usage of Python IDLE • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
3.	Write /execute simple 'Python'program: Develop minimum 2 programs using different data types (numbers, string, tuple, list, dictionary).	Write a Python program to identify different data types.	• Identify different datatypes • Write basic python program using data types • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute theprogram and check the output for its correctness
4.	Write a program to perform differentArithmetic Operations on numbers in Python	Write a program to perform different Arithmetic Operations such as addition, subtraction, multiplication and division	• Identify different arithmetic operators • Write basic python program using arithmetic operations • Evaluate arithmetic expression • Runtheprogram • Rectify the syntactical errors • Execute the program & Check the output for its

			correctness
5.	Write /execute simple 'Python' program: Develop minimum 2 programs using Arithmetic Operators, exhibiting data type conversion.	Write a Python program to identify arithmetic operators and data type conversion	• Identify different arithmetic operators • Build arithmetic expressions • Identify the priorities of operators • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program and Check the output for its correctness
6.	Write a Python script that prints prime numbers less than 20.	Write a Python script that prints prime numbers less than 20.	• Identify 20 prime numbers • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
7.	(i)Write simple programs to convert U.S. dollars to Indian rupees. ii) Write simple programs to convert bits to Mega bytes, Giga bytes and Tera bytes.	Write a Python program to identify arithmetic operators and data type conversion	• Identify different arithmetic operators • Build arithmetic expressions • Identify the priorities of operators • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program Check the output for its correctness
8	Write simple programs to calculate the area and perimeter of the square, and the volume & perimeter of the cone.	Write a Python program to identify arithmetic operator datatype conversion	• Identify different arithmetic operators • Build arithmetic expressions • Identify the priorities of operators • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program Check the output for its correctness
9	Write program to: (i) Determine whether a given number is odd or even. (ii) Find the greatest of the three numbers using conditional operators.	Write a Python program to identify conditional statements in Python.	• Build a relational expression • Use the if statement for decision making • Rectify the syntax errors • Check the output for correctness
10	Write a program to: i)	Write a Python	• Build the termination

	Find factorial of a given number. ii) Generate multiplication table up to 10 for numbers 1 to 5.	program to identify loops statements in Python.	condition for looping • Use while statement with correct syntax • Check whether correct number of iterations are performed by the while loop • Rectify the syntax errors • Debug logical errors
11	Write a python program to find factorial of a number using Recursion	Write a python program for the factorial for a given number using recursion	• Build the application using recursion. • Build the terminating condition for recursion. • Rectify the syntax errors • Debug logical errors
12	Write a program to: To print Factors of a given Number.	Write a Python program to make use of function.	• Build the termination condition for looping • Use while statement with correct syntax • Check whether correct number of iterations are performed by the while loop • Rectify the syntax errors • Debug logical errors
13	Write a program to: i) Find factorial of a given number. ii) Generate multiplication table up to 10 for numbers 1 to 5 using functions	Write a Python program to using functions	• Build the termination condition for looping • Use while statement with correct syntax • Check whether correct number of iterations are performed by the while loop • Rectify the syntax errors • Debug logical errors
14	Write a program to: i) Find factorial of a given number using recursion. ii) Generate Fibonacci sequence up to100 using recursion.	Write a Python program tomake use of recursion.	• Build the application using recursion. • Build the terminating condition for recursion. • Rectify the syntax errors • Debug logical errors
15.	Write a python program to define a module to find Fibonacci Numbers and import the module to another program	Write a Python program using module and importing the module	• Buildtheapplication using module. • Develop the logic for Fibonacci series. • Import the module • Rectify the syntax errors • Debug logical errors
16.	Write a python program to define a module and import a	Write a Python program using module and	• Build the application using module. • Develop the logic for

	specific function in that module to another program	importing the module	Fibonacci series. • Import the module • Rectify the syntax errors • Debug logical errors
17.	Write a program to create, concatenate and print a string and accessing sub-string from a given string	Write a program to create, concatenate and print a string and accessing sub-string from a given string.	• Build the application • Develop the logic for string concatenation and substring • Rectifythesyntax errors • Debug logical errors
18.	Write a program to: Create a list, add element to list, delete element from the lists.	Write a Python program to identify various lists and list manipulation methods in Python.	• Create a one list with correct syntax • Create a list • Read elements from list • Add elements to list • Delete elements • Rectify thesyntax errors • Debug logical errors • Check for the correctness of output for the given input
19.	Write a program to: Sort the list, reverse the list and counting elements in a list.	Write a Python program to identify various lists and list manipulation methods inPython.	• Create a one list with correct syntax • Create a list • Readelements from list • Add elements to list • Delete elements • Rectify the syntax errors • Debuglogical errors • Check for the correctness of output for the given input
20	Write a program to demonstrate working with tuples in python	Write a Python program to identify various tuples and manipulate	• Create a tuple with correct syntax • Create a tuple • Read elements from tuple • Add elements to tuple • Delete elements • Rectify thesyntax errors • Debuglogical errors • Check for the correctness of output for the given input
21	Write a program to: Create dictionary, add element to dictionary, delete element from the dictionary.	Write a Python program to identify various dictionary and dictionary manipulation methods in Python.	• Create a one dictionary with correct syntax • Createa dictionary • Read elements from list • Add elements to dictionary • Delete elements from

			dictionary • Rectify the syntax errors • Debug logical errors • Check for the correctness of output for the given input
22	Write a program to: To calculate average, mean, median, and standard deviation of numbers in a list.	Write a Python program to identify various statistical functions.	• Create a list • Add elements to list • perform statistical functions on that list
23	File Input/output: Write a program to: i) To create simple file and write“HelloWorld”init. ii)To open a file in write mode and append Hello world at the end of a file.	Write a Python program to identify the steps to createafileandappend to file.	• Create a Python file • Add contents to file
24	Write a program to:i)To open a file in read mode and write its contents to another file but replace every occurrence of character ‘h’ ii) To open a file in read mode and print the number of occurrences of a character ‘a’.	Write a Python program to identify the steps to openafileinread/write mode.	• Open a Python file in write mode • Add contents to the file • Open a Python file in Read mode • Print the file
25	Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order	Write a Python program to identify the steps to open a file in read/write mode.	• Open a Python file in write mode • Add contents to the file • Open a Python file in Read mode • Develop the logic to find unique words • Print the unique words
26	Write a pandas program to load the CSV into a dataframe and perform arithmetic operations on the data loaded	Write a Python programusing the pandas library to perform the task	• Import the pandas python library • Write the python code to load the CSV into data frame • Perform the arithmetic operations • Debug the python program • Check the correctness
27	Write a program to create a 5 * 5 Numpy array with random	Write a Python programusing the Numpy library to	• Import the Numpy python library • Write the python code to

	integers between 1 and 100	perform the task	create an array of size 5 *5 • Generate the random integers between 1 and 100 • Debugthepython program • Check the correctness
28	Write a python program to handle built-in exceptions (ZeroDivisionError, IndexError, NameError)	Write a python program to handle built-in exceptions (ZeroDivisionError, IndexError, NameError)	• Create a program using the exceptions. • Use Try Catch blocks • Debug the python program • Check the correctness

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 10
Unit test-2	From 11 to 20
Unit test-3	From 21 to 28

COMPUTER HARDWARE LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM108L	COMPUTER HARDWARE LAB	4	120	40	60	3

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Cos Mapped
1.	Computer Hardware Basics	24	CO1
2.	Mother Board Basics	24	CO2
3.	Hard Disk Basics	24	CO3
4	Operating System Basics	28	CO4
5	Troubleshooting Basics	20	CO5
	Total	120	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to

(i) Identify all the components of Computer.
(ii) Identify all the components of motherboard.
(iii) Identify Different Types of Connectors & Pins on motherboard.
(iv) Know Various options in AMOS setup
(v) Assemble& Dis-Assemble a computer
(vi) Install RAM, CPU, HDD
(vii) Partition & format hard drive
(viii) Install system software's & printers
(ix) Identify all the settings of control panel
(x) Identify the voltages in SMPS with color coding
(xi) Troubleshoot hardware issues

COURSE OUTCOMES

CO1	AM108.1	Identify and Assemble the PC with suitable components.
CO2	AM108.2	Identify the components, connectors & pins on a Motherboard
CO3	AM108.3	Install and partition the Hard disk
CO4	AM108.4	Install operating system and printers
CO5	AM108.5	Troubleshoot hardware devices

LEARNING OUTCOMES

Computer Hardware Basics

1. Identification of various Hardware components of Computer
2. Using various options of CMOS setup
3. Installing and removing of Motherboard from computer
4. Printing the summary of your system Hardware and verify for correctness
5. Assembling of a PC
6. De-Assembling of a PC

Mother Board Basics

7. Identification of various components of Motherboard
8. Identification of various back panel connectors of Motherboard
9. Identification of various pins & connectors
10. Installing and removing RAM, CPU, HARD DISK
11. Identification of various motherboards based on the form factor such as AT, ATX, micro ATX, mini ATX , Baby AT et
12. Identification on voltage levels of each wire in SMPS based on the standard color of the wire.

Hard Disk basics

13. Familiarity with hard disk interfacing standards like IDE/SCSI /SATA / PATA
14. Practice on Partition of Hard disk
15. Practice on formatting a hard disk in FAT/NTFS Format
16. Calculating Hard Disk Storage Capacity
17. Recovery of lost data on harddrive using Recovery Tools
18. Defragmenting the Hard Disk

Operating system basics

19. Installation of operating system software (Windows 10/11)
20. Installation of device driver software
21. Installation of application software (MS-Office 2007/ 2010)
22. Practice on various options of control panel
23. Installation of printer using control panel
24. Installation of any anti-virus software for protecting pc
25. Practice on changing resolution, color, appearance, screensaver options of the display Setting in pc
26. Knowing the precautions to be taken while troubleshooting the hardware

Trouble shooting Basics

27. Identification of steps in troubleshooting: Visual inspection, Layman checks, measurement of voltage levels, Beep sounds, Error codes and Use of Advanced Diagnostic tools
28. Troubleshooting Keyboard, Printer Problems
29. Troubleshooting no display on monitor Problem
30. Troubleshooting RAM Issues

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1		1	2	1		2	3	2	
CO2	1		2	2	1		1	3	1	
CO3	1		2	1			1	2	2	1
CO4	1		2	1			1	2	2	1
CO5	1		2	1	2		1	2	2	1
Average	1		1.8	1.4	1.33		1.2	2.4	1.8	1

3=strongly mapped, 2=moderately mapped,1 =slightly mapped

KEY COMPETENCIES

S. No.	Name of the experiment	Objectives	Key Competencies
1	Exercise on Identification and familiarization of various components of computer system.	Identification and familiarization of various components of computer system.	❖ Identify and note down motherboard, Components and Chips. ❖ Identify various Internal and External slots in the mother board and clean them withblower/ Brush. ❖ Practicing Inserting and Removing RAM withcare.
2	Exercise on various operations and modificationsr equired for CMOS setup.	Perform various operationsand modifications required for CMOS setup.	❖ Identify location of CMOS battery on mother board. ❖ Know how to replace CMOSbattery. ❖ Identify key board key for entering BIOS setup. ❖ Setup CMOS settings ❖ Check the status of CMOS settings after Replacement.
3	Exercise on Installing and removing of Motherboard from computer	Perform mother board installation, removal and identification	❖ Identify motherboard form factors (ATX, microATX, mini-ITX) ❖ Recognize various motherboard components (CPU socket, RAM slots, chipset, PCIe slots, power connectors) ❖ Demonstrate correct procedure for removing and installing a motherboard ❖ Properly mount the motherboard using standoffs and screws ❖ Align the I/O shield and rear ports correctly

4	Exercise on Printthe summary of your system Hardware and verify for correctness	Print the summary of your system Hardware and verify for correctness	❖ Know how to open system summary window ❖ Check whether all the hardware peripherals are working properly or not. ❖ Know how to install device drivers ❖ Know how to enable and disable hardware peripherals. ❖ Print the hardware summary page
5	Assembling a PC	understand the step-by-step process of assembling a personal computer.	❖ Recognize essential hardware components (motherboard, RAM, CPU, HDD, PSU, cabinet, etc.) ❖ Understand the role and placement of each component ❖ Install the motherboard, processor, RAM, and storage devices into the cabinet ❖ Mount and connect the SMPS ❖ Connect cables (SATA, power, front panel I/O, etc.) ❖ Install expansion cards (optional) ❖ Connect and manage power cables safely and efficiently ❖ Organize internal wiring to promote airflow and safety
6	De-Assembling of a PC	To understand the systematic process of disassembling a personal computer.	❖ Identify all major components: motherboard, CPU, RAM, HDD/SSD, SMPS, GPU, etc. ❖ Detach cables and connectors carefully (SATA, power, front panel, etc.) ❖ Use tools like screwdrivers correctly and safely. ❖ Handle delicate components such as RAM and processor without damage. ❖ Follow a correct and logical sequence for disassembling the system. ❖ Place screws and components in organized manner for easy reassembly.
7	Identification of various components of Motherboard	To identify and understand the function of key components on a computer motherboard.	❖ Identify components such as CPU socket, RAM slots, chipset, power connectors, SATA/IDE ports, AMOS battery, etc. ❖ Recognize expansion slots (PCI, PCIe, AGP), and onboard headers (USB, front panel, fan headers). ❖ Identify the purpose of each component (e.g., chipset controls data flow, CPU socket holds the processor). ❖ Understand how components work together within the computer system.

8	Identification of various back panel connectors of Motherboard	To identify the different connectors present on the back panel of a motherboard.	❖ Recognize common back panel ports: • USB Ports (Type-A, Type-C) • HDMI / VGA / DVI • Ethernet (RJ-45) • Audio Jacks • PS/2 Ports • DisplayPort / Serial / Parallel Ports (if present) ❖ Identify the use of each connector for devices like monitors, keyboards, mice, network cables, printers, speakers, etc. ❖ Visually and physically distinguish between similar-looking ports (e.g., USB vs. HDMI).
9	Identification ofvarious pins of connectors in Motherboard	To identify different types of connector pins and headers located on the motherboard.	❖ Recognize key pin headers such as: ❖ Back panel connectors (PS2, USB, HDMI, VGA,DVI,RJ-45,SERIAL,PARALLEL PORTS) ❖ Front panel connector (F_PANEL): power switch, reset switch, power LED, HDD LED ❖ USB headers (USB1, USB2...) ❖ Audio headers (HD_AUDIO, AC'97) ❖ Fan headers (CPU_FAN, SYS_FAN) ❖ Power connectors (24-pin ATX, 4/8-pin CPU power) ❖ SATA ports and M.2 slots ❖ Understand the layout of pins (e.g., +ve, -ve, GND, VCC) for each connector. ❖ Read diagrams and pin out charts to match wires correctly.
10	Installing and removing RAM,CPU,HARD DISK in motherboard	To learn the correct procedure for installing and removing RAM, CPU, and Hard Disk in a computer system.	❖ Properly insert and remove RAM modules from DIMM slots. ❖ Correctly install the CPU into the socket (LGA/PGA) and apply thermal paste if required. ❖ Install and connect SATA/SSD hard disks, including power and data cab
11	Identify various motherboards based on the form factor such as AT,ATX, micro ATX, mini ATX , Baby AT etc	To identify and differentiate various motherboard form factors used in personal computers.	❖ Visually identify the key characteristics of common form factors such as: • AT (Advanced Technology) • ATX (Advanced Technology Extended) • Micro ATX • Mini ATX / Mini-ITX • Baby AT ❖ Understand how form factor affects: • Cabinet size and type • Power supply connector types • Number of expansion and memory slots • Cooling options

12	Identify voltage levels of each wire in SMPS based on the standard color of the wire	To identify different wires of the SMPS (Switched Mode Power Supply) based on their color codes.	❖ Know the purpose and acceptable range of each voltage rail. ❖ Understand potential issues from overvoltage or under voltage. ❖ Learn how to safely measure voltage from an SMPS using a multimeter. ❖ Follow ESD and electrical safety protocols while dealing with power supply wires. ❖ Match wire voltages to the components they power (e.g., CPU requires 12V, USB uses 5V). ❖ Identify different SMPS connectors (24-pin ATX, 4-pin CPU, SATA, Molex) and their pin/wire color mapping.
13	Familiarize with hard disk interfacings standards like IDE/SCSI /SATA / PATA	To understand various types of hard disk interfaces used in personal computers	❖ Identify and differentiate between IDE, PATA, SATA, and SCSI interfaces by their connectors and cables. ❖ Understand the technical specifications (speed, number of pins, data transfer type) of each interface standard. ❖ Recognize compatible hard disks and motherboards for each interface type. ❖ Understand the historical development and obsolescence of older standards (IDE, PATA) and the adoption of newer ones (SATA).
14	Practice on Partition of Hard disk	To understand the concept and purpose of hard disk partitioning	❖ Grasp how a hard disk can be divided into multiple partitions for better data management. ❖ Use system tools like Windows Disk Management or diskpart (command line) for partitioning tasks. ❖ Choose appropriate file systems (e.g., NTFS for Windows) during formatting. ❖ Apply logical planning to create partitions based on user/system needs (e.g., OS, data, backup)
15	Practice on formatting a hard disk FAT/NTFS Format	To understand the concept and purpose of formatting a hard disk	❖ Distinguish between FAT32 and NTFS in terms of features, limitations, and usage scenarios. ❖ Format a hard drive or partition using both graphical and command-line tools (e.g., format, diskpart). ❖ Select the appropriate file system based on the system requirement (e.g., NTFS for Windows, FAT32 for external drives). ❖ Configure volume labels and choose cluster sizes based on the type of usage.

16	Calculating Hard Disk Storage Capacity	To understand the components that determine a hard disk's storage capacity	❖ Understand disk structure: number of platters, tracks, sectors, bytes per sector, etc. ❖ Convert between different units of storage (e.g., 1 GB = 1024 MB, etc.) ❖ Interpret technical specs of a hard drive (e.g., from a product label or manual) to estimate usable capacity. ❖ Understand why usable space is less than labeled capacity (e.g., due to formatting, file system overhead, 1 GB = 1000 MB marketing vs. 1024 MB actual).
17	How to recover lost data on hard drive using Recovery Tools	How to recover lost data on hard drive.	❖ VerifytheavailablerecoverytoolsofOperatingsystem. ❖ KnowhowtorecoverlostdataonHarddriveusing Restore point. ❖ KnowhowtorecoverlostdataonHarddriveusing RecoveryImage.
18	Defragmenting the Hard Disk	To understand the concept of disk fragmentation and how it affects system performance.	❖ Identify how data gets fragmented on traditional hard drives and its impact on read/write speed. ❖ Use built-in tools like Windows Defragment and Optimize Drives. ❖ Analyze disk drives for fragmentation percentage before initiating defragmentation. ❖ Perform defragmentation safely without interrupting other operations. ❖ Observe changes in performance post-defragmentation. ❖ Set up scheduled defragmentation for regular maintenance.
19	Installation of operating system software (Windows 10 / 11)	To understand the step-by-step procedure of installing a Windows operating system.	❖ Prepare a PC for OS installation (bootable media, BIOS settings, partitioning) ❖ Carry out a complete and clean installation of Windows 10 or Windows 11. ❖ Set and modify the boot device priority in BIOS/UEFI settings. ❖ Create, delete, and format partitions during installation as needed. ❖ Choose correct file system (e.g., NTFS) for Windows installation ❖ Install required drivers post-OS installation for full hardware support.
20	Installation of device driver software	To understand the role and importance of device drivers in a computer system.	❖ Recognize which devices require drivers (e.g., graphics card, audio, LAN, chipset). ❖ Use Windows Device Manager to view device status, update, install, or uninstall drivers. ❖ Install drivers from CDs, USBs, or downloaded packages. ❖ Fix common issues such as "driver not recognized," "yellow warning sign," or "code

			10 error." ❖ Match correct driver versions to operating systems and hardware models. ❖ Test devices after driver installation to ensure proper working (e.g., sound output, network connectivity).
21	Installation of application software (MS-Office 2007/ 2010)	To install Microsoft Office 2007 / 2010 suite including Word, Excel, PowerPoint, and other components.	❖ Perform installation from CD/DVD, USB, or downloaded setup file. ❖ Choose between typical, custom, or complete installations depending on user needs. ❖ Check system compatibility (OS, RAM, storage) before installation ❖ Enter product key and complete activation process for licensed software. ❖ Choose and manage installation paths or directories during setup. ❖ Confirm installation by launching Office applications and checking version details.
22	Practice on various options of control panel	To explore and understand the purpose of various tools and settings available in the Windows Control Panel.	❖ Navigate through Control Panel efficiently in both Category and Classic views. ❖ Adjust screen resolution, theme, desktop background, and screen saver. ❖ Create, delete, and manage user accounts and passwords. ❖ Add and remove hardware devices; access printer settings. ❖ View and change adapter settings, connect to Wi-Fi, and set up local networks. ❖ Set system date/time, region, and language preferences. ❖ Install/uninstall programs, manage default apps, and check installed updates.
23	Installation of printer using control panel	To understand how to install a printer manually using the Control Panel in Windows	❖ Add a new printer through Control Panel using "Devices and Printers" > "Add a printer" option. ❖ Select or install appropriate drivers for USB, network, or wireless printers. ❖ Choose correct ports (USB, LPT1, TCP/IP) during manual installation. ❖ Set the installed printer as the default printer and configure preferences ❖ Identify and fix installation errors like “printer not found” or “driver unavailable.” ❖ Perform a successful test print to verify installation.

24	Installation of any anti-virus software for protecting pc	To understand the need for anti-virus software in protecting a computer from malware and other threats.	❖ Install anti-virus software from a setup file or online installer (e.g., Avast, Quick Heal, AVG, etc.). ❖ Grant necessary permissions during installation and accept license agreements. ❖ Run full system scans, quick scans, or custom scans and interpret the results. ❖ Identify threats, view quarantine folder, and restore or delete infected files. ❖ Ensure virus definitions are up to date and software is working effectively. ❖ Confirm background protection is active and responding to potential threats.
25	Practice on changing resolution, color, appearance, screensaver options of thedisplay setting of pc	To understand how to access and modify display settings in a Windows PC.	❖ Access the Display Settings through the desktop or Control Panel. ❖ Change the resolution to optimize screen display based on monitor capability. ❖ Modify screen layout (landscape/portrait) as required. ❖ Choose appropriate color schemes and Windows themes for better visibility and aesthetics. ❖ Select, preview, and set timers for screensavers; configure password protection on resume. ❖ Use high contrast modes or larger text options for improved accessibility. ❖ Personalize display options according to user needs or preferences.
26	Know the precautions to be taken while troubleshooting the hardware	To understand the importance of safety and preventive measures during hardware troubleshooting.	❖ Recognize the dangers of working with powered devices and exposed circuitry. ❖ Use of anti-static wrist straps, mats, and ESD-safe tools to prevent component damage. ❖ Ensure power is disconnected before opening the cabinet or removing parts. ❖ Select and use appropriate tools like screwdrivers, tweezers, and testers correctly. ❖ Maintain a clean, dry, and well-lit workspace free from conductive materials. ❖ Avoid touching circuit traces or connectors with bare hands; handle by edges.
27	identify the systematic steps in troubleshooting: Visual inspection, Layman checks, measurement of voltage levels, Beep sounds,	To understand the step-by-step process of hardware troubleshooting.	❖ Identify burnt components, loose wires, broken connectors, or dust accumulation. ❖ Perform basic checks like verifying power supply, monitor connection, and cable tightness. ❖ Use a multimeter to measure voltage levels from the SMPS to motherboard and components (e.g., +12V, +5V, +3.3V lines). ❖ Interpret BIOS beep codes to identify faults in RAM, CPU, GPU, or motherboard ❖ Read and understand on-screen or LED

	Error codes and Use of Advanced Diagnostic tools		error codes shown during POST. ❖ Use hardware diagnostic software (like Hiren's Boot CD, MemTest86, etc.) and built-in Windows tools for checking hardware health.
28	Trouble shooting Keyboard, Printer problems	To identify and diagnose common hardware and connectivity issues in keyboards and printers.	❖ Recognize issues like non-responsive keys, stuck keys, or full keyboard failure. ❖ Verify USB/PS2 port connection, wireless keyboard pairing, and power supply (for wireless). ❖ Access and update keyboard drivers using Device Manager or Control Panel. ❖ Replace with a known working keyboard to verify device-level failure. ❖ Verify cables, network/Wi-Fi connectivity, and power status of the printer. ❖ Clear print queue, restart the print spooler, and reinstall printer software. ❖ Install or update appropriate printer drivers. ❖ Detect and resolve issues like paper jams, low ink/toner, or incorrect paper tray selection. ❖ Check printer settings in Control Panel or Settings and configure defaults properly. ❖ Use printer self-test or built-in diagnostic tools for hardware faults.
29	Trouble shooting no display on monitor	To understand the possible causes behind a blank or no-display monitor issue.	❖ Detect loose cables, damaged connectors, or physically broken monitor parts. ❖ Check VGA/HDMI/DisplayPort/DVI cables, power supply, and monitor input source selection. ❖ Confirm monitor power using power LED indicators or multimeter readings. ❖ Interpret beep codes indicating RAM or graphics card issues. ❖ Remove and re-seat RAM and GPU; test with alternate RAM/monitor where possible. ❖ Connect the system to a different monitor to isolate the issue (monitor vs. system).
30	Troubleshooting RAM Issues	To understand the symptoms and causes of RAM-related problems in a computer system.	❖ Identify RAM issues through signs like continuous beeping, blue screen errors, system freezing, or failure to boot. ❖ Detect physical damage, dust, or improper installation of RAM modules. ❖ Use BIOS/UEFI beep codes to identify RAM-related errors during POST (Power-On Self-Test). ❖ Safely remove, clean, and re-insert RAM sticks into the motherboard slots. ❖ Use tools like MemTest86**,** Windows Memory

			Diagnostic, or other bootable utilities to check RAM health. ❖ Test each RAM stick in different slots to identify faulty RAM or slot.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 10
Unit test-2	From 11 to 20
Unit test-3	From 20 to 30

PHYSICS LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM109L	PHYSICS LAB	3	90	20	30	1.5

Note: For the Physics laboratory, half of the first-year students of each programme will attend, while the remaining half will attend the Chemistry laboratory. Thus, both laboratories will be engaged simultaneously during the 3-hour lab session.

TIME SCHEDULE

S. No	Chapter/ Unit Title	No. of Periods	COs
1.	Vernier calipers	03 + 03	CO1
2.	Micrometer (Screw gauge)	03 + 03	
3.	Verification of Lami's theorem using concurrent forces	03 + 03	
	Revision	03 + 03	
4.	Determination of 'g' using simple pendulum	03 + 03	CO2
5.	Focal length and focal power of convex lens by distant object method and U-V method	03 + 03	
6.	Verification of Boyle's law using Quill tube	03 + 03	
	Revision	03 + 03	
7.	Drawing of magnetic lines of force	03 + 03	CO3
8	Resonance apparatus–Determination of velocity of sound in air	03 + 03	
9	Refractive index of a solid using travelling microscope	03 + 03	
	Revision	03 + 03	
	Experiments for demonstration		
10	Meter bridge–Determination of resistance and specific resistance of material of given wire	03 + 03	CO4
11	Projectile motion- study the range of a projectile for different launch angles	03 + 03	
12	Generation of Beats using water columns	03 + 03	
	Total:	45+ 45	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to

(i)	Apply practical physics principles to operate, troubleshoot, and optimize engineering devices.
(ii)	Develop scientific skills through designing, conducting, and evaluating industry-relevant experiments to enhance technical proficiency.

COURSE OUTCOMES

CO1	AM109.1	Apply measurement techniques to improve accuracy; Explain forces maintaining equilibrium in physical systems.
CO2	AM109.2	Determine acceleration due to gravity experimentally; Investigate refraction of light at curved surfaces; Relate the gas pressure to volume variations at constant temperature.
CO3	AM109.3	Analyze the combined effect of magnetic fields (Earth and artificial magnet); Determine velocity of sound in air using resonance; Demonstrate U-V method to understand the refraction of light at curved surfaces.
CO4	AM109.4	Apply Kirchhoff's laws to compute the resistivity of a wire; Examine the projectile motion parameters; Observe and Interpret beat generation phenomenon.

LEARNING OUTCOMES

1. Apply measurement techniques using Vernier Calipers to determine the volumes of a cylinder and a sphere.
2. Use a screw gauge to measure and determinethe thickness of a glass plate and the cross-sectional area of a wire.
3. VerifyLami's Theorem by analysing a system of concurrent forces.
4. Conduct simple pendulum experiment to calculate the acceleration due to gravity (g) and interpret the result through an L–T^2 graph.
5. Determine the focal length and power of a convex lens using distant object method and U–V method, and compare the results.
6. Verify Boyle's Law using a Quill tube by noting pressure (P) and length of air column(L).
7. Illustrate the behaviour of lines of magnetic field around a bar magnet using magnetic compass.
8. Determine the velocity of sound in air at room temperature and at 0°C using resonance apparatus.

9. Determine the refractive index of a solid by usingthe measurements taken with a travelling microscope.
10. Demonstrate the use of a meter bridge to determine the resistance and specific resistance of a given wire.
11. Simulate projectile motion and observe the range of the projectile for different launch angles using appropriate experimental setup.
12. Demonstrate the phenomenon of beats by creating beat patterns using water columns.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	1	1	1	1
CO2	3	1	1	1	1	1	1
CO3	3	1	1	1	1		1
CO4	3	1	1	2	1		1
Average	3	1	1	1.25	1	1	1

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

(i) Seminars
(ii) Viva-voce
(iii) Assignments
(iv) Quiz competitions
(v) Industrial visits
(vi) Techfest
(vii) Mini project
(viii) Group discussions
(ix) Virtual labs
(x) Library visit for e-books, etc.

COURSE CONTENT

Name of the Experiment	**Competencies (Revised Bloom's Taxonomy)**	**Key Competencies (Revised Bloom's Taxonomy)**
1. Practice on Vernier Calipers	• Determine the least count • Place the object in accurate position. • Interpret scale readings • Calculate volume of cylinder and sphere	• Interpret Vernier readings • Compute volume using appropriate formulae • Apply measurement data to calculate physical quantities
2. Practice on Screw Gauge	• Determine the least count and zero error • Place the object in accurate position. • Interpret scale readings • Calculate thicknessand cross-sectional area	• Analyze scale readings forzero error • Compute thickness and area from measurements • Apply micrometer data to solve practical problems
3. Verification of Lami's Theorem	• Setup experimental arrangement • Apply appropriate weights • Measure angles between forces • Analyze data to verify theorem	• Interpret directions and angles of forces • Evaluate force relationships • Validate Lami's Theorem using experimental data
4. Simple Pendulum	• Arrange the pendulum properly • Measure the time taken for20 oscillations • Compute time period and acceleration due to gravity • Plot L–T^2 graph	• Measure oscillation intervals accurately • Calculate g using experimental data • Interpret L–T^2 graph to confirm relationship
5. Focal Length and Power of Convex Lens	• Place the object and convex lens in proper positions. • Measure image distance • Compute focal length and power	• Determine focal length using both methods • Validate optical formulae using experiment
6. Boyle's Law Verification	• Record atmospheric pressure • Measure air column length and calculatethe enclosed pressure • Analyze data for PxL consistency	• Setup quill tube in different positions for multiple readings • Interpret pressure–length data

7. Drawing of Magnetic Lines of force	• Draw meridian and set magnet orientation • Sketch the lines of magnetic field using compass.	• Visualize field pattern accurately • Analyze field symmetry
8. Velocity of Sound – Resonance Method	• Assemble apparatus and adjust reservoir • Identify resonating lengths • Calculate velocity of sound at room temperature and at 0^{o}C.	• Detect resonance points • Compute velocity using resonance data • Extrapolate to standard temperature
9. Refractive Index of a solid using Traveling Microscope	• Determine least count • Measure real and apparent thickness • Calculate refractive index	• Analyze scale readings • Apply refraction formula • Interpret refractive index ofa solid.
10. Meter Bridge	• Connect circuit properly • Measure balancing length, radius of given wire • Compute resistance and specific resistance	• Analyze circuit behavior • Calculate unknown resistance • Interpret experimental values for resistivity
11. Projectile motion- study the range of a projectile for different launch angles	• Setup and align launcher • Adjust launch angles • Measure range	• Observe the variations in horizontal range for different angles of projection. • Evaluate trajectory data
12. Generation of Beats using water columns	• Setup beat source using glasses or online tone generator • Generate close frequencies • Detect and analyze beat pattern	• Observe frequency interference • Interpret beat frequency data • Analyze patterns using mobile sensors/ software

REFERENCES

1. NCERT Physics Laboratory Manual for Class XI.
2. NCERT Physics Laboratory Manual for Class XII.
3. Experiments in Physics: A Laboratory Manual by Daryl W. Preston, Joseph W. Kane, Morton M. Sternheim

SCHEME OF VALUATION FOR END PRACTICAL EXAMINATION

Activity	Marks
Aim, Apparatus, Formulae	6
Tabulations and Readings	12
Calculations	4
Precautions, Results	3
Viva-voce	5
Total marks	**30**

TABLE SHOWING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit test	Experiments to be covered
Unit test - 1	From Experiment 1 to 4
Unit test - 2	From Experiment 5 to 8
Unit test - 3	From Experiment 9 to 12

CHEMISTRY LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM110L	CHEMISTRY LAB	3	90	20	30	1.5

NOTE : For the Physics laboratory, half of the first-year students of each programme will attend, while the remaining half will attend the Chemistry laboratory. Thus, both laboratories will be engaged simultaneously during the 3-hour lab session**.**

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	COs Mapped
1.	Introduction to Fundamentals of Analytical Chemistry.	03+03	CO1
2.	Chemical Recognition by Sensory Cues.	03+03	CO1
3.	Preparation of Standard Na_2CO_3 Solution.	03+03	CO1
4.	Estimation of HCl Using Standard NaOH Solution.	03+03	CO2
5.	Determination of Alkalinity of Water Sample.	03+03	CO2
	Revision	03+03	
6.	Estimation of Mohr's Salt Using Standard $KMnO_4$ Solution.	03+03	CO3
7.	Determination of Total Hardness of Water Using Standard EDTA Solution.	03+03	CO4
8.	Estimation of Chlorides Present in Water Sample Using Standard $AgNO_3$ Solution.	03+03	CO4
9.	Analyzing pH of Common Compounds Using Visual and Instrumental Methods.	03+03	CO5
	Revision	03+03	
	Demonstration Experiments		
10.	Demonstration of Copper Deposition on an Object by Using Electrolysis Process.	03+03	CO5
11.	Demonstration of Construction and Working of a Galvanic Cell.	03+03	CO5
12.	Open Ended Experiments/Micro Projects – I.	03+03	CO5
13.	Open Ended Experiments/Micro Projects – II.	03+03	CO5
	TOTAL	45+45	

COURSE OBJECTIVES

Upon completion of the course the shall be able to:	
(i)	To Perform fundamental analytical chemistry techniques, identify chemical substances using sensory cues and accurately prepare standard solutions.
(ii)	To Evaluate and judge the neutralization point in acid base titration.
(iii)	To Evaluate the endpoint of reduction and oxidation reaction.
(iv)	To Judge the stable end point of complex formation, stable precipitation.
(v)	To Determine the pH of compounds, demonstrate copper deposition using electrolysis, and the working of a galvanic cell.

COURSE OUTCOMES

CO1	AM110.1	Perform fundamental analytical chemistry techniques, identify chemical substances using sensory cues and accurately prepare standard solutions.
CO2	AM110.2	Evaluate and judge the neutralization point in acid base titration.
CO3	AM110.3	Evaluate the endpoint of reduction and oxidation reaction.
CO4	AM110.4	Judge the stable end point of complex formation, stable precipitation.
CO5	AM110.5	Determine the pH of compounds, demonstrate copper deposition using electrolysis, demonstrate the working of a galvanic cell.

LEARNING OUTCOMES

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.

2.0 Identify the chemical compounds and solutions by senses.

3.0 Practice making standard Na_2CO_3 solutions.

4.0 Conduct titrations adopting standard procedures and using standard NaOH solution for estimation of HCl.

5.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (one ground water and one surface / tap water) using standard H_2SO_4 solution.

6.0 Conduct titrations adopting standard procedures and using standard $KMnO_4$ solution for estimation of Mohr's Salt.

7.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (one ground water and one surface / tap water) using standard EDTA solution.

8.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water (one ground water and one surface / tap water) and waste water by using standard $AgNO_3$ solution.

9.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage etc.,) to determine their pH using pH paper, Universal indicator, digital pH meter.

10.0 Demonstrate the electrolysis process of Copper deposited on an object.

11.0 Understand the construction and working principle of a Galvanic cell and identify how chemical energy is converted into electrical energy through redox reactions.

12.0 Collect water sample from nearby water body and test for any two parameters.[Parameters – Alkalinity, Hardness, Chloride and pH]

13.0 Collect water sample from nearby sewage/industrial effluent and test for any two parameters. [Parameters – Alkalinity, Hardness, Chloride and pH]

CO – PO/PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2		1			1			
CO2	3	2		1						
CO3	3	2		1						
CO4	3	2		1	1					
CO5	3	2	1	1	1		1			
Average	3	2	1	1	1		1			

3 = Strongly Mapped 2 = Moderately Mapped 1 = Slightly Mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i).Assignments (ii).Tutorials (iii). Guest Lectures (iv). Seminars (v). Quiz Competitions (vi).Industrial Visit (vii). Tech Fest (viii). Mini Projects (ix). Group Discussions (x). Virtual Classes and (xi). Library Visits.

COMPETENCIES AND KEY COMPETENCIES TO BE ACHIEVED BY THE STUDENT

Name of the Experiment (No of Periods)	Competencies	Key Competencies
Introduction to Fundamentals of Analytical Chemistry. (03)	• Develop a foundational understanding of analytical chemistry principles and demonstrate proficiency in basic laboratory techniques, data analysis, and safety protocols.	• Students will master the foundational principles and laboratory techniques of analytical chemistry.
Chemical Recognition by Sensory Cues. (03)	• Develop skills in conducting simple tests and making accurate observations. • Interpret results to draw conclusions about the nature of chemical compounds.	• Develop skills in conducting simple tests and making accurate observations. • Interpret results to draw conclusions about the nature of chemical compounds.
Preparation of Standard Na_2CO_3 Solution. (03)	• Weighing the salt to the accuracy of 0.01mg • Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette.	• Weighing the salt to the accuracy of 0.01 mg. • Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette.
Estimation of HCl Solution Using Standard NaOH Solution. (03)	• Cleaning the glass ware and rinsing with appropriate solutions. • Making standard solutions. • Measuring accurately the standard solutions and titrants. • Filling the burette with titrant. • Fixing the burette to the stand	• Making standard solutions. • Measuring accurately the standard solutions and titrants. • Effectively controlling the flow of the titrant. • Identifying the endpoint. • Making accurate
Determination of Alkalinity of Water Sample (03)		
Estimation of Mohr's Salt Using Standard $KMnO_4$ Solution. (03)		

Determination of Total Hardness of Water Using Standard EDTA Solution. (03) Estimation of Chlorides Present in Water Sample by Using Standard $AgNO_3$ Solution. (03)	• Effectively controlling the flow of the titrant. • Identifying the endpoint. • Making accurate observations. • Calculating the results.	observations.
Analyzing pH of Common Compounds Using Visual and Instrumental Methods. (03)	• Know pH range (0 – 14) and classify substances as acidic, neutral and basic. • Accurately measure pH using pH paper and universal indicator. • Note color changes and interpret pH values correctly. • Perform precise pH tests to ensure reliable results. • Record pH data and observations clearly. • Connect pH results to real- world contexts. • Familiarize with instrument. • Choose appropriate 'Mode'/ 'Unit'. • Prepare standard solutions/buffers, etc. • Standardize the instrument with appropriate standard solutions. • Make measurements accurately.	• Accurately measure pH using pH paper and universal indicator. • Perform precise pH tests to ensure reliable results. • Prepare standard solutions/buffers, etc. • Standardize the instrument with appropriate standard solutions. • Make measurements accurately.

Demonstration of Copper Deposition on an Object by Using Electrolysis Process. (03)	• Prepare standard solutions. • Selection of electrodes. • Set up and perform an electrolysis experiment accurately and safely. • Analyze the deposition of Copper on an object.	• Set up and perform an electrolysis experiment accurately and safely. • Analyze the deposition of Copper on an object.
Demonstration of Construction and Working of Galvanic Cell.(03)	• Prepare standard solutions. • Selection of electrodes. • Making of salt bridge. • Construct a simple galvanic cell using appropriate electrodes and electrolyte solutions. • Explain the working principle of a galvanic cell, including electron flow, redox reactions, and the function of the salt bridge	• Construct a simple galvanic cell using appropriate electrodes and electrolyte solutions. • Explain the working principle of a galvanic cell, including electron flow, redox reactions, and the function of the salt bridge.
Open Ended Experiments /Micro Projects – I. (03)	• Identifies a relevant chemical problem or question based on prior knowledge. • Demonstrates proficiency in basic chemistry lab techniques (e.g., titration, preparation). • Prepares solutions accurately (Molarity, dilutions, standardizations). • Handles chemicals safely following MSDS guidelines and standard lab practices. • Uses instruments relevant to the experiment	• Prepares solutions accurately (Molarity, dilutions, standardizations). • Uses instruments relevant to the experiment (e.g., pH meter, and digital balance) correctly. • Calibrates and maintains instruments when needed. • Makes accurate, timely and detailed observations of • chemical

Open Ended Experiments/ Micro Projects – II. (03)	(e.g., pH meter, and digital balance) correctly. • Calibrates and maintains instruments when needed. • Interprets instrumental output with understanding of underlying chemical principles. • Makes accurate, timely and detailed observations of chemical reactions (e.g., color changes, precipitate formation). • Records quantitative and qualitative data systematically. • Maintains an organized and complete lab notebook. • Works effectively in pairs or groups; shares responsibilities and discusses findings collaboratively. • Presents results through oral discussion, lab reports, or visual presentations using proper chemical terminology.	reactions (e.g., color changes, precipitate formation).

REFERENCES

1. VOGEL's Textbook of Quantitative Analysis, Sixth Edition, Pearson Education Limited.
2. VOGEL's Textbook of Qualitative Analysis, Seventh Edition, Pearson Education Limited.
3. Y. Bharathi Kumari & Jyotsna Cherukuri - Laboratory Manual of Engineering Chemistry for Engineering Students of JNT Universities.
4. Instrumental Methods of Chemical Analysis.
5. NCERT Chemistry Laboratory Manual for Class XII.
6. Practical Chemistry by the Royal Society of Chemistry Education.

SCHEME OF VALUATION FOR END PRACTICAL EXAMINATION

Activity	Marks
Aim, Apparatus, Formulae	6
Tabulations and Readings	12
Calculations	4
Precautions, Results	3
Viva-voce	5
Total marks	**30**

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST

Unit Test	Learning Outcomes to be Covered
Unit Test – 1	From Experiment 1 to 4
Unit Test – 2	From Experiment 5 to 8
Unit Test – 3	From Experiment 9 to 13

COMPUTER & DIGITAL SKILLS LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Year	FA Marks	SA Marks	Credits
26AM111L	COMPUTER & DIGITAL SKILLS LAB	3	90	40	60	3

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	COs Mapped
1.	Computer hardware and Software Basics	3	CO1
2.	Windows Operating System	3	CO1
3.	MSWord	18	CO2
4.	MS Excel	21	CO3
5.	MS PowerPoint	18	CO4
6	AI,ML & Quantum computing Tools	27	CO5
Total periods		90	

COURSE OBJECTIVES

(i) To familiarize with basics of Computer Hardware and Software
(ii) To familiarize with operatingsystems
(iii) Tof amiliarize with Microsoft word
(iv) To familiarize with Microsoft Excel
(v) To familiarize with Microsoft PowerPoint
(vi) To familiarize with AI, ML, Quantum Computing Tools

COURSE OUTCOMES

CO1	AM111.1	Identify hardware and software components
CO2	AM111 .2	Prepare documents with given specifications using word processing software
CO3	AM111 .3	Use Spreadsheet software to make calculations and to drawvarious graphs/charts.
CO4	AM111 .4	Use Power point software to develop effective presentation for a given theme or topic.
CO5	AM111 .5	To use basic AI,ML & Quantum Computing Tools

LEARNING OUTCOMES

I. Computer Hardware and Software Basics

1. a). To get familiarized with Computer system and hardware connections
   b). To start andShut downComputercorrectly
   c). To exploreWindowsDesktop
2. To check the software details of the computer
3. Tocheckthe hardware present in your computer

II. Windows's operating system

4. To workwith Files andFolders
5. To use WindowsAccessories:Calculator –Notepad –WordPad–MSPaint

III. MS-WORD

6. To get familiarized with Ribbon layout of MSWord.
7. To perform basic word processing
8. Touse basic formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MSWord
12. To use Equations and symbols features

IV. MS-EXCEL

13. To get familiarized with MS-EXCEL ribbon layout
14. To access and enter datain the cells
15. To edit a spreadsheet-Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Data Formatting
17. To create Excel Functions, use autofill feature
18. To enter a Formula for automaticcal culations
19. To sort and filter data in sheet.
20. To present data using Excel Graphs and Charts.
21. To format a Worksheetin Excel for printing using Pagelayout
22. To develop lab report formats of respective discipline.

V. Practice with MS-POWERPOINT

23. To get familiarized with Ribbon layout features of PowerPoint.
24. To create a simple Power Point Presentation
25. To setup a Master Slide in PowerPoint
26. To insert Text and Objects
27. To insert Flow Charts
28. To insertTables
29. To insert Charts/Graphs
30. To insert video, audio& hyperlinks
31. To animate text, objects and slides.
32. To Review Presentations

VI. AI,ML & Quantum Computing Tools

33. To get familiarized with AI Tools
34. To get familiarized with working of ChatGPT
35. Identify Objects using AI Tools based on CNN,YOLO,SSD,R-CNN
36. To paraphrase text using AI Tools(PEGASUS,GPT,T5)
37. To use text-to-Image Generation AI Tools (DALL-E,MIDJOURNEY)
38. To use voice command simulation AI Tools (SPEECH-TO-TEXT)
39. To get familiarized with ML Tools
40. To get familiarized with Quantum Computing Tools
41. To familiarize with quantum bits (qubits) using Dirac notation
42. To familiarize the behaviour of single and multiple qubit gates.
43. To familiarize with Qubit as a Coin / Spin Analogy

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	1	2	3	1	1
CO2	2	2	3	3	2	2	2	3	2	1
CO3	2	2	3	3	2	1	2	3	3	3
CO4	2	2	3	3	2	1	2	3	2	1
CO5	3	3	2	3	3	3	3	3	3	3
Average	2	2.2	2.4	2.6	2.2	1.6	2.2	3	2.2	1.8

3=Strongly mapped, 2=moderately mapped, 1=slightly mapped

KEY COMPETENCIES

Exp /Task/ Ex No	Name of Experiment /Task /Exercise	Objectives	Key competencies
1 (a).	To get familiarized with Computer system and hardware connections	a. Connect cables to external hardware and operate the computer	a. Identify the parts of a computer system: i). CPU ii).Mother Board iii) Monitor iv)CD/DVD Drive v) Power Switch vi)Start Button vii)ResetButton viii) RAM ix) SSD /HDD b. Identify and connect various peripherals c. Identify and connect thecables used with computer system d. Identify various ports on CPU cabinet and connect Keyboard, Mouse and peripherals
1(b).	Start and Shut downComputer correctly	a. Login and logout as per the standard procedure b. Operate mouse & KeyBoard	a. Login using the password b. Start and shut down thecomputer c. Use Mouse and Key Board
1 (c).	Explore Windows Desktop	a. Access application programs using Start menu b. Use taskbar and Taskmanager	a. Familiarity with Start Menu, Task bar,Icons and Shortcuts b. Access application programs using Start menu, Taskmanager c. Use Helpsupport
2.	Check the software details of the computer System	a. Access the properties of computer and to find the details	a. Finding the details of operating system being used b. Finding the details of edition/version Service Pack installed
3.	Check the hardware present in your computer	a. Access device manager and to find the details b. Type /Navigate the correct path and Select icon related to the details required	a. Finding theCPU name and clock speed b. Finding the details of RAM and hard disk present c. Accessing Device manager using Control Panel and check thestatus of devices like mouseandkeyboard d. Using My Computer

			tocheckthe details of Hard drives and partitions
4.	Working with Files and Folders	a. Create files and folders b. Rename, arrange and search for the required folder/file c. Restore deleted files from Recyclebin	a. Create folders and organize files indifferent folders b. Use cut, copy and paste commands to organize files andfolders c. Arrange icons by name, size, type and Modified d. Search for a file or folder andfinditspath e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarity with theuse of MyDocuments g. Familiarity with the use of Recycle Bin
5.	Use Windows Accessories like Calculator– Notepad– WordPad – MSPaint	a. Use windows accessories and select correct texteditor based on the situation. b. Use MS paint tocreate /Edit pictures and save in the required format	a. Access Calculator using Run command b. Familiarity with the use of Calculator c. Create Text Files using Notepad, WordPad and observe the difference in file sizes d. Use MSpaint to create .jpeg, .bmpfiles
6.	Get familiarized with Ribbon layout of MSword.	a. Create a Document and name appropriately and save it b. Set paper size and print options	a. Create/Open a document b. Use Save and Save asfeatures c. Work on two Word documents simultaneously d. Choose correct Paper size and Printing options
7.	Perform basic Word Processing	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. use Spell /Grammar Check features for auto corrections	a. Typingtext b. Keyboardusage c. Mouse Usage (Leftclick/Rightclick/Scrol l) d. Using Keyboard shortcuts e. Using Find and Replace features inMS-word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar

8.	Use basic formatting techniques	a. Format Text and paragraphs and using various text styles. b. Use bullets and numbers to create lists. c. Use Templates /Themes d. Insert page numbers, date, headers and footers	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. Use various Font Styles f. Insert bullets and numbers g. Using Themes and Templates h. Insert page numbers, header and footer
9.	Insert a table ofrequired number ofrowsand columns	a. Insert table in the word document and edit b. Use sort optionfor arranging data.	a. Editing the table by adding the fields, deleting rows and columns, inserting subtable, marking borders. Merging and splitting of cells in a Table b. Changing the background color ofthetable c. Using table designtools d. Using auto fit – fixed row/column height/length – Even distribution of rows /columns feature e. Converting Text to table and Table toText f. Use Sort feature of the Table to arrange data in ascending/ descending order
10.	Insert objects, clipart and Hyperlinks	a. Insert hyperlinks & Bookmarks b. Create organization charts/flow charts	a. Creating a 2-page document and Insert hyperlinks and Bookmarks. b. Creating an organization chart c. Preparing an Examination schedule notice with a hyperlink to Exam schedule table.
11.	Use Mail merge feature of MSWord	Using Mail merge feature	a. Using mail merge to prepare individually addressed letters b. Using mail merge to print envelopes.

12.	Use Equations and symbols features.	Enter Mathematical symbols and Equations in the word document	a. Exploring various symbols available b. Inserting a symbol in the text c. Inserting mathematical equations in the document
13.	Get familiarized with MS Excel Ribbon layout	a. Get familiarized withexcel layout b. Use variousfeatures available in toolbar	a. Open /create an MS Excelspread sheet and familiarity with MS Excel layout b. Use Quick Access Toolbar, Title Bar, Worksheets, Formula Bar, Status Bar
14.	Access and Enter data in thecells	a. Access and select the required cells by various addressing methods b. Enter and edit data	a. Moving around a Worksheets using Quick access toolbar b. Selecting Cells, Entering Data-Editing a Cell, Wrapping of Text-Deleting a Cell Entry, Saving aFile, ClosingExcel
15.	Editspread sheetselect, Copy, Cut, Paste	Format the excelsheet	a. Inserting and Deleting Columns andRows b. Creating Borders c. Merging and aligning center d. Adding background Color Changing the Font, Font Size, and Font Color e. Formatting text with Bold, Italicize, and Underline f. Working with Long Text, Change a Column'sWidth
16.	Use built in functions and Format Data	Use built in functionsinExcel	a. Performing Mathematical Calculations b. Verification AutoSum c. Perform Automatic Calculations d. Aligning Cell Entries
17.	Create Excel Functions, Fill Cells	a. To Create Excel sheets involving cross references and equations b. Using the advanced functions for conditional calculations	a. Using Reference Operators b. Working with sum, Sumif , Count and CountIf Functions c. Filling Cells Automatically

18.	Enter a Formula for automatic calculations	Enter formula for automatic calculations	a. Entering formulae b. Using Cell References in Formulae c. Using Automatic updating function of Excel Formulae d. Using Mathematical Operators in Formulae e. Using Excel Error Message and Help
19.	Sort and filter data in sheet.	a. Refine the data in a worksheet and keep it organized. b. Narrow a worksheet by selecting specific choice	a. Sorting data in multiple columns b. Sorting data in a row c. Sorting data using Customorder Filter data inwork sheet
20.	Practice Excel Graphs And Charts	a. Use data in Excel sheet to Create technical charts and graphs b. Prepare various graphs from data.	a. Using data in sheets for getting charts. b. Producing various charts.
21.	Format a Work sheet in Excel, use page setup andprint features	Format Excel sheet, Insert headers & footers and print	a. Shading alternate rows of data b. Adding currency and percentage symbols c. Changing height of a row and width of a column d. Changing data alignment e. Inserting Headers and Footers f. Set Print Options and Printing.
22.	Develop lab report formats of respective discipline	Use Headers/Footers/Page Numbers for preparing reports	Creating Lab reports using MSExcel
23.	Get familiarized with Ribbon layout &features Of PowerPoint.	Access required options in the toolbar	Explore and use various options inPower Point a. Home b. Insert c. Design d. Animation e. Slideshow f. View g. Review

24.	Create a simple Power Point Presentation	a. Create simple Power Point presentation with photographs/ ClipArt and text boxes b. Use bullets option	a. Inserting a New Slide into PowerPoint b. Changing the Title of a Power Point Slide c. Using Bullets in PowerPoint d. Adding an Image to a Power Point Slide e. Addinga Textbox to a PowerPointslide
25.	Set up a Master Slide in PowerPoint and add notes	a. Setup Master slide and format b. Add notes to master slide.	a. Creating a PowerPoint Design Template b. Modifying themes c. Switching between Slide master view and Normal view d. Formatting a Design Template for Master Slide e. Adding a Title Slide to a Design Template f. Using the Slide Show g. Adding Notes to a Power Point Presentation slide
26.	Insert Text and Objects	a. Insert Text and Objects. b. Use 3d features	a. Inserting Text and objects b. Setting Indents and linespacing c. Inserting pictures/clipart d. Formatting pictures e. Inserting shapes and wordart f. Using 3d features to Arrange objects
27.	Create Flow Charts /Organizational Charts	Create organizational charts and flow charts using smart art	a. Creating a Flow Chart in PowerPoint b. Grouping and Ungrouping Shapes c. Use smart art
28.	Insert Tables	Insert tables and format	a. Using Tables in PowerPoint b. Formatting the Table Data c. Changing Table Background
29.	Insert Charts/ Graphs	Create charts and Bargraphs, Pie Charts and format.	a. Creating 3D Bar Graphs in PowerPoint b. Working with the Power Point Datasheet c. Formatting a PowerPoint Chart Axis

			d. Formatting the Bars of a Chart e. Creating PowerPoint Pie Charts f. Using Pie Chart Segments g. Creating 2D Bar Charts in PowerPoint h. Formatting the 2D Chart i. Formatting a Chart Background
30.	Insert audio & video, Hyperlinks in a slide and Add narration to the slide	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide. c. Use hyperlinks to switch to different slides and files	a. Inserting sounds in the slide and hide the audio symbol b. Adjusting the volume in the settings c. Inserting video file in the format supported by Power Point inaslide d. Using automatic and on click options e. Adding narration to the slide Insert Hyperlinks
31.	Create Animation effects	Add animation effects	a. Applying transitions to slides b. Using special animation effects like Entrance, Emphasis, Motion Paths & Exit as per requirement.
32.	Reviewing presentation	a. Use Spell and Grammar check feature b. Setup slideshow c. Add timing to theslides d. Setup automatic slide show	a. Checking spelling and grammar b. Previewing presentation c. Setting up slideshow d. Setting up resolution e. Using Rehearse Timing feature in PowerPoint f. Using PowerPoint Pen Tool During slideshow g. Saving h. Printing presentation Slides as Hand- out
33	Familiarizing with AI Tools	Introductions of AI tools and their applications. Understand the basic use cases and functionality of AI tools (like ChatGPT, Google Gemini, Teachable	a) Grasping the concept of Artificial Intelligence and how tools mimic human thinking or behavior. b) Identifying and interacting with AI tools such as: ChatGPT (natural language

		Machine, etc.).	processing), Google Teachable Machine (image/audio classification), DALL·E / Bing Image Creator (AI art), Grammarly / Quillbot (AI-based writing assistants).
34	Usage of ChatGPT	a) Introduction to ChatGPT, an AI-powered conversational assistant. b) To explore ChatGPT's capabilities in answering questions, generating content, and solving problems.	a) Operating the ChatGPT interface (web or app), input prompts, and interpret outputs. b) Using ChatGPT to generate summaries, ideas, code snippets, explanations, emails, etc. c) Evaluating the relevance and accuracy of ChatGPT's responses.
35	Object identification using AI Tools based on CNN,YOLO,SSD,R-CNN	a. Get awareness about object detection techniques using AI. b. To explore how AI tools based on CNN, YOLO, SSD, and R-CNN detect and classify objects in images/videos.	a) Differentiating object detection from image classification. b) Using web-based AI tools or platforms that demonstrate object detection (e.g., Teachable Machine, Roboflow, Edge Impulse, Hugging Face Demos). c) Observing and comparing the speed, accuracy, and bounding box behavior of different models.
36	Paraphrase text using AI Tools(PEGASUS,GPT,T5)	a. Get awareness about AI-powered text paraphrasing techniques. b. To explore the usage and functioning of transformer-based models like PEGASUS, GPT, and T5	a) Recognizing of Natural Language Processing (NATURAL LANGUAGE PROCESSING) tasks and how transformer models like PEGASUS, GPT, and T5 can be used. b) Using AI tools to generate reworded versions of sentences or paragraphs while

			retaining the original meaning. c) Interacting with user-friendly interfaces like: • Hugging Face demos • ChatGPT • Quillbot • Parrot.ai
37	Text-to-Image Generation using AI Tools (DALL-E, MIDJOURNEY)	a) Get awareness about text-to-image generation using advanced AI models. b) To explore the usage of tools like DALL·E and Mid journey convert text prompts into realistic or artistic images.	a. Learning usage of how AI models generate visual content from natural language prompts. b. Formulating effective, clear, and creative text prompts to generate meaningful images. c. Enhancing creative thinking by translating ideas into visual representations using AI. d. Analyzing and comparing output quality, style, and relevance between DALL·E and Midjourney.
38	Voice Command Simulation using AI Tools (SPEECH-TO-TEXT)	Get awareness about Speech-to-Text (STT) technology and its role in AI-powered voice recognition systems.	a. Using AI tools to generate text from speech. b. Reading prompts and commands to analyze how accurately the tool transcribes voice. c. Using voice to simulate commands such as opening files, dictating emails, or interacting with virtual assistants.
39	Usage of ML Tools	a) To use ML tools for suitable real-world applications b) To use popular ML tools and platforms through simple, hands-on demonstrations.	a. Understanding key ML terms like dataset, training, testing, classification, prediction, and accuracy. b. Learning to use beginner-friendly ML tools such as: • Teachable Machine by Google (image/audio recognition) • Microsoft Lobe (no-code image classification) • Weka (GUI-based ML

			toolkit) • IBM Watson Studio (visual data workflows)
40	Usage of Quantum Computing Tools	To explore and interact with quantum computing simulation tools and platforms.	a. Understanding key terms: Qubit, Superposition, Entanglement, Quantum Gate, Quantum Circuit. b. Navigate and use beginner-friendly quantum computing tools: • IBM Quantum Experience (IBM Q / Qiskit) • Microsoft Quantum Development Kit • Quirk (online quantum circuit simulator) • Quantum Playground by Google
41	To familiarize with quantum bits (qubits) using Dirac notation	a) To introduce the concept of a qubit as the fundamental unit of quantum information. b) To understand the representation of qubits using Dirac (bra-ket) notation.	• Identify and interpret the basic qubit states: • $\|0\rangle = \begin{bmatrix}1\\0\end{bmatrix}$ • $\|1\rangle = \begin{bmatrix}0\\1\end{bmatrix}$ • Understand that a qubit can exist in a **superposition**: • $\|\psi\rangle = \alpha\|0\rangle + \beta\|1\rangle$, where α and β are complex numbers and $\|\alpha\|^2$ a) Learn how to write and read quantum states using the ket ($\|\rangle$) and bra ($\langle\|$) notations. b) Understand the purpose of $\langle\psi\|$ and how it represents a dual vector in quantum mechanics.
42	To familiarize the behavior of single and multiple qubit gates.	To understand the concept of quantum gates and their role in quantum circuits.	a) Recognize the function and matrix representation of: • Single-qubit gates: ○ Pauli-X (NOT): flips $\|0\rangle \leftrightarrow \|1\rangle$ ○ Hadamard (H): creates superposition ○ Pauli-Z: applies a phase flip

			• Multi-qubit gates: o CNOT: flips target qubit based on control o Toffoli (CCNOT): controlled-controlled NOT o SWAP: exchanges the states of two qubits
43	To familiarize with Qubit as a Coin / Spin Analogy	a) To introduce the concept of a qubit using intuitive physical analogies. b) To help students understand quantum superposition through the coin toss or spin-½ particle analogy.	a. Relate a qubit in superposition to a coin spinning in the air: • Classical coin: heads (0) or tails (1) • Spinning coin: both until observed (|0⟩ and |1⟩ at once) b.Use spin analogy: a particle with spin "up" (|0⟩) or "down" (|1⟩), or in between (superposition)

REFERENCES

1. Fundamentals of computers -- V. Rajaraman, Niharika Adabala, 7th Edition, PHI Publication.
2. Introduction to computers -- Peter Norton, 7th Edition, McGrawHill.
3. Microsoft Office (Office 2021 & Microsoft 365) – Joan Lambert, Curis Frye by Pearson Publication.
4. Introduction to MS office by Indira Gandhi National University.
5. Emerging technologies for engineers -- Reema Thareja, Wiley Emerging Technology series.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 12
Unit test-2	From 13 to 32
Unit test-3	From 33 to 43

III Semester

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III SEMESTER

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Semester	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM301T	Data Structures using Python	6	-	N	90	4	3	30	70	100
26AM302T	Database Management Systems	6	-	N	90	4	3	30	70	100
26AM303T	Operating Systems	6	-	N	90	4	3	30	70	100
ELECTIVE COURSES										
26AM304E	Engineering Mathematics-II	3	-	N	45	2	3	30	70	100
26AM305E	Digital Electronics									
26AM306E	Computer Organization									
AUDIT COURSE										
26AM307A	Multimedia	2	-	Y	30	-	-	-	-	-
PRACTICAL COURSES										
26AM308L	Data Structures using Python Lab	-	6	N	90	2	3	40	60	100
26AM309L	DBMS Lab	-	6	N	60	2	3	40	60	100
26AM310L	LINUX Practicals	-	4	Y	60	1.5	3	40	60	100
26AM311C	Student Centric Activities	-	3	N	45	0.5	-	-	-	-
	TOTAL	**23**	**19**		**630**	**20**	-	**240**	**460**	**700**
Note: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games										

Note 2: 26AM304E is common elective to all programmes.

26AM301T, 308L is common with CME/CCB/CCN/CAI
26AM302T, 305E, 309L, 310L is common with CME/CCB/CCN/CAI/CIOT
26AM307A is common with CME/CCB/CAI
26AM303T, 306E is common with CME/CCB/CCN/CAI

DATA STRUCTURES USING PYTHON

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
C26AM301T	DATA STRUCTURES USING PYTHON	6	90	30	70	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Weightage of Marks	No.of Short Questions	No.of Essay Questions	COs Mapped
1.	Introduction to Object Oriented Programming(OOP)	15	14	2	1	CO1
2.	Introduction to Data Structures	20	22	2	2	CO2
3.	Linear Data structure-Linked lists	20	25	3	2	CO3
4.	Linear Data structure –Stacks	15	14	2	1	CO4
5.	Queues and Trees	20	25	3	2	CO5
Total Periods		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)To know the fundamentals of OOP

(ii)To know the various types of Data Structures

(iii)To familiarize with the representation of Data Structures

(iv)To use various Data structures in organizing data

(v)To reinforce theoretical concepts by writing relevant programs

COURSE OUTCOMES

CO1	AM301.1	Know about Object oriented programming concepts
CO2	AM301.2	Illustrate various techniques of sorting and searching
CO3	AM301.3	Explain the operations on Various Linked Lists
CO4	AM301.4	Apply the operations of Stack.
CO5	AM301.5	Explain the operations of Queues and Apply Binary tree traversal techniques.

LEARNING OUTCOMES

1.Introduction to Object Oriented Programming(OOP)

1.1 Define OOP
1.2 Differentiate between Procedural Oriented Programming (POP) and Object-Oriented Programming (OOP)
1.3 List and Explain the core principles of OOP
1.4 State the importance of Data Abstraction and Encapsulation
1.5 Describe Inheritance and Polymorphism
1.6 Define Class and Object in Python
1.7 Know the creation of classes in Python
1.8 Know the creation of objects (instances) in Python
1.9 State the importance of __init__ method (constructor) and self
1.10 Explain Method Overloading
1.11 Explain Method Overriding
1.12 Explain various types of inheritance

2. Introduction to Data Structures

2.1 Define Data structure
2.2 List various types of Data Structures
2.3 Explain Linear Data Structures
2.4 Explain Non-Linear Data Structures
2.5 Know about Time and Space complexities
2.6 List and Explain Abstract Data Types
2.7 List and Explain Built-in data structures
2.8 Various Sorting Techniques
2.8.1 Define Sorting
2.8.2 List the methods of Sorting
2.8.3 Explain Bubble Sort
2.8.4 Explain Selection Sort
2.8.5 Explain Insertion Sort
2.8.6 Explain Quick Sort
2.8.7 Explain Merge Sort
2.9 Various Searching Techniques
2.9.1 Define Searching
2.9.2 List types of Searching Techniques
2.9.3 Explain Linear Search with Recursion and without Recursion
2.9.4 Explain Binary Search with Recursion and without Recursion

3. Linear Data structure: Linked lists

3.1 Explain arrays in Python
3.2 Explain the following for Singly Linked List
  3.2.1 Creation
  3.2.2 Perform insertion, deletion and traverse operations
  3.2.3 Perform search and replace an element
3.3 Explain the following for Doubly Linked List
  3.3.1 Creation
  3.3.2 Perform insertion, deletion, and traverse operations
  3.3.3 Perform search and replace an element
3.4 Explain the following for Singly Circular List
  3.4.1 Creation
  3.4.2 Perform insertion, deletion, and traverse operations
  3.4.3 Perform search and replace an element
3.5 Explain the following for Doubly Circular List
  3.5.1 Creation
  3.5.2 Perform insertion, deletion and traverse operations
  3.5.3 Perform search and replace an element
3.6 Differentiate between arrays and linked lists.

4. Linear Data Structures-Stacks

4.1 Define Stack
4.2 Explain the push, pop and display operations of a Stack
  4.2.1 Explain implementation of a Stack using built-in functions in python
  4.2.2 Explain implementation of a Stack without using built-in functions.
4.3 Explain Linked List implementation of a Stack with various operations.
4.4 List the applications of Stacks
4.5 Convert Infix expression to Postfix expression
4.6 Explain the steps for Conversion of Infix expression to Postfix expression with program
4.7 Explain the steps for Evaluating Postfix expression with program
4.8 Evaluate Postfix expression

5. Queues and Trees

5.1 Define Queue
5.2 Explain the insertion, deletion and display operations on Queues
5.3 Explain the implementation of a Queue using built-in functions in python
5.4 Explain the implementation of a Queue without using built-in functions.
5.5 Explain Linked List implementation of a Queue with various operations.
5.6 Explain the implementation of a Circular Queue.
5.7 List the application of Queues
5.8 Non-Linear Data Structures-Trees:
  5.8.1 Define a Tree
  5.8.2 Know about Root, Edge, Parent, Child, Siblings, Leaf, Internal nodes, Degree, Level, Height, Depth, Path, Sub tree, Forest.
  5.8.3 Define Binary Tree
  5.8.4 Differentiate between General Tree and Binary Tree.
  5.8.5 Define Binary Search Tree
  5.8.6 Perform various traversals on Binary Search Trees
  5.8.7 Construct a Binary Tree using In-order and Preorder Traversals
  5.8.8 Construct a Binary Tree using In-order and Post-order Traversals
  5.8.9 Perform insertion, deletion, search and various traversal operations

on a Binary Search Tree.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	1	1	2	1	3
CO2	2	2	1	2	2			2	2	2
CO3	2	3	1	2	3			2	1	2
CO4	2	2	1	1	1			2	3	1
CO5	2	2	1	2	2	1	1	2	2	3
Average	2.2	2.2	1	2	2	1	1	2	2	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1. Concepts of Object Oriented Programming: Introduction to OOP – difference between procedural oriented programming (POP) and object oriented programming (OOP) – core principles of OOP – Abstraction and Encapsulation – inheritance and Polymorphism – class and object in Python – creation of classes in Python – creation of objects in Python – __init__ method (constructor) and self – Method Overloading – Method Overriding – various types of inheritance.

2. Introduction to Data Structures: Data structure – types of Data Structures – Time and Space complexities – Data Types and Abstract Data Types – Built-in data structures such as Lists, Tuples, Dictionaries, Sets – sorting techniques – Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort – Searching Techniques: linear and Binary.

3. Linear Data Structures – Linked Lists: Linked Lists – Types – Singly Linked Lists – Create, insert, delete, sort, search and replace an element in a linked list – Doubly Linked Lists – Create, insert, delete, sort, search and replace an element in a linked list – Define terms singly circular and doubly circular linked lists.

4. Linear Data Structures – Stacks: Stacks – Implementation of stacks – application of stacks – converting infix to postfix expression and postfix expression evaluation.

5. Queues and Trees: Queues – Implementation of queues – Application of queues – know about Circular queues and Priority queue. Trees – Trees Terminology – Binary trees – Representation – Binary Search Tree – various operations – Tree traversals.

REFERENCES

1. "Data Structures and Algorithms in Python" by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser
2. "Data Structures and Algorithmic Thinking with Python" by Narasimha Karumanchi
3. "Hands-On Data Structures and Algorithms with Python" by Dr. Basant Agarwal
4. https://www.geeksforgeeks.org/dsa/python-data-structures-and-algorithms/

5. https://www.w3schools.com/python/python_dsa.asp

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.3
Unit test-2	From 3.4 to 5.8.8

DATA BASE MANAGEMENT SYSTEMS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
C26AM302T	DATA BASE MANAGEMENT SYSTEMS	6	90	30	70	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Weightage of Marks	No.Of Short Questions	No.Of Essay Questions	COs Mapped
1.	Concepts of DBMS & RDBMS	20	22	2	2	CO1
2.	Concepts of SQL	20	25	3	2	CO2
3.	Basics of PL/ SQL	20	25	3	2	CO3
4.	Advance PL/SQL	15	14	2	1	CO4
5.	Concepts of NoSQL & MongoDB.	15	14	2	1	CO5
Total Periods		90	100	12	08	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)To know the fundamentals of DBMS

(ii)To familiarize insert, retrieve, update, delete data in database

(iii)To familiarize programming skills for insert, retrieve, update, delete data in database

COURSE OUTCOMES

CO1	AM302.1	Describe fundamentals, types and Overall structure of DBMS
CO2	AM302.2	Apply SQL commands to create, retrieve, update, delete data from the Relational data bases.
CO3	AM302.3	Describe PL/SQL programming constructs, control statements and sub programs.
CO4	AM302.4	Apply cursors, triggers and Exception handling concepts

CO5	AM302.5	Use NOSQL database concepts and MongoDB data base concepts in designing database Schema.

LEARNING OUTCOMES

1.0 Concepts of DBMS &RDBMS

1.1 Define Database Management System (DBMS)
1.2 List the advantages of DBMS
1.3 Explain Database Abstraction, Data Independence
1.4 Define Instance and Schema
1.5 Explain Data Models.
1.6 Define Database languages DDL, DML, TCL
1.7 Explain Database Administrator, Users and Database System Architecture with diagram.
1.8 Define Entity, Entity sets, Relationship, Relationship sets, Super Key , Candidate Key and Primary Key, Foreign Key
1.9 Explain Mapping Cardinalities.
1.10 List the symbols used in ER model.
1.11 Know The Entity-Relationship Model.
1.12 Reduce the ER-diagrams to tables
1.13 Explain Generalization, Specialization & Aggregation.
1.14 Explain Functional Dependencies, Normalizations– 1 NF, 2 NF and 3NF

2.0 Concepts of SQL

2.1 Explain SQL and benefits of SQL.
2.2 Explain literals & different data types like character, number, long, date, raw and long raw etc.
2.3 Illustrate the comments within SQL Statement
2.4 Explain SQL Operators
2.5 Describe Data Definition Language commands CREATE, ALTER and DROP.
2.6 Explain integrity constraints through creating a table and altering table.
2.7 Describe Data Manipulation Language commands INSERT, UPDATE and DELETE
2.8 Explain SELECT statement with WHERE, ORDER BY, GROUP BY and HAVING clauses with examples
2.9 List and explain singlerow(Number, character, date and conversion) functions
2.10 List and Explain group functions
2.11 Explain Transaction Control Commands COMMIT, SAVEPOINT, ROLLBACK, GRANT, and REVOKE.
2.12 Explain Subqueries with examples
2.13 Explain Joins (Equi Join, Non-Equi Joins, Inner Join, Outer Join, cross join and Self join) with syntax and examples.

3.0 PL/SQL

3.1 Explain PL/SQL Block structure.
3.2 List the features of PL/SQL
3.3 Explain the data types of PL/SQL
3.4 Declaration of variables
3.5 Explain PL/SQL tables and user defined records.
3.6 Explain Input/Output statements
3.7 Explain decision making statements and illustrate
3.8 Explain looping statements and illustrate
3.9 Define procedure and function

3.10 Describe the advantages of subprograms.
3.11 Explain handling procedures and functions with example programs.
3.12 Explain the parameter modes in PL/SQL with examples (in , out and in out)

4.0 Advanced PL/SQL and Exception Handling

4.1 Define cursor.
4.2 Classify cursors
4.3 Explain implicit cursor with example
4.4 Explain explicit cursors with example
4.5 Define trigger
4.6 List Advantages of triggers
4.7 Explain database triggers.
4.8 Define the term Exception handling
4.9 List the advantages of Exception handling
4.10 List various types of Exception handling
4.11 Illustrate built-in Exceptions
4.12 Illustrate User defined Exceptions

5.0 Concepts of NoSQL & MongoDB.

5.1 No SQL
- 5.1.1 List features of NOSQL
- 5.1.2 Compare RDBMS and NoSQL
- 5.1.3 List the Advantages and Disadvantages of NoSQL
- 5.1.4 Know about the ACID and BASE system.
- 5.1.5 Compare ACID and BASE properties
- 5.1.6 NoSQL types
  - 5.1.6.1 Key-value stores,
  - 5.1.6.2 Column-oriented,
  - 5.1.6.3 Graph oriented Databases
  - 5.1.6.4 Document oriented Databases.

5.2 MongoDB
- 5.2.1 What is MongoDB
- 5.2.2 List the advantages of MongoDB
- 5.2.3 Explain the Creation, Dropping of Collection in MongoDB
- 5.2.4 Explain the creation and Dropping of Database in MongoDB
- 5.2.5 Explain the Datatypes of MongoDB.
- 5.2.6 Explain Inserting Document, Query Document, Update Document, Deleting Document & Sorting Document.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	2	3	1
CO2	2	3	3	3	3	3	3	2	1	2
CO3	3	2	2	2	1	3	2	2	3	1
CO4	1	3	3	2	2	3	3		3	3
CO5	3	1	3	1	3	3	2	2	2	3
Average	2.4	2.2	2.6	2	2.2	3	2.4	2	2.4	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1. Concepts of DBMS & RDBMS

Define DBMS –Advantages of DBMS - Data Abstraction – Data Models – Instance and Schema – Data Independence – Data Definition Language - Data Manipulation Language – Database Administrator - Database Users – Database system Structure.

Entities – Relationships and Relationship sets – Mapping constraints – Entity – Relationship Diagram – Super key , Candidate key and Primary key - Reducing E- R Diagrams to tables – Generalization and Specialization – Aggregation – Functional Dependencies - Normal forms 1NF , 2 NF , 3 NF

2. Concepts of SQL

Benefits of SQL Literals – Text –Integer – Number – Data types – Character data types – Number data type – Long data type –Raw and Long Raw data types – comments within SQL statements

SQL Operators –DDL Commands – Integrity Constraints – DML Commands - functions – single row functions – numeric functions – character functions – date functions – conversion functions – other functions- Group functions. Transaction control commands-Sub queries - Joins.

3. Basics of PL/SQL

SQL features –SQL Block architecture – Data types – Declaration - PL/SQL tables – user defined records.

Conditional control- IF statement --Loop Statements sub programs- Advantages of sub programs – procedures – Functions RETURN statement – parameter modes

4. Advanced PL/SQL

Cursors – Implicit cursor – Explicit cursor – Triggers – Advantages - creating trigger – raising trigger – Data base triggers

5. NoSQL& Basics of MongoDB

Introduction to NoSQL - Features – Comparison of RDBMS and NoSQL- Advantages and Disadvantages of NoSQL - BASE system – ACID System – Comparison of ACID and BASE properties – Classification of NoSQL as Key-value stores, Column-oriented, Graph and Document oriented Databases- Introduction to MongoDB - advantages of MongoDB - MongoDB - Installation of MongoDB - Creation of Database - Dropping of Database - Creation of Collection - Dropping of Collection - Data types of MongoDB -- Inserting Document - Query Document - Updating Document – Deleting Documents - Sorting Documents

REFERENCES

1. Database System Concepts -- Silberschatz, Henry F. Korth, S. Sudarshan
2. Oracle Database 11g :The Complete Reference - Kevin Loney
3. Understanding ORACLE -- James T. Peary & Joseph G. Laseer.
4. RDBMS with ORACLE -- Rolland.
5. ORACLE series books of ORACLE Press – TMH.
6. Starting out with Oracle – Covering Databases- John Day &CraigVan
7. PL/SQL, Developer Tools & DBA -- Slyke, Dreamtech

8. www.nosql-database.org
9. www.mongodb.org
10. https://www.guru99.com/nosql-tutorial.html#5

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.5
Unit test-2	From 3.6 to 5.2.5

OPERATING SYSTEMS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM303T	OPERATING SYSTEMS	6	90	30	70	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Weightage Allocated	No. of Short Questions	No. of Essay Questions	COs Mapped
1	Introduction to Operating system	15	14	2	1	CO1
2	Process management	20	22	2	2	CO2
3	Synchronization & Deadlocks	20	25	3	2	CO3
4	Memory management	20	25	3	2	CO4
5	Disk scheduling and File management	15	14	2	1	CO5
Total Periods		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able	
(i)	To know about the basics of Operating Systems.
(ii)	To familiarize with process management and Scheduling algorithms.
(iii)	To familiarize with Synchronization and deadlock techniques.
(iv)	To understand various Memory management techniques.
(v)	To familiarize with File management.

COURSE OUTCOMES

CO1	AM303.1	Explain basic concepts of Operating System
CO2	AM303.2	Explain process scheduling algorithm
CO3	AM303.3	Describe Semaphores, solving problems using semaphores, synchronization and Deadlock handling techniques
CO4	AM303.4	Use memory management techniques and page replacement algorithms
CO5	AM303.5	Use Disk scheduling algorithms and File allocation methods with respect to different operating systems

LEARNING OUTCOMES

1.0 Introduction to operating systems

1.1 Define an operating system

1.2 Discuss history of operating system

1.3 Distinguish spooling and buffering

1.4 Explain the concepts

- 1.4.1 Multiprogramming
- 1.4.2 Timesharing Systems
- 1.4.3 Distributed Systems
- 1.4.4 Real time systems

1.5 Differentiate between distributed and real time systems

1.6 Describe multiprocessor systems

1.7 Describe the operating system components

1.8 Discuss operating system services

1.9 Define system call with an example.

1.10 List and explain different types of system calls

1.11 Define single user, multi user operating system structure

2.0 Process management

2.1 Define process and process control block

2.2 Explain process state diagram

2.3 Describe process creation and termination

2.4 Discuss the relation between processes

2.5 Define Thread and describe multithreading

2.6 Explain scheduling concepts

2.7 Describe scheduling queues and schedulers

2.8 Explain CPU scheduling and scheduling criteria

2.9 Explain various scheduling algorithms

- 2.9.1 FCFS
- 2.9.2 SJF
- 2.9.3 Round Robin
- 2.9.4 Priority
- 2.9.5 Multilevel Scheduling

3.0 Synchronization & Deadlocks

3.1 Describe semaphores

3.2 Explain semaphores to solve Producer consumer problem

3.3 Explain semaphores to solve Readers Writers Problem

3.4 Explain inter process communication

3.5 Define Deadlock

3.6 State the necessary conditions for arising deadlocks

3.7 State various techniques for deadlock prevention

3.8 Discuss Deadlock Detection and Avoidance strategies.

3.9 Describe the process of recovering from deadlock

3.10 Explain Dining philosopher's problem

4.0 Memory management

4.1 Describe briefly address binding, dynamic loading, dynamic linking

4.2 Define overlays

4.3 Describe swapping

4.4 Explain single partition allocation

4.5 Explain multiple partition allocation

4.6 Explain the concept of fragmentation

4.7 Explain paging concept

4.8 Explain how logical address is translated into physical address

4.9 Explain segmentation and segmentation with paging

4.10 Define virtual memory techniques

4.11 Explain demand paging

4.12 Describe page replacement

4.13 Discuss page replacement algorithms

4.13.1 FIFO

4.13.2 LRU

4.13.3 Optimal

4.14 Describe the concept of thrashing

4.15 Explain working set model and page fault frequency

5.0 Disk scheduling and File management

5.1 List and explain various disk performance parameters

5.2 Disk scheduling policies

5.2.1 FCFS

5.2.2 SSTF

5.2.3 SCAN

5.3 Define file management

5.4 List and explain various file operations

5.5 List and explain various access methods

5.6 List and explain various allocation methods

5.6 List and explain directory structure

5.7 Explain disk organization and structure

CO-PO/PSO MAAPPIG

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	3	3	3	2	2
CO2	3	3	3	2	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	2	2	2	3	3	3	3	3
Average	3	2.8	2.6	2.2	2.6	3	3	2.8	2.4	2.6

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1. Introduction to operating systems

Operating System –Evolution of operating system-Types of Operating Systems - Multi Programming and Time Sharing - Distributed and Real time Systems - spooling and buffering - Multi processor systems-Components of Operating Systems - operating System Services - system Calls - single User and Multi user operating System Structure.

2. Process management

Processes - Sequential Processes - Process State Diagram - Process Control Block - Process Creation and Termination - Relations between Processes - Threads and Multi Threading - Scheduling Concepts - Schedulers - CPU scheduling and Scheduling criteria - scheduling algorithms.

3. Synchronization & Deadlocks

Semaphores –Application of semaphores-Producer Consumer problem- Readers-writers problem – Inter Process Communications - monitors- Deadlocks – Necessary conditions of deadlock - deadlock prevention - deadlock detection - deadlock avoidance-Deadlock Recovery-Dining philosopher problem.

4. Memory management

Address binding -Dynamic Loading- dynamic linking-overlays-swapping- memory allocation-fragmentation-paging-segmentation- Address Translation-segmentation with paging-Benefits of virtual memory - virtual memory techniques - demand paging - page replacements - page replacement algorithms – thrashing.

5.Disk scheduling and File management

Disk performance parameters - Disk scheduling policies – Introduction to file systems - File management-File Operations - Access methods - Directory structure organization - File Protection.

REFERENCES

1. Operating Systems -- Silber Schatz and Galvin
2. Operating Systems -- William Stallings, PHI
3. Operating Systems -- Dietel and Dietel
4. Operating Systems -- Dhamdhere (TMH)
5. Advanced Operating Systems -- Tanenbaum

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.3
Unit test-2	From 3.4 to 5.7

ENGINEERING MATHEMATICS-II

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM304E	ENGINEERING MATHEMATICS-II	3	45	30	70	2

TIME SCHEDULE

S.No.	Chapter/Unit title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs mapped
Unit – I: Applications of Definite Integrals						
1	Area of curves	4	7	1	½	CO1
2	Volumes of Solids of Revolution	3	4	0	½	CO1
3	Mean and RMS values	4	11	1	1	CO1
4	Numerical Integration	4	8	0	1	CO1
Unit – II: Differential Equations						
5	Introduction to Differential Equations	4	6	2	0	CO2
6	Solution of first order differential equations	6	14	2	1	CO2
7	Solution of second order homogeneous andnon-homogeneous linear differential equations	5	14	2	1	CO2
Unit – III: Probability and Statistics						
8	Probability	5	14	2	1	CO3
9	Measures of Dispersion	6	14	2	1	CO3
10	Correlation	4	8	0	1	CO3
	Total	45	100	12	8	
			Marks	36	64	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)	To apply integral techniques to solve various engineering problems.
(ii)	To solve first-order and first-degree differential equations and second-order homogeneous and non-homogeneous linear differential equations.
(iii)	To analyse data using the concepts of probability and statistical techniques.

COURSE OUTCOMES

CO1	AM304.1	Apply definite integrals in engineering applications.
CO2	AM304.2	Solve first-order and first-degree differential equations and second-order homogeneous and non-homogeneous linear differential equations.
CO3	AM304.3	Apply various probability and statistical techniques for data analysis.

LEARNING OUTCOMES

C.O.1 Apply definite integrals in engineering applications.

L.O.1.1 Find the area bounded by a curve and axes.
1.2 Determine the volumes of solids of revolution along the x-axis.
1.3 Obtain the Mean and R.M.S values of simple functions.
1.4 Solve the problems of areas using Numerical Integration.

C.O.2 Solve first-order and first- degree differential equations and second-order homogeneous and non-homogeneous linear differential equations.

L.O.2.1 Define a Differential equation, its order and degree.
2.2Find order and degree of a given differential equation.
2.3Form a differential equation by eliminating arbitrary constants.
2.4 Solve the first order and first degree differential equations by variables separable method.
2.5Solve linear differential equation of the form $\frac{dy}{dx} + \mathrm{P}y = \mathrm{Q}$, where P and Q are functions of x only or constants.
2.6 Solve Differential equations of the type $(a\mathrm{D}^2 + b\mathrm{D} + c)y = 0,$ where $a \neq 0, b$ and c are real numbers.
2.7 Define complementary function, particular integral and general solution of a non-homogeneous linear differential equation of second order with constant coefficients.
2.8 Describe the method of solving $f(\mathrm{D})y = e^{ax},$ where $f(\mathrm{D})$ is a polynomial of second order.

C.O. 3 Apply various probability and statistical techniques for data analysis.

L.O.3.1Recall the basic probability principles.
3.2 State addition theorem of probability for two mutually exclusive andexhaustive events.
3.3 Solve simple problems on addition theorem.
3.4 Explain conditional event and conditional probability.
3.5 Solve simple problems on conditional probability.
3.6 Explain dependent, independent events and state multiplication theorem.
3.7 Solve simple problems on multiplication theorem.
3.8 Recall the measures of central tendency.
3.9 Explain the significance of measures of dispersion to determine the degree of heterogeneityof the data.
3.10 Find the measures of dispersion, Range, Mean Deviation and Standard Deviation forungrouped data.
3.11 Explain the merits and demerits of these measures of dispersion.
3.12 Explain bivariate data.
3.13 Explain the concept of covariance and correlation between two variables.

3.14 Find Spearman's rank correlation coefficient.

CO/PO – MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3				3	3	1
CO2	3	1	1	1				3	1	1
CO3	3	3	3	3				3	3	3
Avg.	3	2.33	2.33	2.33				3	2.33	1.66

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

ForPO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted

For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates inreputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

COURSE CONTENT

1. Applications of Definite Integrals:
Area bounded by a curve and axes. Volume of Solids of Revolutions.Mean and RMS values of a function on a given interval.Numerical Integration.

2.Differential Equations:
Definition of a differential equation, Order and degree of a differential equation, Formation of differential equations. Solutions of differential equations of first order and first degree using variables separable method and linear differential equation of the type $\frac{dy}{dx} + Py = Q$. Solutions of homogenous and non-homogeneous linear differential equations of second order with constant coefficients.

3. Probability & Statistics:
Addition theorem of probability, conditional probability, dependent and independent events with multiplication theorem. Measures of dispersion, range, mean deviation and standard deviation of ungrouped data, merits and demerits. Bivariate data, correlation, Spearman's rank correlation coefficient.

TEXTBOOK

1. Engineering Mathematics-II, a textbook for second year third semester diploma courses, prepared & prescribed by SBTET, AP.

REFERENCES

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. Schaum's Outline: Introduction to Probability and Statistics, Seymour Lipschutz& John J.Schiller.
4. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

SUGGESTED E-LEARNING REFERENCES

1. https://www.khanacademy.org/
2. https://www.wolframalpha.com/
3. https://onlinecourses.nptel.ac.in/
4. http://tutorial.math.lamar.edu/

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning Outcomes to be Covered
Unit Test-1	From L.O 1.1 to L.O 2.5
Unit Test-2	From L.O 2.6 to L.O 3.14

DIGITAL ELECTRONICS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM305E	Digital Electronics	3	45	30	70	2

TIME SCHEDULE

S. No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Number systems		14	2	1	CO1
2.	Logic Gates, Boolean Algebra and Basic Combination circuits		22	2	2	CO2
3.	Flip-Flops		25	3	2	CO3
4.	Counters and registers		25	3	2	CO4
5.	Additional Combinational circuits		14	2	1	CO5
	Total Periods	45	100	12	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able	
(i)	To acquire the basic knowledge of digital logic levels and apply of knowledge to understand digital logic circuits.
(ii)	To prepare students to perform the analysis and design of various digital electronic circuits.

COURSE OUTCOMES

CO1	AM305.1	Explain the structure of various number systems.
CO2	AM305.2	Describe fundamental concepts and techniques used in digital electronics, the switching algebra theorems and logicgates and apply them to design logic circuits using K-Maps
CO3	AM305.3	Explain operation of flip flops
CO4	AM305.4	Design the counting circuits, Registers using flipflop operations.
CO5	AM305.5	Explain design and implement various sequential circuits, combinational circuits

LEARNING OUTCOMES

1.0 Number systems

1.1 List the various number systems used in digital Computer.
1.2 Explain Decimal number system
1.3 Explain Binary number system
1.4 Explain octal number system
1.5 Explain Hexadecimal number system
1.6 Convert decimal number to other base conversion.
- 1.6.1 Decimal to Binary
- 1.6.2 Decimal to Octal
- 1.6.3 Decimal to Hexadecimal

1.7 Convert binary number to other base conversion.
- 1.7.1 Binary to Decimal
- 1.7.2 Binary to octal
- 1.7.3 Binary to Hexadecimal

1.8 Convert octal number to other base conversion.
- 1.8.1 Octal to Decimal
- 1.8.2 Octal to Binary
- 1.8.3 Octal to Hexadecimal

1.9 Convert hexadecimal other base conversion.
- 1.9.1 Hexadecimal to Decimal
- 1.9.2 Hexadecimal to Binary
- 1.9.3 Hexadecimal to Octal

1.10 Binary numbers representation.
- 1.10.1 Define Binary numbers representation.
- 1.10.2 List the types of Binary numbers representation.
- 1.10.3 Explain Unsigned binary number representation.
- 1.10.4 Explain Signed binary number representation.

1.11 Binary arithmetic.
- 1.11.1 Illustrate addition of two signed binary numbers.
- 1.11.2 Illustrate subtraction of two signed binary numbers.
- 1.11.3 Illustrate binary multiplication.
- 1.11.4 Illustrate Binary division.

1.12 Binary coded decimal (BCD) coding scheme.
- 1.12.1 Define Binary coded decimal (BCD) coding scheme.
- 1.12.2 List the types of Binary coded decimal (BCD)
- 1.12.3 Draw and explain 8421 code.
- 1.12.4 Draw and explain 2421 code.
- 1.12.5 Draw and explain 8 4-2-1 code.

1.13 Character representation
- 1.13.1 List character representation codes
- 1.13.2 Explain the ASCII codingscheme.
- 1.13.3 Explain the EBCDIC codingscheme.

2.0 Boolean algebra, Logic gates and Basic Combinational Circuits

2.1 Boolean algebra
- 2.1.1 Define Boolean algebra
- 2.1.2 Explain AND, OR, NOT operations with truth tables.
- 2.1.3 Explain the working of EX-OR and EX-NOR operations with truth tables.
- 2.1.4 List the different postulates in Boolean algebra.
- 2.1.5 State De-Morgan's theorems.
- 2.1.6 Prove De-Morgan's theorems using truth tables.
- 2.1.7 Apply De-Morgan's theorems and other postulates of Boolean algebra

to simplify the given Boolean expression.

2.1.8 Generate Boolean expression for given truth table.
- 2.1.8.1 Using Sum-Of-Products(SOP) method
- 2.1.8.2 Using Product-Of-Sums(POS)method

2.1.9 Use K – map to simplify Boolean expression (up to 4 variables).
- 2.1.9.1 Using Two variable K-Map
- 2.1.9.2 Using Three variable K-Map
- 2.1.9.3 Using Four variable K-Map

2.2 Logic Gates
- 2.2.1 Define Logic gate
- 2.2.2 List basic gates
- 2.2.3 Define OR gate
- 2.2.4 Explain OR gate with logic symbol and truth table.
- 2.2.5 Define AND gate
- 2.2.6 Explain AND gate with logic symbol and truth table.
- 2.2.7 Define NOT gate
- 2.2.8 Explain NOT gate with logic symbol and truth table.
- 2.2.9 What is universal gate? List universal gates
- 2.2.10 Define NOR gate
- 2.2.11 Explain NOR gate with logic symbol and truth table.
- 2.2.12 Define NAND gate
- 2.2.13 Explain NAND gate with logic symbol and truth table.
- 2.2.14 Define EX-OR and EX-NOR gates
- 2.2.15 Explain the working of EX-OR and EX-NOR gates with truth tables.
- 2.2.16 Implement AND, OR and NOT gates using NAND gates only
- 2.2.17 Implement AND, OR and NOT gates using NOR gate only.

2.3 Basic Combinational Circuits
- 2.3.1 Define the Half Adder.
- 2.3.2 Explain the function of Half Adder.
- 2.3.3 Draw Half-Adder circuit using an EX- OR and an ANDgate.
- 2.3.4 Define the Full Adder.
- 2.3.5 Explain the function of Full Adder.
- 2.3.6 Construct Full Adder using two Half-Adder and an OR gate
- 2.3.7 Define the parallel Adder
- 2.3.8 Explain the function of parallel Adder using logic symbol.
- 2.3.9 Draw and explain 4-bit parallel adder using full adders.
- 2.3.10 Explain the working of a serial adder with a block diagram.
- 2.3.11 List the advantage and disadvantages of a serial adder
- 2.3.12 List the advantage and disadvantages of a parallel adder.
- 2.3.13 Distinguish between serial adder and parallel adder.
- 2.3.14 Explain the operation of a digital comparator circuit for two 4-bitwords.

3.0 Flip-Flops

3.1 List the details of different logic families.
3.2 Define positive and negative logic levels.
3.3 Define Flip flop
3.4 Draw and explain the basic principle of operation of aFlip-flop.
3.5 Define Latch.
3.6 Explain the working of NAND latch circuit with truth table and Timing diagram
3.7 Explain the working of a NOR latch circuit with truth table and Timing diagram
3.8 Explain with block diagram, waveforms and truth tables the working of RS Flip-flop.
3.9 Explain with block diagram, waveforms and truth tables the working of DFlip-flop.

3.10 Explain with block diagram, waveforms and truth tables the working of JK Flip-Flop.
3.11 Distinguish between synchronous and asynchronous inputs ofa flip- flop
3.12 State the need for a Master-Slave Flip-Flop.
3.13 Explain the working of a Master-Slave flip-flop using suitable circuit diagram and truth table.

4.0 Counters and Registers

4.1 Counters
- 4.1.1 Define Counter
- 4.1.2 List the types of counters.
- 4.1.3 Define the terms Synchronous counter, Asynchronous counter
- 4.1.4 Distinguish between asynchronous and synchronous counters.
- 4.1.5 Draw and explain module-8 ripple counter circuit diagram withwaveforms and truth tables
- 4.1.6 Draw and explain module-10 (decade)Asynchronous counter circuit diagram with waveforms and truth tables
- 4.1.7 Draw and explain module-8 synchronous counter circuit diagram with waveforms and truth tables
- 4.1.8 List the draw backs of ripple counters.
- 4.1.9 Draw and explain the operation of a 4-bit ring counter.
- 4.1.10 List the applications of counter.

4.2 Register
- 4.2.1 Define Register
- 4.2.2 State the need of Register.
- 4.2.3 List the methods of data transfer in register.
- 4.2.4 List the types of Registers
- 4.2.5 Define Serial in – Serial out register, Serial in – Parallel out register,Parallel in – Serial out register, Parallel in – Parallel out register
- 4.2.6 Explain the working of serial in – serial out register with circuit diagram.
- 4.2.7 Explain the working principle of serial in – parallel out register with circuit diagram.
- 4.2.8 Explain the working principle of shift left Register with circuit diagram.
- 4.2.9 Explain the working of shift right registers with circuit diagram.

5.0 Additional Combinational Circuits

5.1 Define the terms Multiplexer and Demultiplexer
5.2 Draw and explain the operation of a 4X1 multiplexer circuitdiagram with truth table.
5.3 Draw and explain the operation of 1X4 Demultiplexer circuitdiagram with truth table.
5.4 List the applications of Multiplexers, Demultiplexers.
5.5 Define the terms Encoder and Decoder.
5.6 Draw and explain the operation of a 4-to-10-linedecoder circuit diagram with truth table.
5.7 Draw and explain the operation of a 8 to 3 encoder circuit diagram with truth table.
5.8 List applications of Decoders, Encoders.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3		2			3	2	3
CO2	3	3	3	2	1	1		3	2	2
CO3	2	1	1	1			1	1	1	3
CO4	2	2	3	1		2	1	2	2	1
CO5	2	2	3	1	1	1	2	3		1
Average	2.4	2.2	2.6	1.25	1.3	1.3	1.3	2.4	1.75	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1. Number Systems: Number Systems, Decimal, Binary, Hexadecimal and Octal codes – Conversion from one number system to another number system – Binary numbers representation – Binary arithmetic – Binary coded decimal (BCD) coding scheme – Character representation codes.

2. Boolean Algebra and Logical Gates: Boolean Algebra – AND, OR, NOT, EX-OR and EX-NOR operations – postulates in Boolean algebra – Boolean theorems, Boolean simplifications of Boolean expressions – Using De-Morgan‘s theorems – Simplify the given Boolean expression – Generate Boolean expression for given truth table – Using K-map to simplify Boolean expression – LOGIC GATES – AND, OR, NOT, EX-OR, EX-NOR, NAND and NOR gates – Implement AND, OR, NOT gates using NAND gates only and NOR gates only – Basic Combinational Circuits – Half adder – Draw Half-Adder circuit using an exclusive OR and an AND gate – Full Adder – Full Adder using two Half-Adder and an OR gate – Parallel Adder – 4-bit parallel adder using full adders – Serial Adder – Advantages and disadvantages of Parallel adder – Differences between serial adder and parallel adder – digital comparator circuit for two 4-bit words.

3. FLIP FLOP: Different logic families – positive and negative logic levels – Basic principles of Flip Flop operation – Explanation of NAND Latch, NOR Latch, RS, D, JK and Master Slave JK flip flops with block diagram, truth table and wave forms.

4. Counters: Basics of Asynchronous, Synchronous counters – Explanation of Asynchronous MOD-8 and MOD-10 counters with diagrams and wave forms – Explanation of Synchronous MOD-8 counter with diagrams and wave forms – 4-bit ripple counter and listing its applications. **Registers:** Basics of registers – definition, need and types of registers – definition of SISO, SIPO, PISO and PIPO registers – Explanation of SISO and SIPO registers with diagram – Shift Left and Shift Right registers.

5. Additional Combinational Circuits: Definitions of Multiplexer, De-Multiplexers – Explanation of 4X1 Multiplexer – Explanation of 1X4 Demultiplexer – Applications of Multiplexers, Demultiplexers – Definitions of Encoder, Decoder – Explanation of 4-to-10-line decoder – Explanation of 8 to 3 encoder – Applications of Encoder, Decoders.

REFERENCES

1. Digital principles and applications … Melvino and Leach
2. Digital Electronics…. Bignell – Thomson
3. Modern Digital Electronics…. R.P. JAIN
4. https://www.geeksforgeeks.org/digital-logic/number-system-and-base-conversions/
5. https://www.tutorialspoint.com/digital-electronics/digital-electronics-number-systems.htm
6. https://www.electronics-tutorials.ws/binary/binary-coded-decimal.html
7. https://learnabout-electronics.org/Digital/dig11.php
8. https://www.tutorialspoint.com/digital-electronics/digital-electronics-binary-codes.htm
9. https://www.tutorialspoint.com/digital-electronics/digital-electronics-combinational-circuits.htm

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.7
Unit test-2	From 3.8 to 5.8

COMPUTER ORGANIZATION

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM306E	COMPUTER ORGANIZATION	3	45	30	70	2

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Weightage of marks	No. of short Questions	No. of Essay Questions	COs Mapped
1.	CPU Organization	10	17	3	1	CO1
2.	Information representation and Arithmetic Operations	15	33	3	3	CO2
3.	Memory Organization	10	25	3	2	CO3
4.	I/O Organization	10	25	3	2	CO4
Total Periods		45	100	12	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able	
(i)	To know about Processor organization
(ii)	To familiarize in formation Representation and arithmetic operations
(iii)	To understand how memory and i/o is organized in an effective way

COURSE OUTCOMES

CO1	AM306.1	Explain the Basic computer organization techniques
CO2	AM306.2	Explain various information representations, algorithms of arithmetic operations
CO3	AM306.3	Explain the memory organization
CO4	AM306.4	Explain the peripheral organization

LEARNING OUTCOMES

1.0 CPU Organization

1.1 Draw the functional block diagram of Digital computer and explain the function of each unit.
1.2 Define Register
1.3 State the purpose of
  1.3.1 Accumulator
  1.3.2 Program counter
  1.3.3 Instruction Register
  1.3.4 Memory Buffer Register
  1.3.5 Memory Address Register
1.4 Draw the block diagram of simpleaccumulator-based CPU.
1.5 Explain the function of each unit.
1.6 Define the terms micro-operation,macro-operation,
1.7 Define instruction cycle, fetch cycle and execution cycle.
1.8 What is stored program concept
1.9 Explain sequential execution of a program stored in memory by the CPU

2.0 Information representation and Arithmetic Operation

2.1 List and Explain basic types of information representation in a computer.
2.2 Define floating point representation and fixed-point representation of numbers.
2.3 Illustrate the floating point and fixed point representations with example.
2.4 Distinguish between Fixed point and Floating point representations.
2.5 What is Instruction format
2.6 Define terms Opcode, Operand and address.
2.7 Instruction formats with examples
  2.7.1 Zero address instructions
  2.7.2 One address instruction
  2.7.3 Two address instructions
  2.7.4 Three address instructions
2.8 Define addressing mode
2.9 List and explain various addressing modes.
2.10 Explain the fixed point addition and subtraction operations with flowchart.
2.11 Explain the Fixed point multiplication operation with flowchart.
2.12 Explain the Fixed point division operation with flowchart.
2.13 Explain floating point addition, subtraction operations with flowchart
2.14 Explain floating point multiplication operation with flowchart
2.15 Explain floating division operation with flowchart.

3.0 Memory Organization

3.1 List and state the importance of various types of memories
3.2 Distinguish between main and auxiliary memory.
3.3 State the need for memory hierarchy in a computer.
3.4 Explain memory hierarchy in a computer in detail
3.5 State the significance of various memory device characteristics: access time, access rate, alterability, permanence of storage, cycle time.
3.6 Differentiate between RAM and CAM
3.7 Explain Associative Memory
3.8 Explain the principle of virtual memory organization in a computer system
3.9 Explain virtual address and physical address organization.
3.10 State the principle of locality of reference
3.11 Explain Cache memory organization.
3.12 Explain principle of memory interleaving in a computer.

4.0 I/O Organization

4.1 List peripheral devices that can be connected to a computer.
4.2 State the need for an interface.
4.3 State the importance of bus system.
4.4 List modes of date transfer.
4.5 Explain synchronous and asynchronous data transfer.
4.6 Differentiate between synchronous and asynchronous data transfer.
4.7 Explain hand shaking procedure of data transfer.
4.8 Explain programmed I/O method of data transfer.
4.9 Explain interrupted initiated I/O.
4.10 Explain priority interrupt : polling and daisy chaining priority
4.11 Explain DMA controlled transfer.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	2	1	2	1	1
CO2	3	3	3	2		1		3	2	3
CO3	3	3	3	2		1		3	2	3
CO4	3	2	2	1	2	2	2	2	1	2
Average	3	2.25	2.5	1.5	1.5	1.5	1.5	2.5	1.5	2.25

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1. Processor Organization–Functional block diagram of Digital computer - Definition of Registers – purpose of accumulator, Program counter instruction register, Memory buffer registers, Memory address register - Simple accumulator based CPU and function of each unit. -Stored program concept - Sequential execution of a program stored in memory by the CPU

2. Information representation and Arithmetic Operation- Basic types of information representation - floating point representation and fixed-point representation of numbers, Operand, Opcode and address - Zero address, One address, Two address and Three address instructions - Different addressing modes. -Fixed point addition and subtraction ,FixedPoint multiplication and Fixed division operations with flow charts - floating point addition, subtraction, multiplication and division operations with flowcharts.
3. Memory Organization – Listing of Various types of memories and their importance - Memory hierarchy in a computer -Various memory devices characteristics - Differentiate between RAM and CAM - Associative Memory- Virtual memory organization in a computer system - Virtual address and physical address organization-Principle of Locality - Cache memory organization – Memory interleaving.

4. I/OOrganization - Peripheral devices - Need for an interface - Bus systems - Modes of date transfer - Synchronous and asynchronous data transfer -Hand shaking procedure of data transfer -Programmed I/O method of data transfer- Interrupted initiated I/O- Priority interrupt: polling and daisy chaining priority- DMA controlled transfer.

REFERENCE BOOKS

1. Structured Computer Organization --- Andrews Tenenbaum.
2. Computer Organization --- Govindarajulu (TMH).
3. Computer Organization & Architecture --- William Stallings
4. Computer System Architecture --- Morris Mano
5. Computer Organization – Car Hamacher, ZvonksVranesic, Safwat Zaky, V Edition, McGraw Hill, 2002.
6. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.
7. Computer architecture and organization , 4th edition , P Chakraborty , JAICO publishers.
8. https://pravin-hub-rgb.github.io/BCA/resources/sem3/coatbc304/unit3/index.html
9. https://witscad.com/course/computer-architecture/chapter/data-representation
10. https://medium.com/@shrutiikhatal07/memory-organization-d0f486a4daa0
11. https://pravin-hub-rgb.github.io/BCA/resources/sem3/coatbc304/unit4/index.html

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 2.15
Unit test-2	From 3.1 to 4.11

MULTIMEDIA

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM307A	MULTIMEDIA	2	30	-	-	-

TIME SCHEDULE

S.NO	Chapter/Unit Title	NO. OF PERIODS	COs mapped
1	MS Access- create Database, create table with and without constraints, Insert, delete, update records, implement queries, create relationship between two tables	6	CO1
2	PageMaker - Creation of publication using tools, text, shapes, etc, Custom template, colors, text block, Objects, Styles, Page elements, Printing the documents	12	CO2
3	Photoshop – Different tools, Working with Layers, Working with painting tools, Colors, Brushes	12	CO3
	TOTAL	30	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
(i)	Familiarize with the features of MS Access.
(ii)	Familiarize with the features of Adobe PageMaker
(iii)	Familiarize with the features of Adobe Photoshop

COURSE OUTCOMES

CO1	AM307.1	Working with databases, tables, manipulating records, queries and establishing relationship among tables.
CO2	AM307.2	Create and print publication files such as Textbooks, Visiting Cards, Invitation Cards, etc. using Adobe Pagemaker
CO3	AM307.3	Design and enhance the quality of all types of picture files using Adobe Photoshop

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	3	1	3	3	3	2	1	2
CO2	2	2	3	2	2	2	2	2	2	2
CO3	2	3	3	2	1	2	2	2	2	2
Average	2.3	2.3	3	1.6	2	2.3	2.3	2	1.6	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

LEARNING OUTCOMES

S.No	Main Learning Outcome	Explanation (Using PPTS, Videos)	Practical
1.	Learn and Practice MS-Access	Explain the concept of databases, tables, operations on tables, constraints, retrieving the data from tables, relating the tables.	1. To create Database To Create table with and without constraints To Insert, delete, update records 2. To implement queries To create relationship between two table
2.	Learn and Practice Adobe Page Maker	Explain various page formatting tools, their usage and various options related to page formatting, Color codes using Adobe page maker	3. Exercise on Installation, invoking and familiarizing Adobe Page Maker. 4. Exercise on Page Maker Tools. 5. Exercise on creating visiting card 6. Exercise on creating book cover page 7. Exercise on creating hotel menu card 8. Exercise on creating invitation card 9. Exercise on creating brochure
3.	Learn and Practice Adobe Photoshop	Explain various image editing tools, various operations on images, layers, colors, by using photoshop.	10. Exercise on Installation, invoking and familiarizing Adobe Photoshop 11. Exercise on selection, Resizing & Cropping Images 12. Exercise on Layers 13. Exercise on Photo Retouching 14. Exercise on CREATING SPECIAL EFFECTS 15. Exercise on Exporting Your Work 16. Exercise on Logo Creation

KEY COMPETENCIES

Exp No	Name of the Experiment	Objectives	Key Competencies
1	To create database and create tables with key constraints and insert/ delete/ update records in a table	a. Open MS Access b. Create database c. save d. create table e. Use primary key f. Insert/delete/update records	❖ Database creation ❖ Table creation ❖ Able toinsert/update/delete and delete records in the table
2	To implement queries to extract data from tables Create relationships between tables	a. Open MS Access b. Create database c. Create table d. Use Select command e. Create one more tables f. Insert records g. Use relationship option	❖ Able to display contents of the table based on the user requirement ❖ Able to link tables
3	Exercise on Installation, invoking and familiarizing Adobe Page Maker.	Installation, invoking and familiarizing Adobe Page Maker.	❖ Installing page maker ❖ Explain PageMaker environment
4	Exercise on Page Maker Tools.	Page Maker Tools.	❖ Explain usage of Tool box, zero position, pointer tool, text tool, rotate tool, crop tool, oblique line tool, constrained line tool, box tool, rectangle frame, circle tool, circular frame, polygon tool, polygon frame, hand tool and zoom tool.
5	Exercise on creating visiting card	creating visiting card	❖ Create visiting card with text and graphics on both sides with proper formatting.
6	Exercise on creating book cover page	creating book cover page	❖ Create front and back cover page of a book with text and graphics with proper formatting.
7	Exercise on creating hotel menu card	creating hotel menu card	❖ Create a hotel menu card with text and graphics with proper formatting.
8	Exercise on creating invitation card	creating invitation card	❖ Create a invitation card with text and graphics with proper formatting for required no. of pages.

9	Exercise on creating brochure	creating brochure	❖ Create a brochure for the firms like real estate companies, hospitals, educational institutions etc..,
10	Exercise on Installation, invoking and familiarizing Adobe Photoshop	Installation, invoking and familiarizing Adobe Photoshop7.0	❖ Exploring the Toolbox ❖ Exploring Panels & Menus ❖ Creating & Viewing a New Document ❖ Customizing the Interface ❖ Setting Preferences
11	Exercise on Selection, Resizing and Cropping of images	Selection , Resizing and Cropping of images	❖ Understanding various selection methods. ❖ Interpolation Options ❖ Resizing for Print & Web ❖ Cropping & Straightening an Image Adjusting Canvas Size & Canvas Rotation
12	Exercise on LAYERS	Working on Layers	❖ Understanding the Background Layer ❖ Creating, Selecting, Linking & Deleting Layers ❖ Locking & Merging Layers ❖ Copying Layers, Using Perspective & Layer Styles ❖ Filling & Grouping Layers ❖ Introduction to Blending Modes ❖ Blending Modes, Opacity & Fill Creating & Modifying Text
13	Exercise on PHOTO RETOUCHING	PHOTO RETOUCHING	❖ Using The Red Eye Tool ❖ The Clone Stamp Tool ❖ The Patch Tool & the Healing Brush Tool ❖ The Spot Healing Brush Tool ❖ The Color Replacement Tool ❖ The Toning & Focus Tools Painting with History
14	Exercise on CREATING SPECIAL EFFECTS	CREATING SPECIAL EFFECTS	❖ Getting Started with Photoshop Filters ❖ Smart Filters ❖ Creating Text Effects Applying Gradients to Text
15	Exercise on Photo Shop Credits	EXPORTING YOUR WORK	❖ Saving with Different File Formats ❖ Saving for Web & Devices ❖ Printing Options ❖ Photo shop Credits
16	Exercise on Logo Creation	Logo Creation	❖ To apply all the tools ❖ Prepare college logo ❖ Prepare logo for industry

DATA STRUCTURES USING PYTHON LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM308L	DATA STRUCTURES USING PYTHON LAB	6	90	40	60	2

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. Of Periods	COs Mapped
1.	Introduction to object oriented concepts and implementation of OOP features, Sequential data structure Array-operations on arrays, built in data structures like lists, Tuple, dictionary and sets	21	CO1
2.	Searching and sorting techniques, Linked Storage Representation-Linked Lists	30	CO2
3.	Linear Data Structures-Stacks	18	CO3
4.	Linear Data Structures-Queues	9	CO4
5.	Non Linear Data Structures-Trees	12	CO5
Total Periods		90	

COURSE OBJECTIVES

Upon the completion of the course students shall be able to

(i) know the object oriented concepts of python
(ii) know the various types of Data Structures
(iii) To familiarize with the representation of Data Structures
(iv) To use various Data structures in organizing data
(v) To reinforce theoretical concepts by writing relevant programs

COURSE OUTCOMES

CO1	AM308.1	Develop Python programs on object oriented concepts, inbuilt data structures and array operations
CO2	AM308.2	Develop Python programs on searching, sorting and various Linked Lists and Linked List operations.

CO3	AM308.3	Develop Python programs on the operations of Stack data structure and its applications
CO4	AM308.4	Develop Python programs on the operations of Queue data structure
CO5	AM308.5	Develop Python programs on the operations of Binary Trees

LEARNING OUTCOMES

1. Object Oriented Concepts and Built in data types

1. Exercise on Class and Object in Python
2. Exercise on Overloading concept
3. Exercise on Overriding concept
4. Exercise on Inheritance techniques
5. Exercise on Array operations using Numpy package
6. Exercise on Lists, Tuples, Dictionaries and Sets in Python.

2. Searching, Sorting and Linked Lists

7. Exercise on BUBBLE SORT using Functions.
8. Exercise on SELECTION SORT using Functions.
9. Exercise on INSERTION SORTusing Functions.
10. Exercise on QUICK SORT using Functions.
11. Exercise on LINEAR SEARCH using Functions.
12. Exercise on BINARY SEARCH without RECURSION.
13. Exercise on BINARY SEARCH with RECURSION.
14. Exercise on SINGLY LINKED LIST with insert, delete and display operations
15. Exercise on DOUBLY LINKED LIST with insert, delete and display operations

3. Linear Data Structures-Stacks

16. Exercise on STACK with push, pop and display operations using built in functions
17. Exercise on STACK with push, pop and display operations without using built in functions.
18. Exercise on Conversion of In-fix expression to post-fix expression using STACKS.
19. Exercise on Evaluation of post-fix expression using STACKS.

4. Linear Data Structures-Queues

20. Exercise on QUEUE with enqueue, dequeue and display operations using arrays.

21. Exercise on QUEUE with enqueue, dequeue and display operations using inbuilt operations.

5. Non Linear Data Structures-Trees

22. Exercise on BINARY SEARCH TREE with insertion, deletion of nodes.

23. Exercise on BINARY SEARCH TREE with varioustree traversal operations.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	3	2	2	2
CO2	3	3	3	2	2	2	2	2	2	2
CO3	3	3	3	2	3	3	2	3	3	3
CO4	3	3	3	2	2	2	2	2	2	2
CO5	3	3	3	2	2	2	2	2	2	2
Average	3	3	3	2	2.4	2.4	2.2	2.2	2.2	2.2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
1	Exercise on Class and Object in Python	Write a Python program for i. Implementing Class ii. Creating an object ii. Accessing data members and member functions	❖ Correct syntactical errors ❖ Debug logical errors ❖ Observe whether Class and object are properly implemented ❖ Check data members and member functions are properly accessed
2	Exercise on Overloadingconcepts	Write a Python program forImplementing overloading of functions	❖ Correct syntactical errors ❖ Debug logical errors ❖ Observe whether overloading of functions is done with different signatures
3.	Exercise on Overriding concepts	Write a Python program forImplementing overriding of functions	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether the overriding of functions is done properly
4.	Exercise on Inheritance	Write a Python program for Implementing various	❖ Correct syntactical errors ❖ Debug logical errors

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
	techniques	inheritance techniques	❖ Observe whether all inheritance types are properly implemented ❖ Check whether the characteristics of each inheritance are achieved or not.
5.	Implement Array operations using Numpy package	Write a Python program for i. Implementing Arrays using Numpy ii. Array addition ii. Array multiplication	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Numpy package is properly installed ❖ Observe whether Array addition is properly implemented ❖ Check whether Array Multiplication is performed
6.	Exercise on List, Tuple, Dictionary and set data structures in Python.	Write a Python program for i. Creating a List, Adding elements to list, Accessing elements to list ii. To implement Tuple and get the specified position element from beginning and ending of the Tuple ii. To create a dictionary and perform the search operation for a specific Element. iv. To create a Set and perform set operations like Union,Intersection and Set Difference.	❖ Correct syntactical errors ❖ Debug logical errors ❖ Observe whether List is properly implemented ❖ Check whether the tuple is createdand specified position element is accessed ❖ Check whether the Dictionary is createdand search operation is performed ❖ Check whether the Set is created and Set operations are properly performed.
7.	Exercises on BUBBLE SORTING using Functions	Write a Python program for i. Implementing Bubble Sort ii. Print the proper result for sorting the elements	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Bubble sort algorithm is properly implemented ❖ Observe the result for sorting the elements using Bubble sort technique.
8.	Exercise on SELECTION SORT using Functions	Write a Python program for i. Implementing Selection Sort ii. Print the proper result for	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Selection

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
		sorting the elements.	sort algorithm is properly implemented ❖ Observe the correctness of result for sorting the elements using selection sort
9.	Exercise on SELECTION SORT using Functions	Write a Python program for I. Implementing Insertion Sort II. Print the proper result for sorting the elements.	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Insertion sort algorithm is properly implemented ❖ Observe the correctness of result for sorting the elements using insertion sort
10.	Exercise on Quick SORT using Functions	Write a Python program for I. Implementing Quick Sort II. Print the proper result for sorting the elements	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Quick sort algorithm is properly implemented ❖ Observe the correctness of result for sorting the elements using Quick sort
11.	Exercise on Linear search using functions	Write a Python program for I. Implementing Linear Search II. Print the proper result for successful and unsuccessful Linear search	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Linear Search algorithm is properly implemented ❖ Observe the Base Condition ❖ Observe the result for the search element is present in the list ❖ Observe the result for the search element is not present in the list
12.	Exercise on binary searchwithout Recursion	Write a Python program for I. Implementing Binary Search II. Print the proper result for successful and unsuccessful Binary search	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Binary Search algorithm is properly implemented ❖ Observe the Base Condition ❖ Observe the result for the search element is present in the list ❖ Observe the result for the search element is not

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
			present in the list
13.	Exercise on binary search with Recursion	Write a Python program for I. Implementing Binary Search II. Print the proper result for successful and unsuccessful Binary search	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether Binary Search algorithm is properly implemented ❖ Observe the Base Condition ❖ Observe the result for the search element is present in the list ❖ Observe the result for the search element is not present in the list
14.	Exercises on creation, insertion, deletion, display of elements in a single linked lists	Write a Python program for i. Creation of linked list ii. Inserting an element in Linked list ii. Check for deletion of a node if no element is present and print error message iv. Delete an element from the Linked list v. Display all the elements from the linked list	❖ Rectify syntactical errors ❖ Debug logical errors ❖ Study node structure ❖ Validate whether the memory allocation is done for the node ❖ Confirm whether the addition of node is done at the end ❖ Correct if deletion of an element in an empty list ❖ Confirm whether deletion of required node is done ❖ Observe whether all the elements of the linked list are displayed in proper order
15.	Exercises on creation, insertion, deletion, display of elements in Doublelinked lists	Write a Python program for I. Creation of doubly linked list II. Inserting an element in Doubly Linked list III. Check for deletion of a node if no element is present and print error message IV. Delete an element from the Linked list V. Display all the elements from the linked list	❖ Rectify syntactical errors ❖ Debug logical errors ❖ Study node structure ❖ Validate whether the memory allocation is done for the node ❖ Confirm whether the addition of node is done at the end ❖ Correct if deletion of an element in an empty list ❖ Confirm whether deletion of required node is done ❖ Observe whether all the elements of the linked list are displayed in proper order

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
16.	Writea program to Implement a stackusingbuilt-infunctions	Write a Python program for i. Creation of Stack consisting of elements using built in functions ii. Insertion of new element is done by () function call ii. Deletion of last element is done by pop() function call iv. Print error message for 'empty stack' if no elements are present for pop() function call v. Print error message for 'stack full' if number of elements exceed size of Stack array	❖ Correct syntactical errors ❖ Debug logical errors ❖ Observe declaration of stack using built-in functions ❖ Validate whether a new element is inserted at the top by push() function call ❖ Check whether only the top element is deleted by using negative indexing. ❖ Verify for empty stack condition in pop()
17.	Write à program to implement stackusingArrays	Write a Python program for i. Creation of Stack consisting of elements using arrays ii. Insertion of new element is done by push() function call ii. Deletion of last element is done by pop() function call iv. Print error message for 'empty stack' if no elements are present for pop() function call	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study node structure ❖ Observe declaration of stack using arrays ❖ Validate whether a new element is inserted at the top by push() function call ❖ Check whether only the top element is deleted by pop() function call ❖ Verify for empty stack condition in pop()
18.	Writea program for conversion of infix arithmetic expression intopostfix expression	Write a Python program for I. Conversion of infix expression into postfix expression using stacks concept II. Printing the postfix expression	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether the final expression is postfix expression or not.
19.	Write a program for Evaluation of post-fix expression using STACKS.	Write a Python program for i. Evaluation of post-fix expression using STACKS ii. Printing the evaluated result	❖ Correct syntactical errors ❖ Debug logical errors ❖ Check whether the result is correctly evaluated or not.
20.	Writea program to implement a queueusingArrays.	Write a Python program for i. Creation of Queue consisting of elements using arrays ii. Insertion of new element is	❖ Correct syntactical errors ❖ Debug logical errors ❖ Observe declaration of Queue using arrays ❖ Validate whether a new

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
		done by add_Queue() ii. Print error message for 'empty queue' if no elements are present for deletion of an empty queue. iv. Print error message for 'queue full' if number of elements exceed size of Queue array upon insertion of new element. v. Deletion of first element is done by delete_Queue()	element is inserted at the end of the array by add_Queue() ❖ Verify for empty Queue condition for deletion of an element ❖ Verify for Queue full condition upon insertion of a new element ❖ Check whether only the first element is deleted by delete_Queue()
21.	Writea program to implement a queueusingbuilt in functions	Write a Python program for i. Creation of Queue consisting of elements using inbuilt functions in Python ii. Insertion of new element is done by put() method ii. Print error message for 'empty queue' if no elements are present for deletion of an empty queue. iv. Deletion of first element is done by get() method	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study node structure ❖ Validate whether a new element is inserted at the end of the Queue byput() ❖ Verify for empty Queue condition for deletion of an element using empty() method ❖ Check whether only the first element is deleted by get()
22.	Writea program to implementBINARY SEARCH TREE with insertion, deletion of nodes	Write a Python program for i. Creation of Binary Trees ii. Insertion of a node iii. Deletion of a node	❖ Correct syntactical errors ❖ Debug logical errors ❖ Observe proper definition of elements in a Binary SearchTree ❖ Check whether the node is properly inserted in the Binary Tree ❖ Check whether the node is properly deleted in the Binary Tree ❖ Observe the root node after deleting root node element

DATA STRUCTURES THROUGH PYTHON LAB OBJECTIVES AND KEY COMPETENCIES			
Sl.No	Name of the Experiment	Objectives	Key Competencies
23.	Writea program to implementBINARY SEARCH TREE with various tree traversal techniques.	Write a Python program for I. 1.Creation of Binary Trees II. 2.Perform In-order Traversal of the binary tree III. 3.Perform Pre-order Traversal of the binary tree IV. 4.Perform Post-order Traversal of the binary tree	❖ Correct syntactical errors ❖ Debug logical errors ❖ Validate whether the Tree in-order traversal is properly done ❖ Validate whether the Tree pre-order traversal is properly done ❖ Validate whether the Tree post-order traversal is properly done

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test 1	From learning outcomes 1 to 11
Unit test 2	From learning outcomes 12 to 23

DBMS LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM309L	DBMS LAB	6	90	40	60	2

TIME SCHEDULE

S. No	Chapter/Unit Title	No. Of Periods	Cos Mapped
1	Concepts of DBMS & RDBMS	12	CO1
2	Concepts of SQL	24	CO2
3	Basics of PL/ SQL	24	CO3
4	Advance PL/SQL	18	CO4
5	Concepts of NoSQL & MongoDB.	12	CO5
	TOTAL	90	

COURSE OBJECTIVES

Upon completion of the course the student shall able to

(i) Insert, update, delete and select data into/from Relation Database.
(ii) Develop PL/SQL programs.
(iii) Insert, update, delete and select data from MongoDB.

COURSE OUTCOMES

CO1	AM309.1	Develop SQL Queries to Create, modify and drop tables andQueries to Insert, update and delete data from tables.
CO2	AM309.2	Execute SQL Queries to display data on different conditions fromdifferent tables
CO3	AM309.3	Execute PL/SQL Programs
CO4	AM309.4	Demonstrate the usage of cursors and triggers
CO5	AM309.5	Execute commands to Insert, update, delete and select data inNOSQL and Mongo DB databases

LEARNING OUTCOMES

1. Concepts of DBMS & RDBMS

1 Know installation of Oracle
2 Exercise on creating tables.
3 Exercise on inserting records

4 Exercise on updating records

5 Exercise on modifying the structure of the table

2. Concepts of SQL

6 Exercise on Select command

7 Exercise on querying the table using clauses like WHERE, ORDER BY, IN, AND, OR,NOT, IS NULL

8 Exercise on GROUP BY, HAVING

9 Exercise on Number functions, character functions, conversion functions and date functions, group functions

10 Exercise on set operators

11 Exercise on sub queries

12 Exercise on Joins

13 Exercise on various date and number format models

14 Exercise on creating tables with integrity constraints

3. Basics of PL/ SQL

15 Write programs using PL/SQL control statements

16 Exercise on Procedures

17 Exercise on Functions

4. Advance PL/SQL

18 Exercise on pre-defined exception

19 Exercise on user-defined exception

20 Exercise on Cursors

21 Exercise on Triggers

5. Concepts of NoSQL & MongoDB.

22 Exercise on Installation of MongoDB

23 Exercise on Creation and Dropping of Database

24 Exercise on Creation and Dropping of Collections.

25 Exercise on Commands of MongoDB- Insert, update, find, delete and sorting of Documents.

Mini Project: Student has to develop a Mini project applying the skills acquired from the learning outcomes of this course.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2		3			2	3	3	2	
CO2	2	2	1			2			2	
CO3	2		1					2		2
CO4	2	2	3	3	3	3		2	2	2
CO5	2	3		3		3	3	2	2	
Average	2	2.3	2	3	3	2.6	3	2.3	2	2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

KEY COMPETENCIES

S.No	Name of the Experiment	Objectives	Key Competencies
1	Know installation of Oracle	Perform the following: i. To identify the version of Oracle beinginstalled ii. To understand the RAM and HDD requirements for Oracle installation iii. To comprehend the installation stepscorrectly iv. Setting up of Oracle AdministrativePassword v. Configuring the Oracle database after post-installation steps of Oracle viz configuring administrative rights forperforming vi. To login to Oracle as administrator account and Oracle useraccount	❖ Observe Oracle version beinginstalled ❖ Observe the RAM & HDD requirements ❖ Rectify for any Oracle installationerrors ❖ Able to login as Administrator and as Oracle useraccount
2	Exercise on creating tables	Perform the following: i. To login with Oracle user account ii. To give correct syntax for table creation iii. To give correct data type for the required fields with appropriatesize iv. To display the structure of the table	❖ Correct Table creation syntaxerrors ❖ Correct the wrong data types and inappropriate sizes for the respective fields ❖ Check for displaying the structure of thetable

S.No	Name of the Experiment	Objectives	Key Competencies
3	Exerciseoninserting records	Perform thefollowing: i. Check for the required table present already ii. To insert the records correctly iii. To display the records correctly	❖ Correct syntax errors for Insertion of record ❖ Check for insertion of proper values for the required fields ❖ Verify the correct values pertaining to the record are inserted in the required table ❖ Check for displaying of the records correctly
4	Exercise on updating records	Perform the following: i. Check for the required table present already ii. To update the records correctly iii. To display the updated records	❖ Correct syntax errors for update ofrecord ❖ Check for update of proper values for the required fields ❖ Check for displaying of the updated records correctly
5	Exercise on modifying the structure of the table	Perform the following i. To identify the required table present in the system already ii. To add newcolumn iii. To display the records correctly	❖ Correct syntax errors in modifying the structure of the table ❖ Check whether required field is newly added to the existing table ❖ Check for displaying of the modified table correctly
6	Exercise on SELECT command	Perform the following i. To identify the required table present already ii. To display the records in the required table	❖ Check for syntax error in usage of Select command ❖ Check whether Select command is given correctly to display all the records
7	Exercise on querying the table using clauses like WHERE, ORDER, IN,AND, OR,NOT, IS NULL	Perform the following: i. To use the Select command ii. To use the clauses WHERE, ORDER, IN,AND, OR, NOT, IS NULL along with Select command on the given records in the table	❖ Check for syntax error in usage of Select command with appropriate clauses ❖ Check whether Select command along with appropriate clause is given correctly for the required condition ❖ Check the usage of clauses WHERE, ORDER, IN,AND, OR, NOT along with Select command appropriately

S.No	Name of the Experiment	Objectives	Key Competencies
8	Exercise on GROUP BY, HAVING	Perform the following: i. To use the Select command To use the clauses GROUP BY, HAVING along with Select command on the given records in the table	❖ Check for syntax error in the usage GROUP BY, HAVING ❖ Check for usage of GROUP BY, HAVING ❖ Verify output values based on certain condition on few records
9	Exercise on Number functions, character functions, conversion functions and date functions, group functions	Perform the following i. To use functions ii. To use set command along with WHERE condition, GROUP BY, HAVING	❖ Check for syntax error of various functions ❖ Check for usage of various functions ❖ Verify output values based on certain condition on few records
10	Exercise on SET operators	Perform the following iii. To use set command iv. To use set command along with WHERE condition	❖ Check for syntax error in the usage of SET command ❖ Check for usage of SET command for updating values based on certain condition on few records
11	Exercise on sub queries	Perform the following i. To use Select command ii. To use appropriate Operators IN	❖ Check for the syntax error in usage of sub queries ❖ Check for the correctness of the usage of appropriate operators used
12	Exercise on Joins	Perform the following i. To create two tables ii. To use the common field if two tables are used iii. To know different types of Join	❖ Check for the correctness of the syntax used for joining ❖ Check if the join is created between two tables ❖ Check if self join is created
13	Exercise on various date and number format models	Perform the following: i. To use date formats correctly ii. To use number formats correctly	❖ Check for the syntax of the date formats ❖ Check for the syntax of the number formats
14	Exercise on creating tables with integrity constraints	Perform the following i. Create Primary key ii. Create Foreign key or referential integrity constraint iii. Create NOT NULL constraint iv. Create UNIQUE Key constraint v. Create CHECK constraint	❖ Check for the syntax errors in usage of all types of Integrity constraints ❖ Check whether different types of Integrity constraints are used

S.No	Name of the Experiment	Objectives	Key Competencies
15	Write programs using PL/SQL control statements	Perform the following i. To use IF .. ELSE statements ii. To use iterative statements – Simple loop, While Loop, For Loop	❖ Check for the syntax of IF.. ELSE statements ❖ Check for the syntax of all iterative statements
16	Exercise on Procedures	Perform the following i. To know the concept ii. To declare procedures iii. The type of parameters IN,INOUT,OUT iv. To call procedures from other procedures	❖ Check for proper declaration of procedures ❖ Check for syntax of parameters and its type ❖ Check for proper calling of procedures
17	Exercise on Functions	Perform the following i. To know the concept ii. To declare function with return data iii. To call functions from other functions	❖ Check for proper declaration of function ❖ Check for syntax of parameters and its data type ❖ Check for proper return data type from the functions ❖ Check for variable assignment to get thereturned value from the function
18	Exercise on pre defined exception	Perform the following i. To know the concept ii. To writeprograms with exception section	❖ Check for proper declaration Exception section ❖ Check for syntax of Exception section
19	Exercise on user defined exception	Perform the following i. To know the concept ii. To writeprograms with exception section	❖ Check for proper declaration Exception section ❖ Check for syntax of Exception section
20	Exercise on Cursors	Perform the following i. To know the concept cursors ii. To know the fetch data from database	❖ Check for the syntax of cursor ❖ Check for open cursor, fetch data, close cursor ❖ Check for the result
21	Exercise on Triggers	Perform the following i. To know the concept of triggers ii. Validation before and after insert, before and after update, before and after delete data	❖ Check for the syntax of trigger ❖ Write a trigger which raises before insert data ❖ Raise trigger ❖ Repeat the procedure for remaining ❖ Check for the result

S.No	Name of the Experiment	Objectives	Key Competencies
22	Exercise on Installation of MongoDB	Perform the following i. To download and install MongoDB	❖ Observe MongoDB version being installed ❖ Observe the RAM & HDD requirements ❖ Rectify for any MongoDB installation errors Able to login as Administrator
23	Exercise on Creation and Dropping of Database	Perform the following i. Create the Database ii. Drop the Database	❖ Know the use of create Database() and dropDatabase() ❖ Correct Database creation syntax errors ❖ Check for displaying the database name
24	Exercise on Creation and Dropping of Collections	Perform the following i. Create the Collection ii. Drop the Collection	❖ Know the use of create Collection() and drop() ❖ Correct Database creation syntax errors ❖ Check for collection name ❖ Check for the collection dropped
25	Exercises on commands of MongoDB	Execute the following commands of MongoDB i. Insert the Document ii. update the Document iii. find the Document iv. Delete the Document v. sort the Documents	❖ Know the syntax of insert(), update(), find(), remove(), sort() functions. ❖ Correct syntax errors. ❖ Check out for different input values.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test 1	From learning outcomes 1 to 12
Unit test 2	From learning outcomes 13 to 25

LINUX PRACTICALS (PRACTICUM -PRACTICAL)

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	FA Marks	SA Marks	Credits
26AM310L	Linux Practicals	4	60	40	60	1.5

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	COs Mapped
1	Linux Installation and user management	8	CO1
2	LINUX commands	24	CO2
3	LINUX editors	4	CO3
4	LINUX Shell Programs	24	CO4
TOTAL		60	

COURSE OBJECTIVES

Upon completion of the course the student shall be able	
(i)	To know the basics of linux installation and user management.
(ii)	To use and execute linux commands.
(iii)	To know the usage of different Linux editors.
(iv)	To know about the shell programming and execute shell programs.

COURSE OUTCOMES

CO1	AM310.1	Demonstrate Linux installation and user management
CO2	AM310.2	Demonstrate Linux commands and Linux Editors
CO3	AM310.3	Execute shell programs using expressions, operators
CO4	AM310.4	Execute shell programs on control statements and conditional statements, Files, Functions and string manipulations.

LEARNING OUTCOMES

Theory

1.Linux Basics

1.1 History of Linux

1.2 Know about multiprogramming, multi-tasking and open source softwares

1.3 Fundamental principles

1.3.1 What is file?

1.3.2 know about hierarchical file system

1.3.3 know about piping and redirection

1.3.4 Distributions in Linux

2.Core Components

2.1 know about kernel

2.2 know about shell

2.3 List the GNU utilities in LINUX

2.4 List system utilities in Linux

2.5 Know about GUI in Linux.

3.Editors

3.1 Understand the concept of editor

3.2 List different types of editors

3.3 Know about the editors (nano, vim(vi), emacs)

3.4 List graphical interface editors

3.5 know about Gedit, kate, visual studio code, atom, sublime text

LEARNING OUTCOMES

S.No	LEARNING OUTCOMES	THEORY (explained using PPT,useful videos from youtube etc.,)	PRACTICAL (Key competencies table enclosed)
1	Installation of Linux	Explanation of Linux installation like ubuntu,kali,centos	Demonstration of Installation of various Linux distributions like Ubuntu, kali,Centos etc.,
2	Creating and managing user accounts in LINUX	Explanation of Creating and managing user accounts in LINUX	Demonstration of Creating and managing user accounts in LINUX
3	Exercise on Basic Commands	Listing and explaining basic Linux Commands	Demonstration on Basic Linux commands
4	Exercise on Linux File Directory Management commands	Listing and explaining of Linux File Directory Management commands	Demonstration of Linux File Directory Management commands
5	Exercise on Linux Permissions and Ownership commands	Listing and explaining of Linux Permissions and Ownership commands	Demonstration of Linux Permissions and Ownership commands

6	Exercise on Linux Archiving and Compression commands	Listing and explaining of Linux Archiving and Compression commands	Demonstration of Linux Archiving and Compression commands
7	Exercise on Linux System Monitoring and Management commands	Listing and explaining of Linux System Monitoring and Management commands	Demonstration of Linux System Monitoring and Management commands
8	Exercise on Linux Miscellaneous and Utility Commands	Listing and explaining of Linux Miscellaneous and Utility commands	Demonstration of Linux Miscellaneous and Utility commands
9	Exercise on Linux Disk and Memory Management commands	Listing and explaining of Linux Disk and Memory Management commands	Demonstration of Linux Disk and Memory Management commands
10	Exercise on Linux filters commands	Listing and explaining of on Linux filters commands	Demonstration of on Linux filters commands
11	Exercise on Linux Text editors	Explanation of Linux editors like vi,vim etc.,	Demonstration of Linux editors like vi,vim
12	Exercise on shell script using expressions, operators	NA	Execution of shell script
13	Exercise on Shell Script on control statements.	NA	Execution of shell script
14	Exercise on Shell script on conditional statements.	NA	Execution of shell script
15	Exercise on Shell script on LOOP statements	NA	Execution of shell script
16	Exercise on shell script on string manipulations.	NA	Execution of shell script
17	Exercise on Shell script on FUNCTIONS	NA	Execution of shell script
18	Exercise on Shell script on FILES	NA	Execution of shell script

CO-PO-PSO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	1	1	2	1	1	3	2	1
CO2	1	3	2	1	3	2	1	2	3	2
CO3	1	2	2	2	2	1	1	2	3	2
CO4	1	3	3	2	3	2	2	3	3	3
Average	1.25	2.75	2	1.5	2.5	1.5	1.25	2.5	2.75	2

KEY COMPETENCIES

Sl.No	Name of the Experiment	Objectives	Key Competencies
1	Installation of Linux	Installation on Linux distributions like Ubuntu, kali,Centos etc.,	1. Choose method to install 2. Choose a Linux distribution 3. Check for the syntax errors and clear the errors 4. Follow install method instructions
2	Creating and managing user accounts in LINUX	Creating and managing user accounts in Linux	1. Create user account 2. Modify user accounts 3. Delete user accounts 4. Remove user accounts
3	Exercise on Basic Commands	To Run Linux shell basic commands	1. Open Linux OS 2. Open shell 3. Run basic shell commands 4. Observe output of command
4	Exercise on Linux File Directory Management commands	To Run Linux File Directory Management commands	1. Open Linux OS 2. Open shell 3. Run various File directory and management commands in the shell 4. Observe output of command
5	Exercise on Linux Permissions and Ownership commands	To Run Linux Permissions and Ownership commands	1. Open Linux OS 2. Open shell 3. Run various Permissions and Ownership command in the shell 4. Observe output of command

6	Exercise on Linux Archiving and Compression commands	To Run Linux Archiving and Compression commands	1. Open Linux OS 2. Open shell 3.Run various Archiving and Compression commandin the shell 4.Observe output of command
7	Exercise on Linux System Monitoring and Management commands .	To Run System Monitoring and Management commands	1. Open Linux OS 2. Open shell 3. Run various System Monitoring and Management commands in the shell 4. Observe output of command
8	Exercise on Linux Miscellaneous and Utility Commands	To Run Miscellaneous and Utility Commands	1. Open Linux OS 2. Open shell 3. Run various Miscellaneous and Utility Commands in the shell 4. Observe output of command
9	Exercise on Linux Disk and Memory Management commands	To Run Disk and Memory Management commands	1. Open Linux OS 2. Open shell 3. Run various Disk and Memory Management Commands in the shell 4. Observe output of command
10	Exercise on Linux filters commands	To Run Linux filters commands	1. Open Linux OS 2. Open shell 3. Run various Filtering Commands in the shell 4. Observe output of command
11	Exercise on Linux Text editors	Working on Linux text editors like vi	1.Opening/Creating a File 2.Editing Modes (for modal editors like Vim) 3. Text Input and Manipulation 4. Saving Changes 5. Exiting editor
12	Exercise on shell script using expressions, operators	Write a shell script program on expressions and operators to demonstrate various operators and expression in Linux shell script	1. Create the Shell Script File with operators and expressions 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug

13	Exercise on Shell Script on control statements.	Write a shell script program on control statements to demonstrate various control statements in Linux shell script	1. Create the Shell Script File with control statements 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug
14	Exercise on Shell script on conditional statements.	Write a shell script program on conditional statements to demonstrate various conditional statements in Linux shell script	1. Create the Shell Script File with conditional statements 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug file
15	Exercise on Shell script on LOOP statements	Write a shell script program on Loop statements to demonstrate various loop statements in Linux shell script	1. Create the Shell Script File with loop statements 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug file
16	Exercise on shell script on string manipulations.	Write a shell script program on string manipulation commands to demonstrate string manipulation commands in Linux shell script	1. Create the Shell Script File with string commands 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug file

17	Exercise on Shell script on FUNCTIONS	Write a shell script programon functions to demonstrate functions in Linux shell script	1. Create the Shell Script File with functions 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug file
18	Exercise on Shell script on FILES	Write a shell script program on files to demonstrate files in Linux shell script	1. Create the Shell Script File 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5.Save script 6. Make the Script Executable by granting execute permissions 7.Run the Script 8. Verify and Debug file

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Key Competencies to be Covered
Unit Test–1	From 1 to 9
Unit Test–2	From 10 to 18

IV Semester

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV SEMESTER

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Semester	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM401T	Web Technologies	6	-	N	90	3.5	3	30	70	100
26AM402T	Artificial Intelligence	6	-	N	90	3.5	3	30	70	100
26AM403T	Machine Learning	6	-	N	90	3.5	3	30	70	100
ELECTIVE COURSES										
26AM404E	Computer Vision	3	-	N	45	2	3	30	70	100
26AM405E	Computer Networks									
AUDIT COURSE										
26AM406A	Troubleshooting of Computer Networks	2	-	Y	30	-	-	-	-	-
PRACTICAL COURSES										
26AM407L	Web Technologies Lab	-	6	N	90	2.5	3	40	60	100
26AM408L	Communication & Employability Skills	-	4	N	60	2	3	40	60	100
26AM409L	AI using Prolog Lab	-	6	N	90	2.5	3	40	60	100
26AM410C	Student Centric Activities	-	3	N	45	0.5	-	-	-	-
	TOTAL	**23**	**19**		**630**	**20**	**-**	**240**	**460**	**700**

Note 1 : 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games

Note 2: 26AM408L is common laboratory to all programmes.

26AM401T,407L is common with CCB/CME/CAI/CCN
26AM402T,409L is common with CAI
26AM404E is common with CAI
26AM406A is common with CCB/CIOT/CAI/CME
26AM408L is common with CCB/CIOT/CAI/CME/CCN

WEB TECHNOLOGIES

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM401T	WEB TECHNOLOGIES	6	90	30	70	3.5

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Introduction to Web Design and HTML	18	22	2	2	CO1
2.	CSS (Cascading Style Sheets) and XML	18	18	2	1.5	CO1, CO2
3.	JavaScript	16	14	2	1	CO2
4.	Angular JS &JQuery	18	21	3	1.5	CO3
5.	Web Servers and PHP — Server-side Scripting	20	25	3	2	CO4
Total		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to

(i) Understand the basic elements of web page

(ii) Know the working with HTML, CSS

(iii) To familiarize the various Technologies like Java Script, J Query, PHP.

(iv) To understand Database connectivity Using PHP

COURSE OUTCOMES

CO1	AM401.1	Implement interactive web page(s) using HTML and CSS
CO2	AM401.2	Know how to format and validate Web page elements using JavaScript and describe data in a web page using XML.
CO3	AM401.3	Understand and apply jQuery to enhance interactivity, handle events, apply visual effects, and extend functionality using plugins
CO4	AM401.4	Build Dynamic web site using server side PHP Programming and database connectivity using PHP.

LEARNING OUTCOMES

1. Introduction to Web Design and HTML

1.1 Understand Principles of Effective Web Design

1.1.1 Basic web Terminology.
1.1.2 Describe Anatomy of web page.
1.1.3 Understand different Web page elements.
1.1.4 Navigate through web pages
1.1.5 Narrate steps in building web site
1.1.6 Narrate steps in launching
1.1.7 Narrate maintaining web site.

1.2 HTML Introduction

1.2.1 Introduction and Overview of HTML
1.2.2 Discuss the rules for designing a HTML document.
1.2.3 Explain the structure of HTML document.
1.2.4 Define HTML element and Attribute.
1.2.5 Study the basic tags in HTML <html>, <head>, <title>, <body>.
1.2.6 Study the header tags <h1> to <h6>
1.2.7 Discuss the Physical formatting tags <b>, <i>, <u>, <strike>, <sub>, <sup>, big>, <small>
1.2.8 Discuss the Logical formatting tags <q>, , <cite>, <<ins>, <del>,
1.2.9 Discuss the <marquee> with attributes.
1.2.10 List Character entities.
1.2.11 Explain the List tags like <ul>, <ol>, <li>, <dl>, <menu> with attributes.

1.3 Describe the setting of tables.

1.3.1 Describe the tags <table>, <tr>, <td>, <th>,<tbody>, <thead>, <tfoot>, <colspan>, <rowspan>

1.4 Connecting to hyperlinks and Imaging

1.4.1 Explain the link and imaging tags <a>, <img> with attributes.

1.5 Forms: Input Types, Elements, and Attributes

1.5.1 Build web forms using various <form>, <input>, <button>, <label>, <select>, <options>,<textarea>, <legend><fieldsets>with attributes.
1.5.2 Utilize form attributes (name, id, value, required, etc.) for data collection and usability.

1.6 Basic Form Validation Techniques

1.6.1 Implement basic HTML form validation using built-in attributes (required, pattern, minlength)
1.6.2 Identify common input errors and ensure user-friendly feedback is provided.

1.6.3 Explain the importance of validation for both user experience and data integrity.

1.7 Understand the difference between and tags

1.7.1 Recognize that is a block-level element used for grouping large sections.

1.7.2 Organize web page components (header, footer, sidebar, main content) using tags.

1.7.3 Use for inline formatting:

1.7.4 Highlight or style specific words or phrases inside larger text blocks.

2. CSS (Cascading Style Sheets) and XML

2.1 Illustrate about cascading style sheets

2.1.1 Understand the level of styles inline, internal and external style sheets.

2.1.2 Explain ID and Class selectors in CSS

2.1.3 Explain about Color and background properties

2.1.4 Explain about Box properties like Border, position, margin, padding of elements.

2.1.5 Understand the use of different CSS display properties to control how elements appear on a webpage.

2.1.6 Apply CSS positioning methods to place elements precisely on a webpage.

2.1.7 Use the float property to align elements (like images or boxes) to the left or right within a container

2.1.8 Create flexible and responsive layouts using the Flexbox model to align and distribute space among items in a container.

2.1.9 Design complex webpage layouts using the CSS Grid system to create rows and columns easily.

2.1.10 Apply CSS styles to improve the appearance and usability of HTML forms and tables.

2.1.11 Enhance user experience by adding smooth visual effects using CSS transitions and basic animations.

2.2 Understand XML

2.2.1 Explain the Purpose of XML

2.2.2 Describe how to organize data in the form of XML

2.2.3 Explain the rules for designing XML document.

2.2.4 Understand the significance of Namespace.

2.2.5 List the various applications of XML.

3. JavaScript

3.1 Types of scripting-JavaScript

3.2 Differentiate between Client-side and Server-side scripting.

3.3 List Client side and server side scripting languages.

3.4 Describe the features of Java Script.

3.5 Placing JavaScript code in HTML.

3.6 Understand functions

3.6.1 Know how to define and call a function.

3.6.2 Know how to pass parameters.

3.6.3 Understand the purpose of getElementById and getElementByName method

3.6.4 Describe the global functions provided by JavaScript.

3.7 Form Handling in Java Script

3.8 Illustrate Arrays

3.8.1 Understand single and multi-dimensional arrays.

3.8.2 Design small programs using arrays.

3.9 Various Objects provided by JavaScript.

3.9.1 Math object.

3.9.2 String object.

3.9.3 Date object.

3.9.4 Boolean and Number object.
3.10 Describe events in java script.

4. Angular JS and JQuery

4.1 Angular JS
- **4.1.1** What is AngularJS? Architecture, Advantages & Features.
- **4.1.2** List and Explain Angular JS Directives like ng-app,ng-init ,ng-model , ng-repeat
- **4.1.3** Explain AngularJS Expressions like number, string, object, and array.
- **4.1.4** Explain AngularJS Filters like lowercase, uppercase, filter, orderby, currency**.**

4.2 Define JQuery
4.3 List the features of JQuery
4.4 List JQuery plug ins
4.5 Explain the steps to include JQuery in Web Pages
4.6 Explain JQuery Syntax with example program
4.7 Describe the JQuery Selectors
4.8 Accessing HTML elements by using Element Selectors, ID, Class Selectors
4.9 Explain the JQuery Document Ready Event
4.10 Describe the JQuery Event handling methods
- **4.10.1** Events
- **4.10.2** Keyboard Events
- **4.10.3** Form Mouse Events
- **4.10.4** Document/Window events

4.11 Explain effects of JQuery like hide, show, fade In, fadeout, fade Toggle, fade To, SlideDown, SlideUp, Slide Toggle
4.12 Perform DOM manipulation using jQuery methods .html(), .text(),.val(), .append()
4.13 Implement event handling click, hover, and submit to create interactive web pages.
4.14 Integrate and utilize jQuery plugins to extend web functionality.

5 Web servers and PHP - Server-side scripting.

5.1 Web servers:
- **5.1.1** Understand the architecture of a Web server.
- **5.1.2** List various web servers.
- **5.1.3** Illustrate the various HTTP request types and their difference.
- **5.1.4** Compare the properties of IIS and Apache.

5.2 Fundamentals of PHP
- **5.2.1** State the importance of PHP
- **5.2.2** Explain how to combine HTML and PHP.
- **5.2.3** Explain how to access HTML, PHP documents from web servers.

5.3 Data types, Variables and Constants
- **5.3.1** List Data types
- **5.3.2** Explain Data types with examples
- **5.3.3** Explain how to declare Variables and Constants.

5.4 List and explain string manipulation functions.
5.5 Understand Arrays
- **5.5.1** Explain types of arrays.
- **5.5.2** Design small programs using arrays.

5.6 Explain form handling in PHP
- **5.6.1** Access elements of form using $_GET,$_POST

5.7 Know how to access My SQL Database
- **5.7.1** List and explain My SQL database functions in PHP.
- **5.7.2** Explain the steps of connecting to a Database.
- **5.7.3** Know about retrieving data from a table.

5.7.4 Know about inserting data into a table.
5.7.5 Know about updating the data in a table.
5.7.6 Know about deleting data from a table.
5.7.7 Design some simple programs to insert, delete, update and retrieve data from database

5.8 Cookies
5.8.1 Define Cookie.
5.8.2 Know how to create and delete a cookie.
5.8.3 Know the purpose of cookie.

5.9 Sessions
5.9.1 Define Session
5.9.2 Understand how to create a session.
5.9.3 Know how to destroy a session.
5.9.4 Know the purpose of session.
5.9.5 Differentiate Sessions and Cookies.

5.10 Passing data from one web page to other webpage using query string.

CO-PO MAPPING

POs	**Mapped with CO No.**	**CO Periods Addressing PO in column1**		**Level (1,2,3)**	**Remarks**
		No	%		
PO1	CO1	25	30	2	>40% Level3
PO2	CO2,CO3,CO4	60	70	3	Highly addressed
PO3	CO1,CO2,CO3,CO4	60	70	3	
PO4					25% to 40% Level 2
PO5	CO1,CO2,CO3,CO4	50	60	3	Moderately Addressed
PO6					
PO7	CO2,CO3,CO4	60	70	3	5% to 25% Level1 Low addressed <5% Not addressed

COURSE CONTENT

1. Introduction to Web Design and HTML (Hyper Text Markup Language): Principles of effective web design, Anatomy of a web page: structure, layout, and basic navigation, HTML, Introduction to HTML, Format of Web page, Tags and Attributes, Formatting text, Adding images, Positioning, Lists, Colors, Tables, Connecting to hyperlinks and Imaging, Forms: input types, elements, and attributes, Basic form validation techniques, Basic Page Layout using and .

2. CSS (Cascading Style Sheets) and XML: Introduction, inline, internal, and external styles, CSS selectors, Text and font styling, colors, backgrounds, Box model, Layout techniques: display, position, float, flexbox, grid, Responsive design, Styling forms and tables, Transitions and simple animations. XML: Purpose of XML, Structure and syntax of XML documents, Data organization, XML Namespaces, Simple XML use cases.

3. JavaScript: Introduction to Scripting, JavaScript features, Functions – Function definitions, Use of getElementById, getElementByName, Global functions, Form handling, Arrays – Declaring and allocating arrays, passing arrays to functions, sorting and Searching arrays, Objects – Math object, String object, Date object, Boolean and Number object, Events in JavaScript.

4. Angular JS & jQuery: Angular JS, Introduction to Angular JS, Features, Advantages, Angular JS architecture, Directives, Expressions, Filters, Sample programs. jQuery, Role of jQuery, Features of jQuery, steps to include jQuery in Web Page, Syntax, including document ready function, Selectors: element, class, ID, DOM manipulation with jQuery, jQuery event handling, jQuery effects, working with plugins.

5. Web Servers and PHP – Server-side Scripting: Web server, Overview of HTTP protocol and request types, Client-side vs. server-side scripting, Types of web servers, hosting websites and accessed, Requesting and serving HTML, PHP documents. PHP, Introduction to PHP and embedding in HTML, Syntax, variables, datatypes, String Functions, arrays, Form Handling with PHP, Sessions and cookies, Connecting to a database, Simple CRUD operations, Passing data between web pages.

REFERENCES

1) Principles of Web Design, Sklar, TMH

2) HTML complete reference, Powell, TMH

3) Basics of Web Site Design, NIIT – PHI

4) WWW Design with HTML, Xavier (TMH)

5) Internet & World Wide Web, Dietel and Dietel, Pearson education Asia.

6) Complete Reference PHP, Steven Holzer-McGraw Hill

7) JQuery Cook book, O' Reilly Media

8) www.w3schools.com

9) www.php.net

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.5
Unit test-2	From 3.6 to 5.10

ARTIFICIAL INTELLIGENCE

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM402T	ARTIFICIAL INTELLIGENCE	6	90	30	70	3.5

TIME SCHEDULE

S. No.	Chapter/Unit Title	No. of Periods	Marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Introduction to PROLOG	18	14	2	1	CO1
2.	Problems and Search Methods in AI	23	25	3	2	CO2
3.	Knowledge Representation	23	25	3	2	CO3
4.	Game Theory	13	22	2	2	CO4
5.	Fuzzy Logic	13	14	2	1	CO5
Total		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i) To understand PROLOG
(ii) To know the Searching techniques of AI
(iii) To knowledge representation using predicate logic
(iv) To familiarize Game playing strategies and Fuzzy logic

COURSE OUTCOMES

CO1	AM402.1	Describe concepts of PROLOG language
CO2	AM402.2	Analyze various searching techniques
CO3	AM402.3	Illustrate various knowledge representation Techniques
CO4	AM402.4	Explain various game paying techniques
CO5	AM402.5	Explain fuzzylogicconcepts

LEARNING OUTCOMES

1. INTRODUCTION TO PROLOG

1.1 State the need of PROLOG.
1.2 List the Key features of prolog
1.3 List the facts and rules of PROLOG
1.4 Describe how to install Prolog in Linux
1.5 List Advantages and Disadvantages of Prolog
1.6 State the Goals and terminology.
1.7 Explain Variables.
18 Explain Control Structures
1.9 Illustrate the usage of Arithmetic operators
1.10 State the importance of Matching in PROLOG
1.11 Explain Backtracking
1.12 List and explain th etype's of cuts
1.13 Explain Recursion
1.14 Define List
1.15 Explain Lists with examples
1.16 Describe Dynamic databases
1.17 List and explain various Input/output operations
1.18 ListandexplainvariousInputandOutputStreams

2. PROBLEMS AND SEARCH METHODS IN AI

2.1 Define Artificial Intelligence
2.2 List the AI Problems.
2.3 Explain Underlying Assumption.
2.4 List AI Techniques
2.5 Explain the level of model.
2.6 State the Criteria for success.
2.7 Define the problem as a state space search.
2.8 List the Problem Characteristics.
2.9 Define the production system.
2.10 Explain the Production systems.
2.11 List the Features of Production system.
2.12 Explain about Searching problems,solutions
2.13 Define Un-informed Searching strategy.
2.14 Define Informed Searching strategy
2.15 Explain Un-informed searching methods
2.16 Breadth First Search
2.17 Depth First Search
2.18 Greedy search
2.19 Brute force search
2.20 Explain Informed searching methods
2.21 Branch and bound
2.22 Hill climbing
2.23 Constraint satisfaction searching A*

3. KNOWLEDGE REPRESENTATION

3.1 Define Knowledge representation
3.2 List and explain the types of Knowledge
3.3 Knowledge representation issues
3.4 List and Explain issues in knowledge representation
3.5 Describe Explain representationon mappings

3.6 List the approaches to knowledge representation
3.7 Predicate logic:
  3.7.1 Define predicate logic
  3.7.2 Illustrate simple facts in logic
  3.7.3 Illustrate instance and ISA relationships
  3.7.4 Computable functions and predicates
  Quote Resolutions
3.8 Representing knowledge as rules define procedural knowledge
3.9 Define Declarative knowledge
3.10 Distinguish Procedura lvs Declarative knowledge
3.11 Define Logic Programming
3.12 Explain Logic programming
3.13 Explain forward reasoning
3.14 Explain Backward reasoning
3.15 Distinguish Forward vs Backward reasoning

4.GAME THEORY

4.1 Describe Games as Search Problems
4.2 Explain components of Search problem
4.3 Describe Minimax search procedures
4.4 Explain Additional refinements
4.5 Define pruning the search tree
4.6 Describe Alpha-Beta Pruning.
4.7 State the purpose of Chance Node
4.8 State the importance of Expected Value
4.9 Illustrate Games that Include an Element of Chance

5. FUZZY LOGIC

5.1 DefineFuzzy logic
5.2 Explain basics of fuzzylogic
5.3 State the importance of sets
5.4 Explain Fuzzy sets
5.5 State importance of crisp sets
5.6 Explain Crisp sets
5.7 State importance of fuzzy logic control
5.8 Explain Fuzzylogic control
5.9 State importance of fuzzy inference
5.10 Explain Fuzzy inference
5.11 State fuzzy hedges
5.12 Explain Fuzzyhedges
5.13 State the importance of Alpha cut threshold
5.14 Explain Alpha cut threshold
5.15 State the importance of Neuro fuzzy systems
5.16 Explain Neuro fuzzy systems
5.17 State the importance of fuzzy Bayesian networks
5.18 Explain Fuzzy Bayesian networks

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	1	1	2	3	1
CO2	1	3	1	1	1	1	1	1	3	2
CO3	2	1	3	2	1	2	1	1	2	3
CO4	1	3	3	2	1	2	1	1	2	2
CO5	2	2	2	2	2	2	1	2	2	1
Average	1.6	2	2	1.8	1.4	1.6	1	1.4	2.4	1.8

3=strongly mapped,2=moderately mapped,1=slightly mapped

COURSE CONTENT

1: Introduction to PROLOG
Introduction to PROLOG--facts–rules–goals–variables–control structures–operator matching– backtracking–cuts– recursion–lists–dynamic database–simple input/output streams
2:PROBLEMS AND SEARCH METHODS in AI
Introduction to artificial intelligence–Problems–Problem Spaces–Search Strategies Uninformed– Informed Search Methods.
3:KNOWLEDGE REPRESENTATION
Knowledge representation issues–predicate logic–representing knowledge using rules
4:GAME THEORY
Minimax algorithm–alpha-beta pruning–additional refinements–State-of-the-Art Game Programs
5:FUZZY LOGIC
Introduction–fuzzy sets–crisp sets–fuzzylogicc ontrol–fuzzy inference–fuzzy hedges– alpha cut threshold–neuro fuzzy systems–fuzzy Bayesian networks.

REFERENCES

1. Artificial Intelligence:Elaine Rich,Kevin Knight, Mc-GrawHill.
2. Introduction to AI & Expert System:Dan Watterson,PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Pearson Education
5. http://www.nptel.iitm.ac.in/video.php?subjectId=106105077
6. Website for search strategy implementation in python http://code.google.com/p/aima-python/
7. http://www.journals.elsevier.com/artificial-intelligence/
8. https://www.technologyreview.com/s/534871/our-fear-of-artificial-intelligence/
9. http://www.sanfoundry.com/artificial-intelligence-mcqs-inductive-logicunification-lifting-1/

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I &UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.2
Unit test-2	From 3.3 to 5.9

MACHINE LEARNING

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM403T	MACHINE LEARNING	6	90	30	70	3.5

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Introduction to Machine Learning	14	14	2	1	CO1
2.	Process of machine learning	22	22	3	2	CO2
3.	Probability and Bayesian Learning	18	22	2	2	CO3
4.	Supervised learning	20	22	3	2	CO4
5.	Unsupervised Learning	16	14	2	1	CO5
	Total	90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able

(i) To know about the basics of machine learning
(ii) To understand the steps involved in building and training ML models.
(iii) To understandand Apply probability and Bayesian concepts in ML
(iv) To Analyzev arious supervised learning algorithms
(v) To Analyze unsupervised learningte chniques such as clustering and association rules

COURSE OUTCOMES

CO1	AM403.1	Explain the basic concepts of Machine Learning
CO2	AM403.2	Describe the data modeling forMachine Learning
CO3	AM403.3	Explain the basic mathematics for Machine Learning
CO4	AM403.4	Analyze various supervised learning algorithms of Machine Learning
CO5	AM403.5	Analyze unsupervised learning algorithms of Machine Learning.

LEARNING OUTCOMES

1.0 Introduction to Machine Learning

1.1 Define Human Learning
1.2 Define Machine Learning
1.3 State the Need of Machine Learning
1.4 Explain Types of Machine Learning
- 1.4.1 Supervised Learning
- 1.4.2 Unsupervised Learning
- 1.4.3 Semi-supervised Learning
- 1.4.4 Reinforcement learning

1.5 Compare Supervised, Unsupervised and Reinforcement Learning
1.6 Define the Basic Terminology-Model, Algorithm, Training data, Test data, Features and Labels Prediction, Target, Output
1.7 Explain the Importance and Applications of ML in real-world Domains (health care, finance,etc.).
1.8 List the Tools used for Machine Learning
1.9 List the Advantages and Disadvantages of Machine Learning
1.10 Relation between AI,ML, and Deep Learning
1.11 Explain Work flow of aM achine Learning Project

2.0:Process of Machine Learning

2.1 Discuss the data modeling
2.2 Types of data
- 2.2.1 Based on Data Format/Structure
- 2.2.2 Based on Label
- 2.2.3 Based on Data Type

2.3 Structure of the data
2.4 Discuss Data Quality and Remediation
2.5 Explain the data Pre-processing
2.6 Explain Dimensionality reduction
- 2.6.1 Importance of reducing features
- 2.6.2 Concept of Principal Component Analysis (PCA)

2.7 Describe learning of the data model
2.8 Selecting a model
- 2.8.1 Key Parameters in Model Selection

2.9 Training a model
- 2.9.1 Explain Steps to Train a Machine Learning Model

2.10 Model Representation and Interpretability
- 2.10.1 Importance of Interpretability

2.11. Over fitting,Under fitting,and Cross-Validation
- 2.11.1 Reasons for Over fitting and How to Reduce Over fitting
- 2.11.2 Reasons for Under fitting and How to Reduce Under fitting

2.11.3 What is Cross-Validation and Why is it Needed?.
2.11.4 Advantages of Cross-Validation

3.0:Probability and Bayesian Learning

3.1 Explain the Basic Concepts of Probability
3.2 Importance of Statistical Tools in Machine Learning
3.3 Concept of Probability
3.4 Random Variable
3.4.1 Discrete and Continuous Random Variables
3.4.2 Importance of Random Variables in ML
3.4.3 ProbabilityDensityFunction(PDF) and ProbabilityMassFunction(PMF)
3.5 Discrete Distributions
3.5.1 Common Discrete Distributions
3.5.1 Characteristics of Discrete Distributions
3.5.2 Applications in Machine Learning
3.6 Continuous Distributions
3.6.1 Common Continuous Distributions
3.6.2 Applications in Machine Learning
3.7 Sampling Distributions
3.8 Explain Hypothesis Testing

3.9 Types of Hypothesis Tests
3.10 Explain Baye"s theorem

3.10.1 Applications in Machine Learning
3.10.2 Limitations of Bayes 'Theorem
3.11 Explain the Bayes Classifiers
3.11.1 Bayes Optimal Classifier
3.11.2 Naïve Bayes Classifier

4.0:Supervised Learning

4.1 Classification Model
4.1.1 Types of Classification Models
4.2 Describe the Classification Learning Steps
4.3 Analyze the Classification Algorithms
4.4 k-Nearest Neighbor
4.4.1 Explain Working of k-Nearest Neighbor
4.4.2 Applications of k-Nearest Neighbor
4.5 Logistic Regression
4.5.1 Explain the concept of Logistic Regression
4.5.2 Applications of Logistic Regression
4.6 Decision tree
4.6.1 Explain Building a Decision Tree
4.6.2 Explain Searching a Decision Tree
4.6.3 Define Entropy and Information Gain of a Decision Tree
4.6.4 Algorithm of a Decision Tree
4.6.5 Applications of Decision Tree
4.6.6 Advantages and Disadvantages of Decision tree
4.7 Explain Working of Random Forest
4.8 Support vector Machines
4.8.1 Classification using Hyperplanes
4.8.2 Identifying Correct Hyperplane in SVM
4.8.3 Maximum Margin Hyperplane

4.8.4 Kernel-Trick
4.8.5 Applications of SVM

4.9 Regression
4.9.1 Analyze Regression Algorithms
4.9.2 Simple Linear regression
4.9.3 Slope of the Simple Linear Regression Model
4.9.4 Simple Linear Regression Algorithm
4.9.5 Multiple Linear Regression

4.10 Evaluate Performance of Supervised Learning Models
4.10.1 Accuracy, Precision, Recall,F1-score
4.10.2 MSE,R^2Score

4.11 List the applications of Supervised Learning

5.0:Unsupervised Learning

5.1 Introduction to Unsupervised Learning
5.1.1 Types of Unsupervised Learning

5.2 Compare Supervised and Unsupervised Learning

5.3 Explain Different Types of Clustering Techniques
5.3.1 Partition-Based Clustering
5.3.2 Hierarchical Clustering
5.3.3 Density-Based Clustering
5.3.4 Model-Based and Grid-Based Clustering

5.4 K-Means Clustering Algorithms
5.4.1 Elbow Method
5.4.2 Limitations of K-Means

5.5 k-Medoids Algorithm
5.5.1 Applications of k-Medoids

5.6 Differences between k-Medoids and k-Means

5.7 Hierarchical Clustering Algorithm
5.7.1 Agglomerative Clustering
5.7.2 Divisive Clustering

5.8 Explain Apriori Algorithm
5.8.1 Applications of Apriori Algorithm

5.9 List the applications of Un-supervised learning

CO-PO/PSO MAPPING

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	2	3	1	2
CO2	2	3	2	3	1	1	2	2	3	2
CO3	3	2	2	2	1	1	2	2	2	1
CO4	2	3	3	3	2	2	2	3	3	3
CO5	2	3	3	3	2	2	2	3	3	3
AVG	2.4	2.6	2.2	2.6	1.4	1.4	2.0	2.6	2.4	2.2

3=strongly mapped,2=moderately mapped,1=slightly mapped

COURSE CONTENT

1. Introduction to Machine Learning

Basics of machine learning–Human Learning–Define machine learning–Types of machine learning – Compare supervised, unsupervised and reinforcement learning – Define the basic terminology – Applications of machine learning – Tools used for machine learning –

Advantages and disadvantages–Relation between AI,ML,and DeepLearning –Workflow of a machine learning project

2. Process of Machine Learning

Preparing to model the data – Types of data – Structure of data – Data quality and remediation – Data preprocessing – Dimensionality reduction – Principal Component Analysis (PCA)–Learningofthedatamodel –Modelselection–Trainingamodel –Model representation and interpretability – Overfitting, Underfitting and Cross-validation

3. Probability Theory and Bayesian Inference

Basic concepts of probability – Importance of statistical tools – Random variables – PDF & PMF–Discrete and continuous distributions–Sampling distributions–Hypothesis testing– Bayes' theorem – Bayes classifiers – Naïve Bayes

4. Supervised Learning

Classification models – Learning steps – k-NN – Logistic regression– Decision trees – Randomforest–Support vector machines–Regression (simpleand multiple) –Linear regression – Evaluation metrics (Accuracy, Precision, Recall, F1-score, MSE, R^2) – Applications of supervised learning

5. Unsupervised Learning

Introduction to unsupervised learning – Types of unsupervised learning – Compare supervised vs unsupervised–Clustering techniques (partition-based, hierarchical, density- based, model-based) – K-Means, Elbow method – K-Medoids – Hierarchical clustering – Apriori algorithm – Applications of unsupervised learning

REFERENCES

1. Ethem Alpaydin, Introduction to Machine Learning, MITPress
2. Tom M.Mitchell,Machine Learning,McGraw HillEducation
3. Christopher M.Bishop, Pattern Recognition and Machine Learning, Springer
4. Sebastian Raschka,Python Machine Learning,Packt Publishing
5. Jiawei Hanetal.,Data Mining: Concepts and Techniques,Morgan Kaufmann
6. Shai Shalev-Shwartz&ShaiBen-David, Understanding Machine Learning, Cambridge University Press

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.5
Unit test-2	From 3.6 to 5.9

COMPUTER VISION

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM404E	COMPUTER VISION	3	45	30	70	2

TIME SCHEDULE

S.No	Chapter/Unit Title	No. of Periods	Marks	No .of short Questions	No. of Essay Questions	COs Mapped
1.	Image formation	9	22	2	2	CO1
2.	Image processing	6	14	2	1	CO2
3.	Recognition	6	14	2	1	CO3
4.	Feature detection and matching	12	25	3	2	CO4
5.	Image alignment and stitching	12	25	3	2	CO5
	Total Periods	45	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)	To acquire the fundamentals of image formation.
(ii)	To familiarize with Image processing.
(iii)	To Apply various models in recognition.
(iv)	To Illustrate feature detection and matching.
(v)	To Illustrate Image alignment and stitching.

COURSE OUTCOMES

CO1	AM404.1	Present the image formation process
CO2	AM404.2	Use the image processing operators for image processing.
CO3	AM404.3	Apply various models in recognition.
CO4	AM404.4	Explain Feature detection and matching.
CO5	AM404.5	Explain Image alignment and stitching.

LEARNING OUTCOMES

1.0 Image Formation

1.1 What is computervision?

1.2 Explain the History of computer vision.

1.3 Geometric primitives and transformations

- 1.3.1 Explain 2D transformations
- 1.3.2 Explain 3D transformations
- 1.3.3 Explain 3D rotations
- 1.3.4 Explain 3D to 2D projections
- 1.3.5 Describe Lens distortions.

1.4 Photometric image formation

- 1.4.1 Explain Lighting
- 1.4.2 Describe Reflectance and shading
- 1.4.3 Explain optics

1.5 The digital camera

- 1.5.1 Describe Sampling and aliasing
- 1.5.2 Explain Color
- 1.5.3 Explain Compression

2.0 Image Processing

2.1 Point Operators

- 2.1.1 Explain pixel transforms
- 2.1.2 Explain Color transforms
- 2.1.3 Describe Compositing and matting
- 2.1.4 Explain Histogram equalization

2.2 Linear Filtering

- 2.2.1 Explain Separable filtering
- 2.2.2 Describe Band-pass and steerable filters

2.3 More neighbourhood operators

- 2.3.1 Explain Nonlinear filtering
- 2.3.2 Describe Bilateral filtering
- 2.3.3 Explain Binary image processing.

3.0 Recognition

3.1 Define recognition

3.2 Explain Instance recognition

3.3 Describe Image classification

- 3.3.1 Explain Feature-based methods
- 3.3.2 Explain Deep networks
- 3.3.3 Describe Face recognition.

3.4 Object detection

- 3.4.1 Describe Face detection
- 3.4.2 Explain Pedestrian detection
- 3.4.3 Explain General object detection.

3.5 Semantic segmentation

- 3.5.1 Explain Instance segmentation
- 3.5.2 Describe Panoptic segmentation

3.5.3 Explain Pose estimation.

3.6 Explain Video understanding

3.7 Describe Vision and language.

4.0: Feature Detection And Matching

4.1 Poins And patches

4.1.1 Explain Feature detectors

4.1.2 Explain feature descriptors

4.1.3 Describe feature matching

4.1.4 Explain Large-scale matching and retrieval

4.1.5 Explain feature tracking.

4.2 Edges and contours

4.2.1 Describe Edge detection

4.2.2 Explain contour detection.

4.3 Contour tracking

4.3.1 Explain Snakes and scissors

4.3.2 Describe level sets

5.0 Image Alignment and Stitching

5.1 Pairwise alignment

5.1.1 Explain 2D alignment using least squares

5.1.2 Explain Iterative algorithms

5.1.3 Describe Robust least squares and RANSAC

5.1.4 Describe 3D alignment

5.2 Image stitching

5.2.1 Describe Parametric motion models

5.2.2 Explain Rotational panoramas

5.2.3 Describe Gapclosing

5.2.4 Explain Cylindrical and spherical coordinates.

5.3 Global Alignment

5.3.1 Describe Bundle adjustment

5.3.2 Describe parallax removal

5.3.3 Explain Recognizing panoramas.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	1	1	2	1	1
CO2	1	2	2	3	2	1	1	1	2	3
CO3	1	3	3	3	2	1	2	1	2	3
CO4	1	2	2	2	2	1	2	1	2	2
CO5	2	2	2	2	2	1	1	1	2	2
Average	1.4	2	2	2.2	1.8	1	1.4	1.2	1.8	2.2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1:Image formation
Introduction to computer vision, Geometric primitives and transformations: 2D transformations, 3D transformations, 3D rotations, 3D to 2D projections, Lens distortions, Photometric image formation: Lighting, Reflectance and shading, Optics, The digital camera: Sampling and aliasing, Color, Compression.

2:Image processing
Point operators: Pixel transforms, Color transforms, Compositing and matting, Histogram equalization, Linear filtering: Separable filtering, Band-pass and steerable filters, More neighbourhood operators: Nonlinear filtering, Bilateral filtering, Binary image processing.

3:Recognition
Instance recognition, Image classification: Feature-based methods Deep networks, Face recognition. Object detection: Face detection, Pedestrian detection, General object detection. Semantic segmentation: Instance segmentation, Panoptic segmentation, Pose estimation. Video understanding, Vision and language.

4:Feature detection and matching
Points and patches: Feature detectors,feature descriptors, feature matching, Large-scale matching and retrieval, feature tracking.
Edges and contours: Edge detection,contour detection.
Contour tracking: Snakes and scissors, level sets

5:Image alignment and stitching
Pairwise alignment: 2D alignment using least squares, iterativea lgorithms, robust least squares and RANSAC, 3D alignment
Imagestitching: Parametric motion models, Rotational panoramas, Gap closing, Cylindrical and spherical coordinates.
Globa lAlignment:Bundle adjustment,parallax removal,Recognizing panoramas.

REFERENCES

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2nd Edition, 2022.
2. WESLEYE.SNYDER,HAIRONGQI,Fundamentals of Computer Vision, Cambridge University Press,2017.
3. AditiMajumder, M. Gopi, Introduction to VISUAL COMPUTING Core Conceptsin Computer Vision, Graphics, and Image Processing, CRC Press, Taylor & Francis Group, 2018.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 4.1.1
Uni ttest-2	From 4.1.2 to 5.3

COMPUTER NETWORKS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM405E	COMPUTER NETWORKS	3	45	30	70	2

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Fundamentals of Networking	7	14	2	1	CO1
2.	Physical and Data Link Layer	9	22	2	2	CO2
3.	Network and Transport Layer Concepts	11	25	3	2	CO3
4.	Session, Presentation & Application Layers Concepts	10	25	3	2	CO4
5.	Network Security and Emerging Concepts	8	14	2	1	CO5
Total		45	100	12	8	

COURSE OBJECTIVES

Upon successful completion of this course, the student will be able to

(i) Explain fundamental networking concepts, topologies and functions of OSI and TCP/IP layers.
(ii) Explain the role of physical and data link layers.
(iii) Gain knowledge of Network IP addresses and transport layer protocols in the network
(iv) Describe key protocols and services used innetworking.
(v) Appreciate the importance of network security, and emerging trends in communication systems.

COURSE OUTCOMES

CO1	AM405.1	Explain the basic concepts of networking models
CO2	AM405.2	Describe the roles and functionalities of the Physical and Data Link Layers in network kcommunication.
CO3	AM405.3	Apply IP addressing, routing, and transport layer mechanisms
CO4	AM405.4	Illustrate the functions of session, presentation, and protocols of application layers
CO5	AM405.5	Describe network security principles and emerging network technologies.

LEARNING OUTCOMES

1.0 Fundamentals of Networking

1.1 Overview and classification of networks:LAN,MAN,WAN,PAN
1.2 State the need and benefits of Networking.
1.3 Importance o fNetwork standards and communication models.
1.4 Explain OSI Model: architecture and functions
1.5 Explain TCP/IP Model: architecture and functions
1.6 Comparison of OSI and TCP/IP models
1.7 Explain various network Topologies:Bus,Ring,Star,Mesh,Hybrid –with advantages/disadvantages
1.8 Network Hardware:Repeater,Hub,Switch,Router,NIC,Modem,Gateway
1.9 Wireless Technologies:Wi-Fi and Bluetooth

2.0 Physical and DataLink Layer

2.1 Physical Layer
2.1.1 Importance of Transmission Media: Coaxial Cable, Twisted Pair Cable, Optical Fiber, Bandwidth characteristics and comparisons
2.1.2 Purpose of Connectors:RegisteredJ ack(RJ)-45, Straight Tip (ST), Subscriber Connector (SC), Lucent Connector (LC)
2.2 Data Link Layer
2.2.1 Define the terms:Errors,Types of Errors, Redundancy
2.2.2 Explain Coding and Block Coding,
2.2.3 Error Detection and Correction: Detection versus Correction, Forward Error Correction versus Retransmission, ParityBits, Cyclic Redundancy Check.
2.2.4 Explain Medium Access Control (MAC) Protocols: CSMA/CD (used in Ethernet), CSMA/CA (used in Wi-Fi)
2.2.5 MAC Addressing: Format and Role in Frame Delivery

3.0 Network and Transport Layer Concepts

3.1 Network Layer
3.1.1 Introduction to Network Addressing.
3.1.2 List and describe the Components of IP Address.

3.1.3 List and explain IP Address Classes.
3.1.4 Define subnet and describe the necessity of sub-netting.
3.1.5 Describe the Internet Protocol Addressing:IPv4 and IPv6
3.1.6 State the need for IPv6.
3.1.7 Explain about Classful addressing and classless addressing in IPv4.
3.1.8 Describe Internet protocol version-6(IPv6) addressing.
3.1.9 Routing: Static vs.Dynamic Routing
3.1.10 List the functions of Router.

3.2 Transport Layer
3.2.1 Transport Layer Services
3.2.2 Addressing:Port Numbers
3.2.3 Explain the features of UDP
3.2.4 TCP and UDP: differences

4.0 Session, Presentation & Application Layers Concepts

4.1 Explain the functions of Session Layer
4.1.1 Role of Session Layer in the OSI model
4.1.2 Session establishment, maintenance, and termination

4.2 Explain the functions of Presentation Layer
4.2.1 Role of Presentation Layer in the OSI model
4.2.2 Data formatting, encryption/decryption-PrivateKey & Public Key
4.2.3 Cryptography and compression

4.3 Application Layer Protocols:Purpose and working principles
4.3.1 HTTP–Hypertext Transfer Protocol
4.3.2 FTP–File Transfer Protocol
4.3.3 SMTP–Simple Mail Transfer Protocol
4.3.4 DNS–Domain Name System
4.3.5 Telnet–Remote login protocol

4.4 Address Resolution & Configuration
4.4.1 DHCP–Dynamic Host Configuration Protocol (Dynamic IP assignment)
4.4.2 ARP/RARP–Address Resolution Protocol and Reverse ARP (IP-to-MAC and MAC-to-IP mapping)

5.0 **Network Security and Emerging Concepts**

5.1 Explain about Network Security
5.1.1 Define basic security principles(CIA triad)
5.1.2 Firewalls:types, configuration
5.1.3 Intrusion Detection Systems(IDS)–basic idea

5.2 Overview of Emerging Concepts
5.2.1 Discuss the principles and uses of Virtual Private Networks (VPNs).
5.2.2 Explain the key features and applications of Delay Tolerant Networks (DTN).
5.2.3 Explore the role of Sensor Networks in intelligent applications
5.2.4 Describe Vehicular Networks, and the irrole in intelligent transport systems.
5.2.5 Explain the fundamentals and features of 5G Communication Technology.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	2	2	3	-
CO2	3	3	3	-	-	-	2	2	3	-
CO3	3	3	3	1	1	-	2	3	3	2
CO4	2	2	2	2	-	-	2	2	2	2
CO5	2	2	3	1	2	2	3	3	2	3
Average	2.6	2.4	2.6	1.25	1.33	2	2.2	2.4	2.6	2.33

3=strongly mapped,2=moderately mapped,1=slightly mapped

COURSE CONTENT

1:Fundamentals of Networking

Classification of networks: LAN, MAN, WAN, PAN-Need and benefits of Networking-Network standards and communication models- OSI Model-TCP/IPModel-Comparison of OSI and TCP/IP models-Network Topologies- Network Hardware-Wireless Technologies

2:Physical and Data Link Layer:

Physical Layer-Importance of Transmission Media- Connectors

Data Link Layer-

Errors,Types of Errors, Redundancy - Coding and BlockCoding-Error Detection and Correction- Medium Access Control (MAC) Protocols-MAC Addressing

3:Network and Transport Layer Concepts

Network Layer- Network Addressing-Components of IP Address-IP Address Classes-necessity of sub-netting- Internet Protocol Addressing- need for IPv6- Classful addressing and classless addressing inIPv4-Internet protocol version-6 (IPv6) addressing-Routing:Staticvs.DynamicRouting-Listthefunctions of Router- Transport Layer

4:Session, Presentation&ApplicationLayersConcepts

Session Layer- Session Layer in the OSI model-Session establishment, maintenance, and termination- Presentation Layer- Data formatting, encryption/decryption-PrivateKey&PublicKey- Cryptographyandcompression- Application Layer Protocols-Address Resolution & Configuration

5:Network Security and Emerging Concepts:

NetworkSecurity-security principles (CIAtriad)-Firewalls-Intrusion Detection Systems (IDS) –Emerging Concepts.

REFERENCES

1. Computer Networks-Andrew S.Tanenbaum & DavidJ.Wetherall, Pearson Education, 5th Edition, ISBN: 978-0132126953
2. Data Communications and Networking-Behrouz A Forouzan,TataMcGraw- Hill, 5th edition, ISBN: 9780070634145
3. Basics of Networking, PHI learning Pvt.Ltd.2013,ISBN:978-81-203-2489
4. Computer Networking: A Top- Down Approach, Kuroseand Ross,

Pearson Education, 7th Edition, ISBN: 978-0133594140
5. A First Course in Computer Networking, Ullman and Widom, Vikas Publishing, ISBN: 978-0138876470
6. http://www.tutorialspoint.com/data_communication_computer_network/index.htm
7. http://www.e-tutes.com/lesson1/networking_fundamentals_lesson1_1.htm
8. http://www.techiwarehouse.com/engine/d9e99072/Basic-Networking-Tutorial
9. http://nptel.ac.in

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.1.7
Unit test-2	From 3.1.8 to 5.2

TROUBLESHOOTING OF COMPUTER NETWORKS

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM406A	TROUBLESHOOTING OF COMPUTER NETWORKS	2	30	-	-	-

TIME SCHEDULE

S. No.	Unit/Chapter Title	No. of Periods	COs Mapped
1	Basics of Troubleshooting and Network Faults	10	CO1
2	Troubleshooting Tools and Commands	10	CO2
3	Troubleshooting Wired and Wireless Networks	10	CO3
Total		30	

COURSE OBJECTVES

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

(i) Identify and analyze network-related issues in LAN/WAN environments.

(ii) Understand error types in hardware and software components of networks.

(iii) Use diagnostic tools and commands to resolve common network problems.

COURSE OUTCOMES

CO1	AM406.1	Identify common network faults and failures.
CO2	AM406.2	Use hardware and software tools for network troubleshooting.
CO3	AM406.3	Troubleshoot connectivity issues in wired and wireless networks.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	2	2	3	2	2
CO2	3	3	3	2	2	2	2	3	2	2
CO3	3	3	3	3	2	2	2	3	2	2
Average	3	3	2.67	2.33	1.67	2	2	3	3	2

3=strongly mapped,2=moderately mapped,1=slightly mapped

- Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
- If > 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

- If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
- If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
- If < 5% of classroom sessions addressing a particular PO, it is considered that PO is not-addressed.

LEARNING OUTCOMES

Unit 1: Basics of Troubleshooting and Network Faults

1.1 Fundamentals of troubleshooting
  1.1.1 What is troubleshooting?
  1.1.2 Types of Maintenance: Preventive & Corrective Maintenance
  1.1.3 Various approaches to Troubleshooting
    1.1.3.1 Top-Down Approach
    1.1.3.2 Bottom-up Approach
    1.1.3.3 Divide and Conquer
    1.1.3.4 Follow the Path
    1.1.3.5 Spot the difference
  1.1.4 Key Steps in Network Troubleshooting
1.2 Common network faults: Cable issues, NIC failure, switch/router faults
1.3 Types of errors: Link down, IP conflict, DNS resolution error
1.4 Importance of logs and reporting
1.5 Service Desk Process: Basic ticket lifecycle – Ticket creation, classification, assignment, resolution, closure

Unit 2: Troubleshooting Tools and Commands

2.1 OS-level tools: ping, tracert/traceroute, ipconfig/ifconfig, netstat, nslookup, arp, route
2.2 Graphical tools: Wireshark, Advanced IP Scanner, Cisco Packet Tracer
2.3 Hardware tools: Cable tester, Loopback plug, Crimping tools
2.4 Hands-on activities:
  2.4.1 Crimp RJ-45 connectors
  2.4.2 Test Ethernet cables using LAN cable tester
  2.4.3 Observe and interpret LED indicators on switches and routers

Unit 3: Troubleshooting Wired and Wireless Networks

3.1 Wired LAN issues:
  3.1.1 Bad cables
  3.1.2 Loose connectors
  3.1.3 Improper crimping
3.2 LAN setup:
  3.2.1 Assign static/dynamic IPs
  3.2.2 Verify subnet mask and gateway
  3.2.3 Test network connectivity
  3.2.4 Addressing misconfigurations (e.g., IP conflicts, subnet errors, VLAN issues)
3.3 Diagnosing Common Network Faults:
  3.3.1 Loss of network connectivity
  3.3.2 Slow network performance
  3.3.3 Intermittent disconnections
3.4 Packet analysis: Use Wireshark to capture and examine packets (e.g., ARP,

IAMP, DNS)

3.5 Wireless network problems:

3.5.1 Interference from other devices/networks

3.5.2 Weak signal coverage/coverage gaps

3.5.3 Authentication failures (wrong password, encryption type mismatch)

3.6 Wireless troubleshooting activities:

3.6.1 Change SSID and security settings

3.6.2 Analyze signal strength

3.6.3 Resolve connection issues by adjusting placement, channel, or encryption

Lab Activities (Suggestive)

Unit 1: Basics of Troubleshooting and Network Faults

1. **Exercise 1.1:** Identify Physical Layer Faults
   - **Activities:** Unplug NIC, use faulty cable, disable network interface
   - **Objective:** Detect and isolate hardware faults
   - **Tools**: Ethernet cable, PC NIC settings
2. **Exercise 1.2:** Simulate and Troubleshoot IP Address Conflict
   - **Activities:** Assign same IP to two hosts in a LAN and resolve the conflict
   - **Objective:** Understand IP address management and conflict resolution
   - **Tools**: PCs, LAN Switch
3. **Exercise 1.3:** Diagnose and Resolve DNS Resolution Error
   - **Activities:** Use incorrect DNS entry and troubleshoot using nslookup
   - **Objective:** Understand name resolution
   - **Tools**: Command prompt / Terminal, DNS server or public DNS (e.g., 8.8.8.8)
4. **Exercise 1.4:** Simulate and Troubleshoot Link Down Scenarios
   - **Activities**: Disconnect cable or disable port and restore connectivity
   - **Objective:** Practice identifying and resolving Layer 1/2 link issues and resolution
   - **Tools**: Switch/router, cable
5. **Exercise1.5:** Apply Structured Troubleshooting and Documentation
   - **Activities:** Document a network issue and follow the ticket lifecycle
     Simulate a network issue (e.g., no internet)
     Use step by step troubleshooting process
     Fill out a troubleshooting report/log
   - **Objective:** Use a structured troubleshooting method to diagnose and resolve a simulated issue
   - **Tool:** Excel or simulated ticketing software (osTicket), windows/Linux system
6. **Exercise 1.6:** Log File Analysis for Network Issues
   - **Activities**: Use Windows Event Viewer or Linux log files to trace network events
   - **Objective:** Learn how to interpret logs for fault diagnosis
   - **Tools**: Windows/Linux system

Unit 2: Troubleshooting Tools and Commands

7. **Exercise 2.1:** Use Using OS-level Network Commands for Network Testing
    - **Activities**: Test IP connectivity using ping, View routing table and ARP cache, Resolve DNS using nslookup
    - **Objective:** Understand diagnostic command outputs
    - **Tools:** ping, tracert, ipconfig, netstat, nslookup, arp, route
8. **Exercise 2.2:** Capture and Analyze Packets Using Wireshark
    - **Activities:** Capture packets during web access or ping, filter DNS/HTTP/ARP
    - **Objective**: Observe packet-level communication and identify errors
    - **Tools**: Wireshark
9. **Exercise 2.3:** Discover devices and open ports in a subnet Using IP Scanning Tools
    - **Activities**: Scan subnet with Advanced IP Scanner; identify live hosts and open ports
    - **Objective**: Practice IP Scanning and Host Discovery
    - **Tools:** Advanced IP Scanner
10. **Exercise 2.4:** Crimp RJ-45 Cables and Test
    - **Activities**: Create straight-through/crossover cables; test using LAN cable tester
    - **Objective:** Verify cable quality and pinout
    - **Tools**: Crimping tool, cable tester, RJ-45 connectors, Cat5e/Cat6 cables
11. **Exercise 2.5:** Use Loopback Plugs and Cable Testers
    - **Activities:** Check NIC functionality and test cable continuity
    - **Objective:** Understand use of loopback plugs; Validate hardware and cabling with tools
    - **Tools**: Loopback plug, LAN cable tester

Unit 3: Troubleshooting Wired and Wireless Networks

12. **Exercise 3.1:**Configure and Troubleshoot a Wired LAN
    - **Activities**: Assign static and dynamic IP addresses
      Set subnet mask and gateway
      Use ping to test connectivity
    - **Objective:** Perform LAN setup and diagnose IP/subnet/VLAN misconfigurations
    - **Tools**: PCs, Switch, DHCP server/router
13. **Exercise 3.2:**Diagnose Wired Network Performance
    - **Activities**: Capture traffic in problematic scenarios (e.g., high latency)
    - **Objective:** Identify retransmissions, delays, and dropped packets
    - **Tools**: Wireshark, Switch, PCs
14. **Exercise 3.3:**Set Up and Troubleshoot Wireless Networks
    - **Activities:**Change SSID/security settings
      Measure signal strength and adjust channel
      Simulate and resolve auth errors
    - **Objective:** Resolve coverage, interference, and auth errors
    - **Tools**: Wireless router, Wi-Fi analyzer app, laptop
15. **Exercise 3.4:** Simulate Network Faults Using Packet Tracer
    - **Activities:**Create a small topology in Cisco Packet Tracer or GNS3

Introduce faults (e.g., wrong IP, missing cable, switch off)

Diagnose and resolve

- **Objective:** Practice fault handling virtually
- **Tools:** Cisco Packet Tracer

REQUIRED SOFTWARE

Software	Purpose	Platform
Wireshark	Packet capture and analysis	Windows/Linux
Cisco Packet Tracer	Network simulation	Windows/Linux
Advanced IP Scanner	Host discovery & scanning	Windows
Event Viewer	View system and network logs	Windows
Notepad++ / Excel	Logging and ticket simulation	Windows/Linux
Basic ticketing software (e.g., osTicket)	To manage customer support requests	Windows/Linux

REQUIRED HARDWARE AND TOOLS

Hardware / Tools	Purpose
PCs/Laptops (Min 2)	Testing, configuration, and monitoring of network setups
RJ-45 Cables	Provides physical LAN connectivity
Crimping Tool	Used to attach RJ-45 connectors to Ethernet cables
LAN Cable Tester	Tests continuity and pin configuration of Ethernet cables
Loopback Plug / Adapter	Tests NIC and serial port functionality
Network Switch	Facilitates basic wired LAN connectivity between devices
Wi-Fi Router/Access Point	Provides wireless network setup and troubleshooting
Multimeter (optional)	Measures voltage, continuity in electrical components/cables
Cable Stripper	Strips insulation from cables before crimping
Tone Generator	Traces and identifies cables within a bundle or wall
Cables (Cat5e/Cat6)	Used to build or replace Ethernet connections
Labeling Stickers / Tags	For labeling cables and ports for easier identification

SUGGESTED TEXTBOOKS & REFERENCES

1. “Computer Networks” by Andrew S. Tanenbaum
2. “Networking All-in-One for Dummies” by Doug Lowe
3. Cisco Networking Academy Course Materials
4. Official Manuals for Wireshark, Packet Tracer, Windows/Linux networking commands

RECOMMENDED RESOURCES

1. Cisco Networking Academy – *Network Troubleshooting Module*
2. CompTIA Network+ – *Troubleshooting Section*
3. LiveAction, FITA, GeeksforGeeks – Articles on troubleshooting techniques
4. Wireshark & Packet Tracer official documentation

WEB TECHNOLOGIES LAB

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM407L	Web Technologies Lab	6	90	40	60	2.5

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Weightage Of Marks	COs Mapped
1.	HTML & Basic Web Design	15	12	CO1
2.	CSS & XML	18	18	CO2, CO3
3.	JavaScript &JQuery	21	25	CO1, CO2
4.	PHP	21	25	CO3, CO4
5.	Mini – Project	15	10	CO1, CO2, CO3, CO4, CO5
Total Periods		90		

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to

(i) Understand the fundamental principles of designing clear, effective, and user-friendly web pages.
(ii) Learn to structure and style web content using HTML and CSS.
(iii) Develop the skills to create functional websites that incorporate both client-side and server-side components.
(iv) Gain familiarity with essential web technologies such as JavaScript, jQuery, and PHP.
(v) Understand how to connect web applications to a database using PHP for dynamic content management.

COURSE OUTCOMES

CO1	AM407.1	Design and implement interactive web pages using HTML, CSS, and JavaScript.
CO2	AM407..2	Demonstrate the usage and features of jQuery to enhance user interaction and DOM manipulation.
CO3	AM407.3	Develop dynamic web applications using server-side programming with PHP.
CO4	AM407.4	Implement database connectivity using PHP and MySQL to manage and retrieve data.
CO5	AM407.5	Create real-world web applications using a combination of front-end and back-end tools and technologies.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	3	2	-	2	1	2	3	2
CO2	1	3	3	3	1	3	1	3	3	3
CO3	-	2	3	2	1	3	1	2	3	3
CO4	1	1	3	2	2	3	2	2	3	3
CO5	3	3	3	3	2	3	2	3	3	3
Average	1.5	2.6	3	2.6	1.5	3	1.5	2	3	1.5

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

- Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
- If > 40% of lab sessions addressing a particular PO, it is considered that PO is addressed at Level 3.
- If 25 to 40% of lab sessions addressing a particular PO, it is considered that PO is addressed at Level 2.
- If 5 to 25% of lab sessions addressing a particular PO, it is considered that PO is addressed at Level 1.
- If < 5% of lab sessions addressing a particular PO, it is considered that PO is not addressed.

LEARNING OUTCOMES

HTML & Basic Web Design

1. Create a Simple Web Page with Basic Tags using<html>, <head>, <title>, <body>, and text formatting tags.
2. Design a Web Page Using Lists and Character Entities using ordered, unordered, and definition lists along with character entities.
3. Create a Web Page Using Tables by using <table>, <thead>, <tbody>, <tfoot>, <th>, <td>, rowspan, colspan.
4. Build a Web Page with Links and Images using <a> and <img> with various attributes (target, href, src, alt, etc.).
5. Create a Web Form for User Registration using <form>, <input>, <textarea>, <select>, <option>, <fieldset>, <legend>.

CSS

1. Apply Inline, Internal, and External CSS to a Web Page to demonstrate styling using different CSS levels.
2. Use CSS Selectors and Box Model Properties
   Style elements using class, ID selectors; apply padding, margin, border.
3. Design a Responsive Layout Using Flexbox and Grid
   Use display: flex and display: grid to build two-column layouts.

XML

1. Create a Simple XML Document - Define a custom XML structure (e.g., student list) and ensure it follows rules.

JavaScript & AngularJS

1. Use basic JavaScript validation for required fields and pattern matching.
2. Create a calculator or age calculator using functions and onclick.
3. Display student details using arrays and manipulate them dynamically.
4. Show current date and time using Date, perform calculations using Math.
5. Build simple, interactive web pages using core AngularJS directives.

JQuery

1. Access elements using element, ID, and class selectors. Use .css() to change styles.
2. Demonstrate JQuery Effects using .hide(), .show(), .fadeIn(), .slideToggle() on divs.
3. Manipulate DOM Using JQuery using .html(), .text(), .append() to dynamically update content.
4. Handle Events with JQuery using click, hover, focus, submit events to trigger alert or form validation.

PHP – Basics

1. Install the following on local machine:
    i. Apache Web server
    ii. MySQL
    iii. PHP and configure it to work with Apache Web server and MySQL.
2. Display a welcome message using echo, variables, and constants.
3. Write a program that manipulates strings and arrays (e.g., reverse a string, sort array).
4. Create a PHP Script for Form Handling - Read form data using $_POST and display it.

PHP & MySQL

1. Connect to MySQL Database and Display Data using mysqli_connect, fetch data from a table, and display using PHP.
2. Insert Form Data into MySQL Database - Create a form, insert submitted data into a MySQL table.
3. Update and Delete Records in MySQL using PHP Create pages to edit and delete records using UPDATE and DELETE.

PHP – Cookies & Sessions

1. Write a script to create a cookie and display its value on another page.
2. Create a Login Page Using Sessions Authenticate user, start session, and display a welcome message on a protected page.

Note: Mini project – Few examples as listed below.

1. Student Registration System

Build a complete student registration form that saves data to a MySQL database.

2. Online Feedback Form with Admin View

Collect feedback from users and display it in an admin panel.

3. Simple Product Catalogue with Search

Display a list of products pulled from a database with a search option.

4. User Login & Profile Page

Implement a basic authentication system with session handling.

5. Online Event Booking Application

Create a system to book seats for events or workshops.

****

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	1 to 17
Unit test-2	18 to 34

COMMUNICATION AND EMPLOYABILITY SKILLS

Course code	Course Title	No. Of Periods/week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM408L	COMMUNICATION AND EMPLOYABILITY SKILLS	4	60	40	60	2

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	COs Mapped
1.	ABC of Communication	6	CO1
2.	Let's Learn to Listen	6	CO2
3.	I am...	4	CO4
4.	Let's Talk About...	4	CO4
5.	JAM	6	CO4
6	Interpreting Data	6	CO3
7	Your Perfect Profile	4	CO5
8	Group Discussion	8	CO4, CO5
9	Interview Skills	8	CO4, CO5
10	Making Presentations	8	CO3
	Total	60	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)	To impart verbal and non-verbal communication skills
(ii)	To foster employability skills among the students for career building

COURSE OUTCOMES

CO1	AM408.1	Practise appropriate body language and etiquette

CO2	AM408.2	Listen and comprehend the listening inputs related to different genres effectively
CO3	AM408.3	Interpret data and give oral and written presentations in academic and professional contexts
CO4	AM408.4	Communicate effectively in interpersonal interactions, interviews, and group discussions
CO5	AM408.5	Exhibit employability skills: job hunting, resume writing, and attending interviews

LEARNING OUTCOMES

UNIT 1: ABC of Communication

1.1. Understand and practice the process of communication.

1.2. Demonstrate appropriate body language traits for better communication.

1.3. Apply appropriate strategies to minimize various barriers of communication.

1.4. Communicate effectively in a given situation.

UNIT 2: **Let's Learn to Listen**

2.1. Identify and distinguish different phonic sounds in English language.

2.2. Practice active listening techniques for better comprehension.

2.3. Comprehend diverse listening inputs in academic, professional and everyday situations using appropriate strategies.

UNIT 3: I am...

3.1. Prepare an organised self-introduction for formal and informal situations.

3.2. Introduce yourself in job interviews effectively.

3.3. Demonstrate appropriate body language while introducing yourself.

UNIT 4: Let's Talk About...

4.1. Describe objects, places, events and people using appropriate adjectives.

4.2. Use appropriate sentences and expressions while describing.

4.3. Use suitable adjectives to convey mood or tone.

UNIT 5: JAM

5.1. Generate ideas on a given topic.

5.2. Organise the ideas sequentially for an effective JAM speech.

5.3. Speak spontaneously and fluently on a given topic within the stipulated time.

UNIT 6: Interpreting Data

6.1. Understand different forms of graphs, charts, diagrams and tables.

6.2. Analyse and interpret data.

6.3. Present the inferences and findings in spoken and written communication.

UNIT 7: Your Perfect Profile

7.1. Draft a customised professional resume.

7.2. Create a professional Applicant Tracking System (ATS) compliant Resume.

7.3. Draft a cover letter to communicate with prospective employers.

UNIT 8: Group Discussion

8.1. Understand the significance of group discussion and differentiate the various stages involved.

8.2. Practice various roles and skills involved in group discussion.

8.3. Demonstrate appropriate body language for effective participation in group discussion.

UNIT 9: Interview Skills

9.1. Practice proper interview demeanour.

9.2. Respond effectively to frequently asked interview questions (FAQs).

9.3. Demonstrate readiness for job opportunities.

UNIT 10: Making Presentations

10.1. Practise the principles of good presentation.

10.2. Use appropriate presentational aids.

10.3. Prepare and give presentations on various topics effectively.

COURSE CONTENT

Sl. No.	Name of the Unit	Contents
1	ABC of Communication	• Aspects of Communication • Body language: Verbal & Nonverbal Communication • Communication Barriers

		• Strategies for effective communication
2	Let's Learn to Listen	• Basics of pronunciation: Vowel & Consonant sounds • Active vs Passive listening • Barriers to listening • Types of listening& Techniques for effective listening • Listening Comprehension Activities: Academic, Professional, Social conversations
3	I am…	• Significance of self-introduction in formal and informal contexts • Components and structure of self-introduction • Self-introduction in job interviews • Body language while introducing oneself
4	Let's Talk About…	• Describing objects, people, places and events • Using appropriate adjectives for different kinds of descriptions • Using right Tense and tone
5	JAM	• JAM – Structure and organisation • Generating and organising ideas for JAM speech • Dos and Don'ts of JAM • Strategies and techniques for effective JAM speech • Planning a perfect one-minute speech
6	Interpreting Data	• Presentation of data in Graphs, Charts, diagrams, and tables • Analysing and interpreting non-verbal data • Presenting non-verbal information in verbal form (spoken and written)
7	Your Perfect Profile	• Significance of a resume in career building • Resume, Curriculum Vitae (CV) and Bio-data • Applicant Tracking System (ATS) Resume – components and structure • Video Resume • Drafting a Cover letter
8	Group Discussion	• Significance of Group Discussion (GD) in job hunting • Process of Group Discussion • Sub skills of Group Discussion • GD Roles and Group dynamics • GD body language • Techniques for success in GD
9	Interview Skills	• Significance of Interviews in the Job Selection Process • Stages of Interview Preparation: Pre, While, and Post interview • Right demeanour and body language for interviews • Frequently Asked Questions (FAQs)
10	Making Presentations	• Principles of good presentation • Types of Presentational aids • Presentation etiquette • Giving effective presentations

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS01	PS02	PS03
CO1	POs 1 to 5 are not directly applicable to the English course.							Programme Specific Outcomes are branch-specific, with technical aspects that are not directly applicable to the English Language course.		
CO2										
CO3						2	2			
CO4						2	2			
CO5						2	2			
Average						2	2			

3-StronglyMapped 2-ModeratelyMapped 1-Slightly Mapped

Note: The gaps in CO and PO mapping will be met by one or more appropriate activities fromthe following:
(i)Assignments(ii)Tutorials(iii)Seminars(iv)GuestLectures(v)GroupDiscussions(vi) Quizzes (iv) Library Visits etc.,

REFERENCES

1. T. Balasubramaian, "*A Textbook of English Phonetics for Indian Students*", MaAMillan (2009)

2. J.D. O'Connor, "*Better English Pronunciation*", Cambridge (1980)

3. Anand. S. Ganguly, *Group Discussion for Admissions and Jobs* (2010)

4. E. Suresh Kumar and P. Sreehari, *Communicative English*, Orient Blackswan (2019)

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning Outcomes to be Covered
Unit Test – 1	From 1.1to 5.3
Unit Test – 2	From 6.1 to. 10.3

ARTIFICIAL INTELLIGENCE USING PROLOG LAB

Course code	Course Title	No. Of Periods/week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM409L	ARTIFICIAL INTELLIGENCE USING PROLOG LAB	06	90	40	60	2.5

TIME SCHEDULE

S No	Chapter/Unit Title	No. of Periods	Cos Mapped
1	Installation and study of PROLOG environment	12	CO1,CO2,CO3
2	Practice programs using facts, objects, predicates, variablesand arithmetic operators	24	CO1,CO2,CO3
3	Study and write programs on Input types, Lists,dynamicdatabase	16	CO1,CO2,CO3
4	Study and write Programs on Goal finding, backtracking, objects, strings, set operations	18	CO1,CO4
5	Programs on various applications	20	CO1,CO2,CO3,CO4, CO5
	Total	90	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to

(i) Installation & Study of PROLOG . Use Edit, compile and execution of PROLOGprograms

(ii) Able to write AIprograms using facts,objects,predicates, variables and arithmetic operators

(iii) Able to execute PROLOG programs on recursion, Lists, dynamicdatabase

(iv) To Write AI program using various PROLOG constructs like Goal finding, backtracking, objects, strings, set operations

(v) Able to write AI programs on various applications using PROLOG

COURSE OUTCOMES

CO1	AM409.1	Demonstrate Installation of PROLOG and edit, compile and execution of simple PROLOG programs using statements, keywords, user defined identifiers
CO2	AM409.2	Practice programs using facts, objects, predicates, variables And arithmetic operators
CO3	AM409.3	Execute PROLOG program on recursion, Lists, dynamic database
CO4	AM409.4	Prepare Programson Goal finding, backtracking, objects, strings, set operations
CO5	AM409.5	Use PROLOG programs on various applications

LEARNING OUTCOMES

1. Installation of GNU-PROLOG, Study of PROLOG(GNU-PROLOG).
2. Exercise on facts, objects,predicates and variables using PROLOG.
3. Exercise on Rules and Unification using PROLOG.
4. Write a program in PROLOG for medical diagnosis and show the advantage and disadvantage of green and red cuts.
5. Exercise on arithmetic operators, simple input/output and compound goals using PROLOG .
6. Write a program to implement simple calculator in PROLOG.
7. Write predicates one converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
8. Write a program to display **n** numbers of the Fibonacci series using recursion in PROLOG .
9. Exercise on Lists in PROLOG.
10. Exercise on dynamic data base in PROLOG.
11. Implement string operationsl ike string comparison, stringcopy, string reverse, substring, string position etc using PROLOG .
12. Write a PROLOG program to implement all set operations (Union, intersection, complement etc.)
13. Write a PROLOG program to maintain familytree.
14. Write a PROLOG program to solve “WaterJugProblem”.
15. To write a Program to Implement “Tower of Hanoi”.
16. Write a program to solve the “MonkeyBananaProblem”.
17. Write a program to solve“Traveling Salesman Problem”.
18. Write a program to solve “4-queens problem”.
19. Write a program for “Tic-Tac –Toe problem”.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	2	3	2	1	3	3	3	2
CO2	2	1	2	2	2	1	2	3	3	2
CO3	3	1	1	2	1	1	1	2	3	2
CO4	2	3	3	2	3	2	3	2	3	2
CO5	3	3	3	2	2	1	2	3	3	3
Average	2.2	2	2.2	2.2	2	1.2	2.2	2.6	3	2.2

3=stronglymapped, 2=moderately mapped, 1=slightlymapped

KEY COMPETENCIES

Exp. No.	Name of the experiment	Objectives	Key Competencies
1	Install ation of gnu-PROLOG	(a) Study of PROLOG (gnu-PROLOG) (b) Installation of PROLOG	a) Identify the errors during the installation b) Observe the installation completion
2	Exercise on facts, objects, predicates and variables in PROLOG .	(a) Write a program for facts using PROLOG (b) Write a program objects usingPROLOG (c) Write a program for predicates using PROLOG (d) Write a program for variables using PROLOG	(a) Compile the program and rectify the errors. (b) Execute the program (c) Observe the output.
3	Exerciseon Rules and Unificationin PROLOG .	(a) Write a programon Rules in PROLOG (b) Write program on Unification in PROLOG	(a) Provide the terms as input. (b) Use parent method for matching terms (c)Observe the output.
4	Write a program in PROLOGfor medical diagnosis and show the advantage and disadvantage of green and red cuts.	(a)Write a program on medical diagnosis in PROLOG (b)Write a program to show the advantage and disadvantage of green and red cuts.	(a) Use different methods for cut and fails predicates (b) Observe the errors (c) Observe the output

5	Exercise on arithmetic operators, simple input/output and compound goals in PROLOG .	Write a aprogram on (a) arithmetic operators (b) input/output (c) goalsin PROLOG	(a) use different terms as input (b) call the different methods (c) observe the errors (d) observe th eoutput
6	Exercise to implement simple calculator in PROLOG.	(a) Write a program to implement simple calculator in PROLOG.	(a) Give different inputs to calculate different operations (b) Check the errors (c) Observe the output
7	Exercise to predicates one convertscentigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing in PROLOG .	(a) Write a program to i predicates one converts centigrade temperatures to Fahrenheit,theother checks if a temperature is below freezing in PROLOG.	(a) Give different inputs (b) Check the errors (c) Observe the output
8	Exercise on Fibonacci series using recursion in PROLOG	(a) Write a aprogram to display **n** numbers of the Fibonacci series using using Recursion in PROLOG	(a) Give different values for N (b) Observe the errors (c) Observe the result
9	Exercise on Lists in PROLOG .	(a) Write a aprogram on lists	(a) Use different operations like membership, length, concatenation, append, insertion (b) Check the errors (c) Observe the output
10	Exercise on dynamic database in PROLOG	(a) Write a aprogram on database in PROLOG	(a) Create database (b) Use different manipulations (c) Check the errors (d) Observe the result

11	Exercise on string operations in PROLOG	Write a aprogram on (a) String comparison (b) String copy (c) String reverse (d) Substring (e) Position of the string	(a) Use different string operations (b) Check the errors (c) Observe the output
12	Exercise on all set operations (Union, intersection, complement, difference) in PROLOG	(a) Write a program on set operations in PROLOG	(a) Use different operations like union Intersection, difference (b) Observe the errors (c) Observe the output
13	Exercise on maintainfamily treeinPROLOG	(a) Write a aprogram on creation of family tree in PROLOG	(a) Create the family tree (b) Check the errors (c) Observe the output
14	Exerciseon "Water Jug Problem" in PROLOG	(a) Write a aprogram to implement water- Jug problem.	(a) Use water jug concept (b) Observe the errors (c) Check the output
15	Exercise on "Tower of Hanoi" in PROLOG	(a) Write a aprogram to implement Tower of Hanoi problem In PROLOG.	(a) Use Tower of Hanoi concept (b) Observe the errors (c) Check the output
16	Exercise on Monkey Banana Problem in PROLOG	Write a aprogram to implement Monkey Banana (a) Problem problem in PROLOG	(a) Use Monkey Banana Problem concept (b) Observe the errors (c)Observe the output
17	Exercise on Traveling Salesman Problem in PROLOG	(a) Write a aprogram to implement Traveling Salesman Problem in PROLOG	(a) Use Traveling Salesman Problem concept (b) Check the errors (c) Observe the output
18	Exercise on 4-queens problem in PROLOG	(a) Write a aprogram to implement the 4-queens problem in PROLOG	(a) Use 4-queens instead of N (b) Observe the errors (c) Observe the output
19	Exercise on Tic-Tac-Toe	(a) Write a aprogram on Tic-Tac-Toe	(a) Create the Tic-Tac-Toe (b) Check the errors (c) Observe the output

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning Outcomes to be Covered
Unit Test–1	From 1 to 11
Unit Test–2	From 12 to. 19

V Semester

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V SEMESTER

Course Code	Course Title	No. of Periods / Week		Practicum (Y/N)	Total No. of Periods /Semester	Credits	Scheme of Examination			
		Theory	Practical/ Tutorial				Duration (hours)	FA Marks	SA Marks	Total Marks
THEORY COURSES										
26AM501T	Basics of Quantum Computing	6	-	N	90	4	3	30	70	100
26AM502T	Software Engineering	6	-	N	90	4	3	30	70	100
26AM503T	Natural Language Processing	6	-	N	90	4	3	30	70	100
ELECTIVE COURSES										
26AM504E	Data Science	3	-	N	45	2	3	30	70	100
26AM505E	Artificial Neural Networks& Deep Learning									
AUDIT COURSE										
26AM506A	Pattern Recognition	2	-	Y	30	-	-	-	-	-
PRACTICAL COURSES										
26AM507L	Natural Language Processing using Python Lab	-	4	N	60	1.5	3	40	60	100
26AM508L	Machine Learning Lab	-	6	N	90	2	3	40	60	100
26AM509L	Project Work	-	6	N	90	2	3	40	60	100
26AM510C	Student Centric Activities	-	3	N	45	0.5	-	-	-	-
	TOTAL	**23**	**19**	**-**	**630**	**20**	**-**	**240**	**460**	**700**

Note: 0.5 credits will be awarded for student centric activities based on the participation in the extra Curricular activities like NSS/NCC/Clean and Green or Sports/ Games

26AM501T is common with CCB/CIOT/CAI/CME/CCN
26AM502T is common with CCB/CME
26AM503T is common with CAI
26AM506A, 26AM507L is common with CAI
26AM509L is common with CCB/CIOT/CAI/CME/CCN

BASICS OF QUANTUM COMPUTING

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
C26AM501T	BASICS OF QUANTUM COMPUTING	6	90	30	70	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Introduction to Quantum Computing	18	14	2	2	CO1
2.	Qubits and Superposition	18	22	2	2	CO2
3.	Quantum Gates and Circuits	20	25	3	1	CO3
4.	Entanglement and Quantum Teleportation	19	17	3	1	CO3,CO4
5.	Quantum Computing in AI & ML	15	22	2	2	CO3,CO5
Total Periods		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to

(i) Understand the fundamental differences between classical and quantum computing concepts.
(ii) Learn the evolution, history, and key terminology of quantum computing.
(iii) Comprehend the principles of qubits, superposition, and quantum measurement.
(iv) Gain conceptual knowledge of quantum gates, circuits, and their role in quantum computation.
(v) Explore the phenomena of quantum entanglement and teleportation and their applications.
(vi) Recognize how quantum computing can enhance Artificial Intelligence and Machine Learning techniques.
(vii) Analyze real-world applications, hardware platforms, and current

	research trends in quantum technology. (viii) Develop foundational understanding required for further studies or practical work in quantum computing and AI/ML integration.

COURSE OUTCOMES

CO1	AM501.1	Describe the basic principles and evolution of quantum computing, distinguishing it from classical computing systems.
CO2	AM501.2	Explain the concept of qubits, superposition, and quantum states, and understand their role in quantum computation.
CO3	AM501.3	Construct and interpret simple quantum circuits using quantum logic gates, and simulate quantum operations using basic tools or visualizations.
CO4	AM501.4	Understand and apply the principles of entanglement and quantum teleportation, and discuss their implications in secure data transmission.
CO5	AM501.5	Identify and explain potential applications of quantum computing in AI and ML, and evaluate how quantum algorithms may accelerate machine learning tasks.

LEARNING OUTCOMES

Chapter 1 – Introduction to Quantum Computing

1.1 Introduction to classical vs quantum computing.
1.2 History and evolution of quantum computing.
1.3 Key differences between bits and qubits (conceptual view).
1.4 Limitations of classical computing.
1.5 Quantum computing advantages and challenges.
1.6 Quantum computing terminology (conceptual glossary).
1.7 Real-world applications overview.
1.8 Major milestones in quantum computing.
1.9 Overview of quantum hardware platforms (IBM, Google, etc.).
1.10 Future prospects and trends in quantum technology.

Chapter 2 – Qubits and Superposition

2.1 Concept of a qubit.
2.2 Physical representation of qubits (photons, electrons, etc.).
2.3 Difference between 0/1 bits and qubits.
2.4 Superposition explained using analogies.
2.5 Measurement and its effect on qubits.
2.6 Quantum state examples without equations.
2.7 Quantum decoherence (basic understanding).
2.7 Examples of superposition in daily life.
2.9 Role of superposition in computational speed-up.

Chapter 3 – Quantum Gates and Circuits

3.1 Introduction to quantum logic gates.
3.2 Single-qubit gates (X, Y, Z, H) – conceptual only.
3.3 Multi-qubit gates (CNOT, SWAP) – conceptual only.
3.4 Gate operations as transformations without math.
3.5 Building a simple quantum circuit (conceptual).

3.6 Difference between classical and quantum logic gates.
3.7 Quantum parallelism (idea only).
3.8 Circuit representation diagrams (without equations).
3.9 Practical examples of gate usage.

Chapter 4 – Entanglement and Quantum Teleportation

4.1 Concept of quantum entanglement.
4.2 Real-world analogies for entanglement.
4.3 Applications of entanglement in communication.
4.4 Role of entanglement in secure communication.
4.5 Quantum key distribution concept.
4.6 Entanglement in quantum networks.
4.7 Experimental demonstrations of teleportation.
4.8 Limitations and challenges of entanglement.

Chapter 5 – Quantum Computing in AI & ML

5.1 Introduction to AI & ML.
5.2 Why quantum computing can enhance AI & ML.
5.3 Examples of quantum-enhanced machine learning.
5.4 Concept of quantum data encoding (no math).
5.5 Quantum pattern recognition (conceptual).
5.6 Quantum clustering – high-level explanation.
5.7 Industries using quantum AI.
5.8 Case studies of quantum ML applications.
5.9 Challenges and future research directions.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	1	1			2		1	1
CO2	1		1	2	1		2	2	2	
CO3	3			1			2	2	1	
CO4	2	2	1	1			1	2	1	3
CO5	2		1	1	1		2	2	3	
Average	1.8	1.5	1	1.2	1		1.8	2	1.6	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

Chapter 1 – Introduction to Quantum Computing:

Introduction to classical vs quantum computing-History and evolution of quantum computing-Key differences between bits and qubits (conceptual view)-Limitations of classical computing-Quantum computing advantages and challenges-Quantum computing terminology (conceptual glossary)-Real-world applications overview- Major milestones in quantum computing- Overview of quantum hardware platforms (IBM, Google, etc.)- Future prospects and trends in quantum technology.

Chapter 2 – Qubits and Superposition:

Concept of a qubit-Physical representation of qubits (photons, electrons, etc.)-Difference between 0/1 bits and qubits-Superposition explained using analogies-Measurement and its effect on qubits-Quantum state examples without equations-Quantum decoherence (basic understanding)-Examples of superposition in daily life-Role of superposition in computational speed-up.

Chapter 3 – Quantum Gates and Circuits:

Introduction to quantum logic gates-Single-qubit gates (X, Y, Z, H) – conceptual only. Multi-qubit gates (CNOT, SWAP) – conceptual only-Gate operations as transformations without math-Building a simple quantum circuit (conceptual)-Difference between classical and quantum logic gates-Quantum parallelism (idea only)-Circuit representation diagrams (without equations)-Practical examples of gate usage

Chapter 4 – Entanglement and Quantum Teleportation

Concept of quantum entanglement-Real-world analogies for entanglement-Applications of entanglement in communication-Role of entanglement in secure communication. Quantum key distribution concept-Entanglement in quantum networks. Experimental demonstrations of teleportation-Limitations and challenges of entanglement.

Chapter 5 – Quantum Computing in AI & ML

Introduction to AI & ML-Why quantum computing can enhance AI & ML. Examples of quantum-enhanced machine learning-Concept of quantum data encoding (no math)-Quantum pattern recognition (conceptual)-Quantum clustering – high-level explanation-Industries using quantum AI-Case studies of quantum ML applications.Challenges and future research directions.

REFERENCES

1) Quantum Computation and Quantum Information
   Authors: Michael A. Nielsen & Isaac L. Chuang Publisher: Cambridge University Press
2) Dancing with Qubits: How quantum computing works and how it can change the world
   Author: Robert S. Sutor Publisher: Packt Publishing / IBM Press
3) Quantum Computing: An Applied Approach
4) Learn Quantum Computing with Python and Q#
   Authors: Sarah Kaiser, Christopher Granade, Nathan Wiebe, and Brian C. Beckman Publisher: Manning Publications
5) Quantum Machine Learning: What Quantum Computing Means to Data Mining Author: Peter Wittek

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.5
Unit test-2	From 3.6 to 5.9

SOFTWARE ENGINEERING

Course code	Course Title	No. of Periods/Weeks	Total No. of periods/Semester	FA Marks	SA Marks	Credits
26AM502T	SOFTWARE ENGINEERING	6	90	30	70	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Marks	No. of Short Questions	No. of Essay Questions	COs Mapped
1.	Basics of Software Engineering Designs & Life Cycle Models	13	14	2	1	CO1
2.	Software Project Management	21	25	3	2	CO2
3.	Requirement Analysis & Specifications	13	11	1	1	CO3
4.	Software Design, Coding	23	25	3	2	CO4
5.	Software testing, Debugging, Reliability, Quality Management & Maintenance	20	25		2	CO5
Total		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i) To apply the fundamental concepts of software engineering & software development lifecycle (SDLC) models to real-world development scenarios.
(ii) To apply basic principles of software project management including planning, scheduling and risk analysis.
(iii) To design software solutions using software engineering principles and UML diagrams.
(iv) To apply software testing techniques to evaluate reliability and performance.

COURSE OUTCOMES

CO1	AM502.1	Apply the fundamentals of Software Engineering to differentiate between various software life cycle

		models.
CO2	AM502.2	Apply Software Project Management principles to plan, estimate, schedule and manage risks
CO3	AM502.3	Develop a SRS document by identifying and organizing functional and non-functional requirements for a given software problem
CO4	AM502.4	Apply software design principles, UML modeling, and coding standards to develop maintainable software.
CO5	AM502.5	Apply software testing techniques and quality metrics to evaluate software reliability and performance.

LEARNING OUTCOMES

1.0 Basics of Software Engineering Designs & Life Cycle Models

1.1 Know the Evolution and Impact of the Software Engineering
- 1.1.1 Know the evolution of software engineering as an Art to an Engineering Discipline
- 1.1.2 Know how software engineering is a solution to the Software Crisis?

1.2 Know the difference between Programs and Software Products

1.3 Understand the evolution of Software Engineering Design
- 1.3.1 Know about Early Computer Programming
- 1.3.2 Know about High Level Language Programming
- 1.3.3 What is control Flow-Based design
- 1.3.4 What is Data Structure oriented design
- 1.3.5 What is Data Flow-oriented design
- 1.3.6 What is Object Oriented design
- 1.3.7 Know about Model Driven Architecture
- 1.3.8 Know about DevOps based Design
- 1.3.9 Know about Low-code/No-code Development

1.4 Explain the Software Life Cycle Models
- 1.4.1 Explain Classical Waterfall Model
- 1.4.2 Explain Iterative Waterfall Model
- 1.4.3 Explain Prototyping Model
- 1.4.4 Explain Evolutionary Model
- 1.4.5 Explain Spiral Model
- 1.4.6 Know about AGILE Development Model- principles and Life Cycle
- 1.4.7 Compare different Life Cycle Models

1.5 Explain Software Engineering ethics and the responsibilities of software professionals

2.0 Software Project Management

2.1 Know about Software Project Manager
- 2.1.1 List the Job Responsibilities of a Software Project Manager
- 2.1.2 Identify skills necessary for Software Management

2.2 Explain Software Project Planning
2.3 Explain the components of SPMP document
2.4 Know theMetrics for Project Size Estimation
2.4.1 Describe Lines of Code (LOC)
2.4.2 Describe Function Point Metric
2.5 Know about Project Estimation Techniques
2.5.1 What is Empirical Estimation Technique
2.5.2 What is Heuristic Estimation Technique
2.6 List Staffing Level Estimates
2.7 Understand the Basics of Agile Project Management using SCRUM
2.8 Know about Scheduling
2.8.1 Explain Work Break Down Structure
2.8.2 Explain Activity Networks
2.8.3 Explain Gantt Charts
2.8.4 Explain PERT Charts
2.9 Explain the process of Staffing in a Software Project Management
2.10 List the Attributes of a Successful Software Engineer
2.11 Explain the Risk Management
2.11.1 What is Risk Identification
2.11.2 Know about Risk Assesment
2.11.3 Know about Risk Containment

3.0 Requirement Analysis and Specifications

3.1 Explain Requirements Gathering and Analysis
3.2 Explain Software Requirement Specifications
3.2.1 Describe the Purpose and importance of SRS
3.2.2 Summarize IEEE 830 standard
3.3 Explain Functional Requirements and Use Cases
3.3.1 Define Functional Requirements
3.3.2 Describe procedure to Identify requirements using scenario-based use cases
3.3.3 Explain how to document functional requirements
3.4 Explain requirements Traceability and Construct a Traceability matrix
3.5 List Characteristics of a Good SRS Document
3.6 Give Examples of Poor SRS Document
3.7 Explain the typical Organization of the SRS Document
3.8 Develop an SRS for an ATM or Library System

4.0 Principles of Software Design, Coding

4.1 Know the Software Design Concepts
4.1.1 List the characteristics of good software design
4.1.2 What is Cohesion and Coupling
4.1.2.1 Define Cohesion and Coupling
4.1.2.2 Classify and compare types of Cohesion
4.1.2.3 Classify and compare types of Coupling
4.2 Know about Software Design Approaches
4.2.1 Explain Function-Oriented Design
4.2.2 Explain Object-Oriented Design

4.2.3 Compare Function-Oriented and Object-Oriented Design
4.2.4 Describe Service-Oriented Design
4.3 Understand User Interface Design
4.3.1 List the Characteristics of a good User Interface
4.3.2 Understand the Basic Concepts of user interface design
4.3.2.1 Describe User Guidance and Online Help
4.3.2.1 Differentiate Mode Based vs Modeless Interface
4.3.2.2 Compare Graphical vs Text-Based User Interface
4.3.3 Know the Types of User Interface
4.3.3.1 Describe Command Language Based Interface
4.3.3.2 Describe Menu Based Interface
4.3.3.3 Describe Direct Manipulation Interfaces
4.4 Understand Unified Modeling Language
4.4.1 Define UML and its purpose in Software Engineering
4.4.2 Explain the importance of UML in Object oriented Design
4.4.3 List and Explain Building blocks of UML
4.4.4 List different symbols used in UML notation
4.4.5 Classify and list standard UML diagrams
4.4.6 Know about Class Diagrams
4.4.6.1 Describe the purpose of Class Diagram
4.4.6.2 Know how to Draw simple Class Diagrams
4.4.7 Know about Use case diagram
4.4.7.1 Define Use Case and Actors
4.4.7.2 Describe the purpose of Use case diagram
4.4.7.3 Know how to Draw Use case diagrams
4.4.8 Understand Interaction diagrams
4.4.8.1 Explain the purpose and use of Interaction diagrams
4.4.8.2 Distinguish between Sequence and Communication Diagrams
4.4.8.3 Know how to Draw Interaction diagrams for System Scenarios
4.5Know the Concept of Software Coding
4.5.1 Explain Coding Standards
4.5.2 Discuss Coding guidelines
4.5.3 Explain the process of Code Review
4.5.4 Describe Code Walkthroughs
4.5.5 Explain Code Inspection
4.5.6 Define Clean Room Testing
4.5.7 Explain the importance of Software Documentation

5.0 Testing, Debugging, Reliability, Quality Management & Maintenance

5.1 Understand Testing
5.1.1 Define Software Testing and its purpose
5.1.2 Differentiate Verification and Validation
5.1.3 List and Describe common Test Case Design techniques
5.1.4 Compare Testing in the Large and Testing in the Small
5.1.5 Explain Unit Testing with suitable examples
5.1.6 Explain Black box Testing techniques
5.1.7 Explain White Box Testing techniques
5.1.8 List various Software Testing tools
5.1.9 Describe the Role of Testing in Agile and DevOps environment
5.2 Know about Debugging

5.2.1 Explain Debugging Approaches
5.2.2 List standard Debugging Guidelines
5.3 Explain Program Analysis Tools
5.3.1 Know about Static Analysis Tools
5.3.2 *Know about Dynamic Analysis Tools*
5.4 Explain the purpose and process of Integration Testing
5.5 Apply System Testing techniques to check the overall working of the software
5.6 Apply Performance Testing to check how fast and stable the software runs
5.7 Explain the role of Artificial Intelligence in Software Testing
5.8 Understand the basics of Object-Oriented Testing and its techniques
5.9 Understand the concept of Software Reliability
5.9.1 Differentiate Hardware Reliability and Software Reliability
5.9.2 List common reliability metrics: MTTF, MTTR, and availability
5.9.3 Identify the key steps in reliability growth modeling
5.10 Explain Software Quality Management systems
5.11 Explain SEI Capability Maturity Model (CMM) and its levels

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	2	2	1
CO2	2	3	2	1	1	2	-	1	2	1
CO3	2	3	3	2	-	1	-	1	2	2
CO4	2	2	3	3	1	2	-	2	2	1
CO5	2	2	2	3	1	1	1	1	2	3
Average	2.2	2.4	2.4	2	1	1.4	1	1.4	2	1.6

3=strongly mapped,2=moderately mapped,1=slightly mapped

COURSE CONTENT

1. Introduction to Software Engineering-Life Cycle Models-Software Engineering EthicS

2. Software Project Management-Responsibilities of a Software Project Manager – Project Metrics- Project Estimation Techniques-Staffing Level Estimation-Agile Project Planning - Scheduling – Risk Management

3. Requirement Analysis and Specification: Requirement Gathering and Analysis-SRS document

4. Software Design, Coding: Good software design, Cohesion and Coupling, Software Design Approaches, User interface Design, Software Coding and Goals of UML - Role of UML in Object oriented Design - Building blocks of UML : Things, Relationships, and Diagrams - Symbols used in UML notation - Classify and list standard UML diagrams - Class diagram, purposes of class diagram, draw the class diagram - Use case diagram, define the term Use case, purposes of Use case diagram, draw the Use case diagram - Interaction diagram, purposes of Interaction diagram, the types of interaction diagrams: Sequence diagram and Collaboration diagram, draw the Interaction diagrams.

5. Software Testing, Debugging, Reliability, Quality Management and maintenance – Testing, Debugging software Reliability- Statistical Testing, Software Quality, Software Quality Management System, SEI capability Maturity Model.

REFERENCES

1. Fundamentals of Software Engineering – Rajib Mall(PHI) Second Edition.
2. Software Engineering - Jawadekar(TMH)
3. Software Engineering: A Practitioner's Approach – *Roger S. Pressman* &*Bruce R. Maxim*, McGraw Hill (8th or 9th edition)
4. Software Engineering Concepts - Fairley(TMH)
5. An Integrated Approach to Software Engineering-*Pankaj Jalote*, Narosa Publishing House, 2nd Edition
6. The Unified Modeling Language User Guide – *Grady Booch, James Rumbaugh, Ivar Jacobson*
7. http://www.tutorialspoint.com/uml/ – UML concepts and examples (Free Online Resource)

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From1.1 to 3.8
Unit test-2	From4.1 to 5.11

NATURAL LANGUAGE PROCESSING

Course code	Course Title	No.of Periods / Weeks	TotalNo. of Periods/ Semester	FA Marks	SA Marks	Credits
26AM503T	NATURAL LANGUAGE PROCESSING	6	90	30	70	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Weightage of marks	No.of Short Questions	No. of Essay Questions	COs Mapped
1.	Introduction to Natural Language Processing	18	14	2	1	CO1
2.	Word Level Analysis	18	22	2	2	CO2
3.	Syntactic analysis	20	25	3	2	CO3
4.	Semantics and pragmatics	19	14	2	1	CO4
5.	Discourse analysis and lexical resources	15	25	3	2	CO5
Total		90	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to

(i) Acquire the fundamentals of natural language processing
(ii) Familiarize word level analysis
(iii) Analyze CFG and PCFG in Natural Language Processing
(iv) Apply the semantics of sentences and pragmatics
(v) Apply the Natural Language Processing techniques

COURSE OUTCOMES

CO1	AM503.1	Describe a given text with basic Language features
CO2	AM503.2	Explain an innovative application using NATURAL LANGUAGE PROCESSING components
CO3	AM503.3	Apply a rule based system to tackle morphology/syntax of a language.
CO4	AM503.4	Explain a tag set to be used for statistical processing fo rreal- time applications.
CO5	AM503.5	Compare and contrast the use of different statistical Approaches for different types of NATURAL LANGUAGE PROCESSING applications

LEARNING OUTCOMES

1.0 INTRODUCTION TO NATURAL LANGUAGE PROCESSING.

1.1 Describe the Origins and challenges of Natural Language Processing
1.2 Classification of Language Modeling
  1.2.1 Explain Grammar-based LM
  1.2.2 ExplainS tatistical LM
1.3 Describe the role of Regular Expressions
1.4 Define Finite-State Automata.
1.5 Explain Finite automata with output-Moore and Mealy machines.
1.6 Applications of Finite-State Automata.
1.7 Write the usages of transition diagram.
1.8 State the importance of English Morphology.
1.9 Explain Transducers for lexicon and rules.
1.10 State the importance of Tokenization.
1.11 Explain Detecting and Correcting Spelling Errors
1.12 Describe Minimum Edit Distance

2.0 WORD LEVEL ANALYSIS

2.1 Define N-grams.
2.2 Explain Unsmoothed and Smoothed N-grams.
2.3 Describe the Usages of Unsmoothed and Smoothed N-grams
2.4 Analyze N-grams.
2.5 Describe Interpolation and Backoff-Word Classes
2.6 Explain Part-of-Speech Tagging
2.7 Differentiate Rule-based stochastic and Transformation-basedtagging
2.8 Identify the Issues in PoS tagging.
2.9 Explain Hidden Markov model.
2.10 Explain Maximum Entropymodels
2.11 Compare Hidden Markov and Maximum Entropymodels.

3.0 SYNTACTICAL NALYSIS

3.1 Define Context-Free Grammar.
3.2 Define Grammar rules for English
3.3 ClassifyTree banks
3.4 Explain Normal Forms for grammar

3.4.1 Explain Chomsky normal form.
3.4.2 Explain Greibachnormalf orm
3.4.3 Explain procedure for converting CFG TO Chomsky normal form.

3.5 State the importance of Dependency Grammar
3.6 Describe the process of Syntactic Parsing
3.7 Explain the problem of Ambiguity
3.8 Explain DynamicProgramming parsing
3.8.1 Shallow parsing
3.8.2 Probabilistic CFG
3.9 Explain Probabilistic CYK algorithm
3.10 Describe Probabilistic Lexicalized CFGs
3.11 Describe the Unification of feature structures.

4.0 SEMANTICS AND PRAGMATICS

4.1 Identify text representation techniques.
4.2 Explain the First-OrderLogic.
4.3 Classify Description Logics.
4.4 Describe Syntax-Driven Semantic analysis approach.
4.5 State the need of Semantic attachments.
4.6 Define Word Senses.
4.7 Explain the Relations between Words and Senses
4.8 Describe Thematic Roles.
4.9 Define Selectional restrictions.
4.10 Explain the process of Word Sense Disambiguation using Supervised.
4.11 Identify the importance of Dictionary & Thesaurus.

5.0 DISCOURSE ANALYSIS AND LEXICAL RESOURCES

5.1 Describe the procedure of Discourse segmentation.
5.2 Applications of Discourse Analysis
5.3 Define Coherence
5.4 Explain Anaphora Resolution using Hobbs and Centering Algorithm
5.5 State the importance of Coreference Resolution.
5.6 Explain Porter Stemmer algorithm.
5.7 Describe Lemmatizer
5.8 Explain the corpus
5.8.1 Word Net
5.8.2 Prop Bank
5.8.3 Frame Net

5.8.4 Brown Corpus

5.8.5 British National Corpus(BNC).

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	1	1	2	3	2
CO2	1	3	2	2	1	2	1	1	3	2
CO3	1	3	3	2	2	2	2	1	2	3
CO4	1	3	3	2	2	2	2	1	2	2
CO5	2	2	2	3	2	2	2	2	2	1
Average	1.6	2.4	2.2	2	1.6	1.8	1.6	1.4	2.4	2

COURSE CONTENT

1. INTRODUCTION

Origins andchallenges of NATURAL LANGUAGE PROCESSING – Language Modelling: Grammar-based LM,Statistical LM - Regular Expressions, Finite-State Automata, Finite automata with output- Moore and Mealy machines,transition diagrams, – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

2. WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

3.SYNTACTIC ANALYSIS

Context-FreeGrammars, Grammar rules for English,Tree banks,Normal Forms forgrammar– Chomsky normal form, Greibach normal form, Dependency Grammar –Syntactic Parsing, Ambiguity, Dynamic Programming parsing– Shallow parsing–
Probabilistic CFG, Probabilistic CYK,P robabilistic Lexicalized CFGs-Feature structures, Unification of feature structures.

4. SEMANTICS AND PRAGMATICS

Representation of Text, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, Selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus

5. DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation,Applications,Coherence–ReferencePhenomena, Anaphora

Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

REFERENCES

1. Daniel Jurafsky,James H.Martin— Speechand Language Processing: An Introduction to Natural Language Processing,Computational Linguistics and Speech,Pearson Publication, 2014.
2. Steven Bird, Ewan Kleinand Edward Loper,— Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.
3. Breck Baldwin,—Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.2. RichardMReese, — Natural Language Processing with Java‖, O_Reilly Media, 2015.
4. Nitin Indurkhya and Fred J. Damerau, —Handbookof Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
5. Tanveer Siddiqui, U.S.Tiwary, — Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.6
Unit test-2	From 3.7 to 5.7

DATA SCIENCE

Course code	Course Title	No of Periods /week	Total no of periods/ Semester	FA Marks	SA Marks	Credits
26AM504E	DATA SCIENCE	3	45	30	70	2

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Marks	No of short questions	No of Essay questions	Cos Mapped
1.	Introduction to Data Science	8	14	2	1	CO1
2.	Data Collection and Preprocessing	10	22	3	2	CO2
3.	Data Analysis and Visualization	10	22	3	2	CO3
4.	Introduction to Machine Learning	10	22	2	2	CO4
5.	Introduction to Big Data and Cloud in Data Science	7	14	2	1	CO5
Total Periods		45	100	12	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i) Understand the Fundamentals of Data Science
(ii) Apply data collection, cleaning, and preprocessing techniques using tools
(iii) Understand, visualize, and explore data using descriptive statistics and visualize insights with plots (histograms, box plots, scatter plots).
(iv) Understand basicMachine Learning Concepts
(v) Explore Big Data and Cloud Technologies and Address Ethical Considerations

COURSE OUTCOMES

CO1	AM504.1	Fundamentals of data science, its lifecycle,and key roles in the field.
CO2	AM504.2	Collect,clean, andpre process data using tools like pandas, handling missing values, duplicates, and outliers.
CO3	AM504.3	Understand, visualize, and explore data using descriptive statistics and visualize insights withplots (histograms, box plots, scatter plots).
CO4	AM504.4	Apply basic machine learning techniques (k-NN, linear regression,k-means) and evaluate models.
CO5	AM504.5	Fundamentals of big data's 5 Vs, compare Hadoop/ Spark, and demonstrate cloud tools (e.g., AWS/GCP) for data science..

LEARNING OUTCOMES

1.0 Introduction to Data Science

1.1. Define Data Science
1.2. Importance of DataScience
1.3. Data Science Life Cycle and key stages
1.4. Roles in Data Science
  1.4.1 Data Scientist
  1.4.2 Data Analyst
  1.4.3 Data Engineer
1.5. Types of Data
  1.5.1 Structured,
  1.5.2 Semi-structured,
  1.5.3 Unstructured
  1.5.4 Compare Structured,Semi-Structured and Unstructured types of data
1.6 Applications of Data Science
1.7 Relationship between Data Science, Data Analytics, and Machine Learning
1.8 Skills Required in Data Science

2.0 Data Collection and Preprocessing

- 2.1 Data Collection Techniques-(APIs,CSV,Excel,SQL)
- 2.2 Reading Datausing pandas-(CSV,Excel)
- 2 .3 Handling Missing Data
  - 2.3.1 Removing Missing Data
  - 2.3.2 Filling Missing Values
  - 2.3.3 Forward Fill/Backward Fill
- 2.4 Data Cleaning Techniques
- 2.5 Handling Duplicates in Data
- 2.6 Detecting and Removing Outliers
- 2.7 Feature Scaling: Normalization and Standardization
- 2.8 Data Encoding: One-Hot, Label Encoding

3.0 Data Analysis and Visualization

- 3.1 Understanding Data with Descriptive Statistics
  - 3.1.1 Mean,Median,Mode
  - 3.1.2 Range,Variance,StandardDeviation
- 3.2 Data Distributions and Outliers
- 3.3 Data Visualization
  - 3.3.1 Introduction to Visualization Tools (Matplotlib,Seaborn, Pandas Plotting–with comparisons)
  - 3.3.2 Common Plots:Histogram, BoxPlot,Scatter Plot
- 3.4 Correlation and Covariance Define Correlation and Covariance
  - 3.4.1 Applications in DataScience
- 3.5 EDA (Exploratory Data Analysis)
  - 3.5.1 Core Components of Exploratory Data Analysis
  - 3.5.2 Benefits of EDA in Data Science

4.0 Introduction to Machine Learning

- 4.1 Introduction to Machine Learning
  - 4.1.1 Definition of Machine Learning
  - 4.1.2 Importance and real-world applications
- 4.2 Difference between Data Science, ML,andAI
- 4.3 Types of Machine Learning
  - 4.3.1 Supervised
  - 4.3.2 Unsupervised Learning
  - 4.3.3 Reinforcemen tLearning
- 4.4 Data set splitting
  - 4.4.1 Training Set and Testing Set
  - 4.4.2 Importance of splitting data correctly
- 4.5 Supervised Learning:
  - 4.5.1 k-Nearest Neighbors(k-NN)
  - 4.5.2 Linear Regression
- 4.6 Unsupervised Learning
  - 4.6.1 k-Means Clustering
- 4.7 Model Evaluation:Accuracy, ConfusionMatrix

5.0 Introduction to Big Data and Cloud in Data Science

- 5.1 Introduction to Big Data
  - 5.1.1 Definition, Importance
  - 5.1.2 5Vs of BigData

5.2 Big Data Ecosystem–(Storage,Processing,Analysis)
5.3Technologies in Big Data
5.3.1 Hadoop (HDFS,MapReduce)
5.3.2 Apache Sparkbasics
5.3.3 NoSQL:MongoDB,Cassandra
5.4 Introduction to Cloud Computing
5.4.1 Definition,Importance
5.4.2 List Cloud Tools for DataScience
5.4.3 Applications of Cloud Computing in DataScience
5.5 Ethical Issues in Data Science

PO/PSO MAPPING

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	1	2	1	2	2	3	1	1
CO2	2	2	2	3	1	1	2	2	2	1
CO3	2	3	2	3	1	1	2	3	2	1
CO4	2	3	3	3	2	2	2	2	3	1
CO5	2	2	2	3	1	3	2	1	1	3
AVG	2.2	2.2	2.0	2.8	1.2	1.8	2.0	2.2	1.8	1.4

3=strongly mapped,2=moderately mapped,1=slightly mapped

COURSE CONTENT

1. Introduction to Data Science– Define Data Science-Importance of Data Science-Data Science Life Cycle and key stages-Roles in Data Science-Types of Data-Compare Structured, Semi-Structured and Unstructured types of data-Applications of Data Science -Relationship Between Data Science, Data Analytics, and Machine Learning- Skills Required in Data Science
2. Data Collection and Preprocessing– Data Collection Techniques (APIs, CSV, Excel, SQL) – Reading Datausing pandas (CSV, Excel) – HandlingMissingData: Removing, Filling, Forward/Backward Fill – Data Cleaning Techniques – Handling Duplicates in Data – Detecting and Removing Outliers – Feature Scaling: Normalization and Standardization – Data Encoding: One-Hot, Label Encoding
3. Data Analysis and Visualization– Understanding Data with Descriptive Statistics: Mean, Median, Mode, Range, Variance, Standard Deviation – Data Distributions and Outliers – Data Visualization – Visualization Tools: Matplotlib, Seaborn, Pandas Plotting – Common Plots: Histogram, Box Plot, Scatter Plot – Correlation and Covariance: Definitions and Applications – Exploratory Data Analysis (EDA): Core Components and Benefits
4. **Introduction to Machine Learning** – Introduction to Machine Learning: Definition, Importance, Applications – Difference between Data Science, Machine

Learning, and Artificial Intelligence – Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning – Dataset Splitting: Training and Testing Sets, Importance – Supervised Learning: k-Nearest Neighbors (k-NN), Linear Regression – Unsupervised Learning: k-Means Clustering – Model Evaluation: Accuracy, Confusion Matrix

5. **Introduction to Big Data and Cloud in Data Science** – Introduction to Big Data: Definition, Importance, 5 Vs of Big Data – Big Data Ecosystem: Storage, Processing, Analysis – Technologiesin Big Data:Hadoop (HDFS,MapReduce), Apache Spark Basics, NoSQL (MongoDB, Cassandra) – Introduction to Cloud Computing: Definition, Importance – Cloud Tools for Data Science – Applications of Cloud Computing in Data Science – Ethical Issues in Data Science

REFERENCES

1. "Foundations of Data Science" by Avrim Blum, John Hopcroft,and Ravindran Kannan
2. "Data Science from Scratch: First Principles with Python",by Joel Grus, O'Reilly
3. "Data Science and Analytics", by V.K.Jain, Khanna Publishers
4. "Data Science and Big Data Analytics" by EMC Education Services
5. "Python for Data Analysis" by WesMcKinney, O'Reilly
6. "Machine Learning for Absolute Beginners" by Oliver Theobald
7. "Cloud Computing: Concepts, Technology & Architecture" by ThomasErl
8. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" by Pramod J. Sadalage and Martin Fowler

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.3.1
Unit test-2	From 3.3.2 to 5.5

ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING

Course code	Course Title	No. of Periods/ Week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM505E	ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING	3	45	30	70	2

TIME SCHEDULE

S.NO	Chapter/Unit Title	No.of Periods	Weightage of marks	No.of Short Questions	No. of Essay Questions	COs Mapped
1.	INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS	9	17	3	1	CO1
2.	FEED FORWARD NEURAL NETWORKS	9	17	3	1	CO2
3.	OTHER ARTIFICIAL NEURAL NETWORK ARCHITECTURES	9	22	2	2	CO3
4.	DEEP LEARNING	9	22	2	2	CO4
5.	RECURRENT NEURAL NETWORK	9	22	2	2	CO5
Total		45	100	12	8	

COURSE OBJECTIVES

Upon completion of the course thes tudent shall be able to

(i) Introduce the fundamental techniques and principles of Neural Networks

(ii) Study the different models in ARTIFICIAL NEURAL NETWORK and their applications

(iii) Familiarize deep learning concepts with Convolution and Recurrent Neural Network

COURSE OUTCOMES

CO1	AM505.1	Explain the basic concepts in Neural Networks and applications
CO2	AM505.2	Analyze feed forward networks andtheir training issues
CO3	AM505.3	Distinguish different types of ARTIFICIAL NEURAL NETWORK architectures
CO4	AM505.4	Analyze deep learning concepts using Back propagating network
CO5	AM505.5	Explain Recurrent neural Network models and Applications

LEARNING OUTCOMES

1.0 INTRODUCTION TO ARTIFICIAL NEURAL NETWORK

1.1 Define Neural Networks
- 1.1.1 Understanding the biological neuron

1.2 Explain Model of Artificial neural network

1.3 Describe Types of activation Functions
- 1.3.1 Identity function
- 1.3.2 Threshold/step function
- 1.3.3 Rectified linear unit function
- 1.3.4 Sigmoid function
- 1.3.5 Hyperbolic tangent function

1.4 Explain Architectures of Neural Network
- 1.4.1 Single layer feed forward network
- 1.4.2 Multilayer feed forward network
- 1.4.3 Recurrent network

1.5 Explain Learning process in Artificial neural network

1.6 Understand Taxonomy of neural networks

1.7 Discuss real life applications of Neural networks

2.0 FEED FORWARD NEURAL NETWORKS

2.1 Explain perceptron
- 2.1.1 Perceptron
- 2.1.2 Perceptron Learning rule
- 2.1.3 Perceptron Function
- 2.1.4 Inputs of a perceptron
- 2.1.5 Activation functions of a perceptron
- 2.1.6 Output of Perceptron
- 2.1.7 Perceptron decision function

2.2 Analyze Training Algorithms
- 2.2.1 Discrete
- 2.2.2 Continuous

2.3 List Limitations of Perceptron Model

2.4 Explain Credit Assignment problem

2.5 Analyze Back propogation Algorithm
- 2.5.1 Generalized Delta Rule
- 2.5.2 Derivation of Back propogation
- 2.5.3 Summarization of back propogation

3.0 OTHER ARTIFICIAL NEURAL NETWORK ARCHITECTURES

3.1 Explain Associative Memory
- 3.1.1 Introduction
- 3.1.2 Hopfield Network
- 3.1.3 BiDirectionalA ssociative memory

3.2 List the Applications of Associative memory
3.3 Explain Adaptive Resonance Theory (ART)
3.3.1 ART1
3.3.2 ART2
3.3.3 Applications of ART
3.4 Explain Competition based artificial neural network
3.4.1 Kohonen self-organizing maps
3.4.2 Counter propagation network

4.0 DEEP LEARNING

4.1 Define Deep learning
4.2 List the Applications of Deep learning
4.3 Discuss Issues in Feed forward Networks
4.3.1 Temporal/sequential Relationships
4.3.2 Spatial relationships
4.3.3 Vanishing gradient
4.3.4 Over fitting
4.4 Describe Deep learning networks
4.4.1 Convolution neural networks
4.4.2 Recurrent neural networks
4.4.3 Long short term memory networks
4.4.4 Support vector Machines
4.5 Explain Convolution Neural network
4.5.1 Convolution neural network design
4.5.2 Training Convolution neural network
4.5.3 Limitations of Convolution neural network

5.0 RECURRENT NEURAL NET WORK

5.1 Define recurrent neural networks
5.2 Distinguish Feed forward neural networks andr ecurrent neural networks
5.3 List the Applications of Recurrent neural networks
5.4 Explain the Structure of RECURRENT NEURAL NETWORK
5.4.1 Hopfield network
5.4.2 Elmann etwork
5.4.3 Jordan network
5.5 Explain Limitations of RECURRENTL NEURAL NETWORK
5.6 Describe long short-term Memory

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3							3	3	
CO2	2	3	2	2	1	2	1	3	3	2
CO3	3	1	1	2	2			3	2	1
CO4	2	3	2	2				2	2	2
CO5	2	2	3					3	2	2
Average	2.4	2.25	2	2	1.5	2	1	2.8	2.4	1.75

3=Strongly mapped, 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1.0 Introduction To Artificial Neural Networks

Fundamentals Of Neural Networks – Model of Artificial Neuron – Activation functions - Neural Network Architectures – Learning process in ARTIFICIAL NEURAL NETWORK – Taxonomy Of Neural Network Architectures – Applications

2.0 Feed Forward Neural Networks

Introduction toperceptron –Training Algorithms- Perceptron– Limitationsof the Perceptron–
Model- Credit Assignment Problem–Back propagation (BP) Algorithm

3.0 Other Artificial Neural Network Architectures

Associative Memory–Exponential BAM–Adaptive Resonance Theory-ART1–
ART2–Applications–Neural Networks Based On Competition.

4.0 Deep Learning

Overview-Applications of deep learning-issues in feed forward networks-

Deeplearning networks- Convolutional Neural Network- Applications of CNN.

5.0 Recurren Tneural Networks

Introduction-Feed forward neural networks Vs Recurrent neural networks-
Applications of Recurrent neural networks, Structures of Recurrent Neural Network- Limitations of RECURRENTL NEURAL NETWORK

REFERENCES

1. Machine learning, pearson -- Saikat Dutt, Subramanian chandramouli, Amitkumar Das
2. Machine Intelligence, Notionpress—Sureshsamudrala
3. FundamentalsofNeuralnetworks LaureneFausett
4. Charu C.Aggarwal “Neural Networks and Deep learning” Springer International Publishing,2018
5. SatishKumar,“ Neural Networks, A Classroom Approach”,Tata McGraw-Hill, 2007
6. Simon Haykin,“Neural Networks, A Comprehensive Foundation”, 2nd Edition, Addison Wesley Longman, 2001.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.3.1
Unit test-2	From 3.3.2 to 5.6

PATTERN RECOGNITION

Course code	Course Title	No. Of Periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM506A	PATTERN RECOGNITION	2	30	-	-	-

TIME SCHEDULE

S. No.	Chapter/Unit Title	No.of Periods	COs mapped
1	Introduction to Pattern Recognition	6	CO1
2	Data Representation and Feature Extraction	6	CO2
3	Classifiers and Statistical Methods	6	CO3
4	Clustering and Dimensionality Reduction	6	CO4
5	Applications and Case Studies	6	CO5
	Total	30	

COURSE OBJECTIVES

Upon completion of the course the student shall be able

(i) Familiarize themselves with the basic idea of pattern recognition

(ii) Simplifyreal-world data (like images or sounds) into useful in formation using feature extraction techniques.

(iii) Analyze patterns in data and apply simple classifiers like K-N N and Decision Trees to recognize or label them.

(iv) Familiarize themselves with tools like Python, OpenCV ,and Scikit-learn to build and present simple pattern recognition solutions.

COURSE OUTCOMES

CO1	AM506.1	Explain the basic concepts of pattern recognition
CO2	AM506.2	Identify and extract useful features from different types of data.
CO3	AM506.3	Apply simple classifiers to recognize and label patterns in data.
CO4	AM506.4	Group similar data using clustering and reduced at a size using PCA.
CO5	AM506.5	Use pattern recognition techniques in real-world mini-projects and case studies.

LEARNING OUTCOMES

1.0Introduction to Pattern Recognition

- 1.1 What is Pattern Recognition?
- 1.2 Applications in real life
- 1.3 Explain Supervised vs.Unsupervised Learning
- 1.4 Explain Python basics&NumPy Basics
- 1.5 Display simple patterns (e.g.,shapes)
- 1.6 Identify image,text,audio datat ypes

2.0Data Representation and Feature Extraction

- 2.1 Define data and types of data
- 2.2 Features and Feature Vectors
- 2.3 Define Shape, Color,Size,Edges
- 2.4 Explain how to Load & display image using OpenCV
- 2.5 What is a color histogram in image processing, edges (Canny) and why is it useful?

3.0 Classifiers and Statistical Methods

- 3.1 What is Bayes'Theorem and how does it work?
- 3.2 What does the digits dataset in Scikit-learn represent, and how is its tructured?
- 3.3 Define classifier
- 3.4 What is a decision tree classifier used for?
- 3.5 What is meant by visualizing classification results?

4.0 Clustering and Dimensionality Reduction

- 4.1 Define K-Means & how to apply K-Means on simple dataset
- 4.2 What is Hierarchical Clustering and How Does It Work?
- 4.3 What is PCA(Principal Component Analysis)?
- 4.4 Why is PCA used in machine learning?

5.0 Applications and Case Studies

- 5.1 Explain the Usecases:Face,fingerprint,image, medical
- 5.2 Explain how to face detection using Haarcascades(OpenCV)
- 5.3 Explain how to Shape detection via webcam

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	3					3	3	
CO2	2	3	3		1			3	3	2
CO3	3	3	3	2	2			3	2	1
CO4	2	3	3	3	3	2	1	2	2	2
CO5	2	2	3	3				3	2	2
Average	2.4	2.4	2.9	1.6	1.2	2	1	2.8	2.4	1.75

3=Strongly mapped,2=moderately mapped,1=slightly mapped

COURSE CONTENT

1.0 Introduction to Pattern Recognition
Introduction to Pattern Recognition-Applications:Face,handwriting, speech recognition-Supervised vs. Unsupervised Learning

2.0 Data Representation and Feature Extraction
Types of data:Images,text, sound- What is a feature, Importance of feature extraction- Feature vector and pattern classes- Examples: Edges, shape, size, color

3.0 Classifiers and Statistical Methods
Bayes 'Theorem (conceptual)-Introduction to Classifiers-Decision Trees (concept only)

4.0 Clustering and Dimensionality Reduction
Clustering-K-Means and Hierarchical Clustering (overview) -Principal Component Analysis (PCA – concept only)

5.0Applications and Case Studies
Real-world classification examples-Applications:Face, fingerprint,andmedical image recognition

REFERENCES

1) Pattern Recognition and ImageAnalysis–Earl Gose, Richard Johnsonbaugh, Steve Jost
2) Introduction to Pattern Recognition–Arindam Chaudhuri
3) Fundamentals of Digital Image Processing–Rafael C.Gonzalez& RichardE.Woods
4) Pattern Recognition– S.Theodoridis (selected hapters)
5) Pattern Recognition– S.Theodoridis &K. Koutroumbas (K-NN, Decision Trees, and Naive Bayes with statistical background.)
6) Artificial Intelligence and Machine Learning–P.S.Grover

NATURAL LANGUAGE PROCESSING LABORATORY USING PYTHON

Course Code	Course title	No of periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM507L	NATURAL LANGUAGE PROCESSING LABORATORY USING PYTHON	04	60	40	60	1.5

TIME SCHEDULE

S No	Chapter/Unit Title	No.of Periods	Cos Mapped
1.	Introduction to Natural Language Processing	10	CO1
2.	Word Level Analysis	10	CO1,CO2
3.	Syntactic Analysis	10	CO2,CO3
4	Semantics and Pragmatics	15	CO3,CO4
5	Discourse Analysis and Lexical Resources	15	CO4,CO5
	Total	60	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able

(i)	Familiarize with the fundamentals of Natural Language Processing (NLP).
(ii)	Make use of word level analysis.
(iii)	To know Context Free Grammar and Probabilistic Context Free Grammar in NLP.
(iv)	Make use of the Semantics of sentences and pragmatics.
(v)	To know NLP techniques in Information Retrieval

COURSE OUTCOMES

CO1	AM507.1	Practice Natural Language Processing in Python Environment.
CO2	AM507.2	Perform Word Level Analysis in Python.
CO3	AM507.3	Perform Syntactic Analysis in Python.
CO4	AM507.4	Practice Semantics and Pragmatics in Python.
CO5	AM507.5	Observe Discourse Analysis and Lexical Resources in Python.

Exercises:

Suggestion:

- Use Anaconda IDE for Python Programming.
- Use common Datasets (like Student Marks for 6 different Subjects with Grades) for easy understanding.

LEARNING OUTCOMES

1. Introduction to Natural Language Processing

1. Practice Installation of NLTK in python.
2. Execute Tokenise by word using NLTK in python.
3. Execute Tokenise by Sentence using NLTK in python.
4. Exercise to find Minimum number of edits (operations)required to convert “str1” Into “str2” using python.

2. Word Level Analysis

5. Practice Part of Speech Tagging with Stop words using NLTK in python.
6. Exercise on binning method (sequential data) for data smoothing using python.
7. Exercise on N-Gram language modelling in Natural Language Processing.

3. Syntactic Analysis

8. Practice basic tree bank structure implementation in python.
9. Exercise on Creating Shallow Tree using python.
10. Practice Fibonacci numbers using dynamic programming python.
11. Execute Correct() function using NLTK in python.
12. Exercise on Chunking using NLTK in python.

13. Exercise on Chinking using NLTK in python.

4. Semantics and Pragmatics

14. Practice Named Entity Recognition (NER) using spcy.
15. Practice Sentiment Analysis using TxtBlob.
16. Implementation of Dictionary and Thesaurus Functions Using Word Netin Python.

5. Discourse Analysis and Lexical Resources

17. Practice Lemmatizing using NLTK in python.
18. Practice Stemming using NLTK in python.

CO-PO/PSO MAPPING

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	2	1	2	3	2
CO2	2	3	2	2	1	2	2	1	3	2
CO3	2	2	3	2	2	1	1	1	2	3
CO4	1	2	3	2	2	1	2	1	2	2
CO5	2	3	2	3	2	2	2	2	2	2
Average	2	2.4	2.4	2	1.8	1.6	1.6	1.4	2.4	2.2

KEY COMPETENCIES

Exp. No.	**Name of the experiment**	**Objectives**	**Key Competencies**
1	Installation of NLTK In python	Learns Installation of Anaconda. Learns Installation of NLTK.	• Know the Installation of Anaconda IDE. • Open your terminal, runpip install NLTK . Write python in the command prompt so python Interactive Shell is ready to execute your code/Script. • Import NLTK

2	Tokenize by word	of word tokenize() method to split a sentence into tokens or words.	• Import word tokenize from NLTK • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
3	Tokenize by Sentence	Usage of senttokenize () method to split a document or paragraph into sentences.	• Import senttokenize from NLTK. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
4	Finding minimum number of edits (operations) required to convert “str1” into “str2”	Perform minimum number of edits (operations) required to convert “str1” into “str2”.	• Save str1 and str2. • Compare the strings. • Count the no of edits required. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
5	Part of Speech Tagging with Stop words	Stop word scan be filtered from the text to be processed.	• Import word tokenize from NLTK • Import stopwords from NLTK • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
6	Binning method for data smoothing	Learn sdata smoothing by using binning methods. • Know smoothing by bin means • Know smoothing by bin median • Know smoothing by binboundary	• Import numpy. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.

7	N-Gram language modeling in Natural Language Processing	To understand and implement N-gram models (unigram, bigram, and trigram) for text preprocessing in Natural Language Processing (NATURAL LANGUAGE PROCESSING).	• Import nltk • Use word tokenize. • Edit and save the program • Check for the syntax errors and clear the errors. • Run the program and check for the output.
8	Basic tree bank structure implementation on	Learns to search for a given key in moderate time (quicker than Linked Listand slower than arrays).	• Import Tree bank from NLTK • Import Tree from NLTK • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
9	Creating Shallow Tree	Learns to keep the highest level sub trees	• Import shallowtree from transforms. • Import Treebank from NLTK • Import Tree from NLTK • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
10	Fibonacci numbers using dynamic programming	Learns to perform recursion Fn=Fn-1+ Fn-2	• Import math • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
11	Correct () function	Learns to get the corrected words if anysentence have spelling mistakes	• Import TextBlob from textblob. • Use correct() method. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
12	Chunking Process	Learns on the process of taking individual piecesofinformation and grouping them into larger units	• importwordtokenizefromNLTK • UseRegexpParsermethodof NLTK. • Edit and save the program • Checkforthesyntaxerrorsand clear the errors • Runtheprogramandcheckforthe output.

13	Chinking Process	Learn store move a chunk from a chunk.	• import wordtokenize from NLTK • Use RegexpParser method of NLTK. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
14	Named Entity Recogniti on(NER) using spaCy	To identify and extract named entities such as person names, locations, dates, organizations, etc., from a text using spaCy.	• Import spacy. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output
15	Sentiment Analysis using Text Blob	To perform sentiment analysis on textual data using the TextBlob Python library	• Use text blob function. • Edit and save the program • Check for the syntax errors and clear the errors. • Run the program and check for the output
16	Impleme ntation of Dictionar y and Thesauru s Function s Using WordNet In Python	To understand the role of Word Net as a lexical database for English in Natural LanguageProcessi ng (NATURAL LANGUAGE PROCESSING).	• Working with the NLTK library in Python. • Edit and save the program • Check for the syntax errors and clear the errors. • Run the program and check for the output.
17	Lemmatizi ng Process	Learns the process of grouping together the inflected forms of a word so they can be analyzed as a single item.	• Import WordNetLemmatizer from NLTK . • Use lemmatizes method. • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.

18	Stemming Process	Learns the process of producing morphological variants of a root/base word. There are mainly two errors in stemming • over-stemming under-stemming	• Import word to kenize from NLTK. • Import Porter Stemmer from NLTK. • Edit and save the program • Check for the syntax errors and clear the Errors 7. Run the program and check for the output.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	**Learning outcomes to be covered**
Unit test-1	From to 9
Unit test-2	From 10 to 18

MACHINE LEARNING LAB

Course Code	Course title	No of periods/week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM508L	MACHINE LEARNING LAB	06	90	40	60	02

TIME SCHEDULE

SNo	Chapter / Unit Title	No.of Periods	Cos Mapped
1.	Installing python and various SciPy Packages using Anaconda, PIPetc	12	CO1
2.	Implementation of Data modeling Functions	30	CO2
3.	Implementation of various Supervised and unsupervised learning Algorithms	30	CO3,CO4
4	Implementation of single layer and Multilayer Neural Networks	18	CO5
	Total	90	

COURSE OBJECTIVES

Upon completion of the course the student shall be able
(i) Install the Python, SciPy packages on windows using Anaconda
(ii) Make use of Datasets in implementing the machine learning algorithms
(iii) Implementing the Algorithms on Supervised and Un- Supervised Learning
(iv) Implementing the single layer and multilayer neural networks

COURSE OUTCOMES

CO1	AM508.1	Understand the implementation procedures for the machine learning algorithms
CO2	AM508.2	Apply appropriate datasets to the Machine Learning algorithms.
CO3	AM508.3	Design python programs for supervised and unsupervised learning algorithms
CO4	AM508.4	Design python programs for single layer and multilayer feed forward neural networks
CO5	AM508.5	Identify and apply machine learning algorithms to solve real world problems.

LEARNING OUTCOMES

1. Installing python and Various Packages:

1. Exercise on installing python, scipy packages (Includes numpy, pandas, matplotlib, sklearn)

2. Data modeling Functions

2. Exercise on basic mathematical operations on data types(vectors , matrices using numpy)
3. Exercise on creating, loading and saving .CSV file.
4. Write a aprogram using pandas to merge two CSV files in to a single Data Frame and save the result to a new CSV file.
5. Exercise on Calculation of mean , median, variance, standard deviation, quartiles, inter quartile range.
6. Exercise on basic plots using matplotlib for an example dataset
7. Exercise on data preprocessing operations on a dataset.

3. Various Supervised and unsupervised learning Algorithms

8. Write a program to to predict a student's score based on the number of hours studied using Simple Linear Regression. Use a small dataset (Hoursvs. Scores) and display the predicted score for a given input hours value.
9. Exercise on model training (Holdout, Kfold cross validation, Boot strap sampling) using SK Learn.
10. Exercise on Feature construction and feature extraction for a sample data set.
11. Exercise on Feature Subsetselection for a model dataset.
12. Exercise on implementing the naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier.
13. Exercise on implementing k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
14. Demonstrate Decision Tree algorithm for finding the most specific hypothesis based on a given set of training data samples.
15. Apply decision tree based ID3 algorithm on a appropriate data set for building the decision tree and to classify a new sample.
16. Write a program to implement K-Means Clustering to classify the data set. Use an appropriate data set for building the K-Means Clustering and apply this knowledge to classify a new sample.
17. Write a program to apply K-Means clustering to a customer dataset containing annual income and spending score, and plot the clusters using matplotlib.
18. Write a program to implement the SVM classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier.
19. Write a program to implement the simple linear regression algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier.

4. Single layer and Multilayer Neural Networks

20. Write a program to implement single layer feed forward neural networks.
21. Write a program to implement multilayer feed forward neural networks.

CO-PO / PSO MAPPING

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	2	3	2	2
CO2	2	3	2	3	2	1	2	3	3	2
CO3	3	3	3	3	2	2	3	3	3	3
CO4	2	3	3	3	2	2	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3
AVG	2.6	2.8	2.6	2.8	2.0	1.6	2.6	3.0	2.8	2.6

KEY COMPETENCIES

Exp. No.	**Name of the experiment**	**Objectives**	**Key Competencies**
1	Exercise on installing python,scipy packages	(a)Installation of python (b)Installing scipy packages using Anaconda	a)observe the installation of the packages
2	Exercise on basic mathematical operations on data types	(a) Write a program for implementing vectors and matrices	(a) Compile the program and rectify the errors (b) Use numpy package (c) Execute the program (d) Observe the output for different data values

3	Exercise on creating , loading and saving .CSV file	(a)Create a datafile in Excel (b)Save the file with .CSV extension (c)Load the .CSV file	(a)Create and save the .CSV file (b)Loading of .CSV file (c)Compiling and executing the program (d)Observe the output
4	Write a program using pandas to merge two CSV files into a singleData Frameand save the result to a new CSV file	(a)Create a datafile in Excel (b)Save the file with .CSV extension (c)Load the.CSV file	(a)Create and save the .CSV file (b)Loading of .CSV file (c)Compiling and executing the program (d)Observe the output
5	Exercise on Calculation of mean , median, variance, standard deviation, quartiles ,inter quartiler ange.	(a) Write a program to implement statistical calculations (b)Apply the program on appropriate data values	(a) Identify the appropriate data values (b) Use Numpy package (c) Observe the errors (d) Correct the program and execute.
6	Exercise on basic plots Using mat plotlib for an example dataset	(a) Write a program for implementing basic plots. (b) Apply the program on sample data set..	(a) Use Matplotlib package of python to generate basic plots (b) Execute the program on sample dataset (c) Observe the output
7	Exercise on data preprocessin g operations on a dataset.	(a) Write a a program to handle outliers and missing values in the dataset	(a)Identifying and removing outliers/ missing values (b)Test the program for a given dataset
8	Program to to predict a student's score based On the	(a)program to predict as student's score based on the number of hours studied (b)use Simple Linear	(a) Student data (b) Use Simple Linear Regression (c) Observe the output

	number of hours studied using Simple Linear Regression	Regression	
9	Exercise on model training using Sk learn.	(a) Write a program to train a model	(a) Use SK learn package (b) Differentiating test dataset and training dataset using hold out method (c) Stabilizing the dataset using K- fold cross validation (d) Generating samples of given size from training data by boot strap sampling (e) Training the model (f) Observe the output
10	Exercise on Feature construction and feature extraction for a sample data set.	(a) Write a program to implement feature construction (b) Write a program to implement feature extraction using PCA	(a) Use Pandas package (b) Dummy coding the categorical variables (nominal) (c) Encoding categorical (ordinal) variables (d) Transforming numeric features to categorical features (e) Using PCA for feature extraction in a dataset. (f) Observe the output
11	Exercise on Feature Subset selection for a model data set.	(a) Write a program to implement feature subset selection	(a)Selecting a subset of features in a dataset to improve the performance (b)Observe the output
12	Write a program to implement the naïve Bayesian classifier for a dataset	(a)Write a program to implement naïve Bayesian classifier algorithm.	(a)Use SK Learn package (b)Importing a dataset (c)Applying naïve Bayesian classifier to classify the dataset (d)Calculating the accuracy of the classifier (e)Analyzing the output
13	Write a program to implement k-Nearest Neighbour algorithm	(a)Write a program to implement KNN Algorithm for supervised learning	(a) Use SK Learn package (b) Importing a dataset (c) Applying KNN classifier to classify the dataset (d) Calculating the accuracy of the classifier (e) Analyzing the output

14	Implement decision tree Algorithmto classify a dataset	a)write a program to implement decision tree algorithm	(a) Importing a dataset (b) Applying decision tree classifier to classify the dataset (c) Calculating the accuracy of the classifier (d) Analyzing the output
15	Program to demonstrate the working of the decision tree based ID3 algorithm.	a)Write a program to implement ID3 algorithm	(a) Importing a dataset (b) Applying ID3 algorithm to classify the dataset (c) Calculating the accuracy of the classifier (d) Analyzing the output
16	program to implement K-Means Clustering algorithm for a sample data set	(a) Write a program for K-Means clustering algorithm	(a) Use SK learn package (b) Importing a dataset (c) Applying K-Means algorithm to cluster the dataset (d) Calculating the accuracy of the classifier (e) Analyzing the output
17	program to apply K-Means clustering to a customer dataset containing annual income and spending score, and plot the clusters using matplotlib	(a) Write a program to apply K-Means clustering to a customer dataset containing annual income and spending score, and plot the clusters using matplotlib	(a) Use SK Learn package (b) Importing a dataset (c) Apply K-Means clustering to a customer dataset (d) Analyzing the output
18	program to implement the SVM classifier for a sample training data set	a)Write a program to implement the SVM classifier for a sample data set	(a) Importing a dataset (b) Applying SVM algorithm to classify the dataset (c) Calculating the accuracy of the classifier (d) Analyzing the output

19	program to implement the simple linear regression algorithm	(a) Write a aprogram to implement the linear regression algorithms	(a) Importing a dataset (b) Applying linear regression algorithmt o classify the dataset (c) Calculating the accuracy of the classifier (d) Analyzing the output
20	program to implement single layer feed forward neural networks	a) Write a program to implement single layer feed forward neural networks	(a) Installing neuro lab package (b) Executing the program (c) Observe the output
21	Program to implement Multi layer feedf orward neural networks.	(a) Write a program to implement multilayer feed forward network	(a) Installing neurolab package (b) Executing the program (c)Observe the output

REFERENCES

1. Machine learning Pearson---Saikat Dutt,Subramanian Chandra mouli, Amit Kumar https://deepakdvallur.weebly.com/machine-learning-laboratory.html
2. https://github.com/DaNgLiN/ML-LAB-PROGRAM-vtu--15csl76
3. http://vtu.babivenu.in/wp-content/ uploads2019/08/CSE-7th-Sem-MACHINE-LEARNING-LABORATORY-csml1819.pdf
4. https://www.tutorialspoint.com/machine_learning_with_python/machine_learning_ with_python_tutor ial.pdf
5. WWW.Kaggle.comforDatasetsin.CSVformat

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED

FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 10
Unit test-2	From 11 to 21

PROJECT WORK

Course Code	Course Title	No of periods/ week	Total No of Periods/ Semester	FA Marks	SA Marks	Credits
26AM509P	Project Work	6	90	40	60	2

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
(i)	Enhance the knowledge by innovative learning and get the skills through the teamwork
(ii)	Provide with the opportunity to synthesize knowledge from various areas of learning
(iii)	Critically and creatively apply it to real life situations

COURSE OUTCOMES

CO1	AM509.1	Organising teamwork.
CO2	AM509.2	Innovative learning.
CO3	AM509.3	Apply theoretical knowledge to practical work situations.
CO4	AM509.4	Practice technical project reports preparation and presentation.

LEARNING OUTCOMES

1. Problem solving and Critical Thinking

1.1 Identify different works to be carried out in the Project
1.2 Collect data relevant to the project work
1.3 Carryout need survey
1.4 Select the most efficient method from the available choices based on preliminary investigation
1.5 Design the required elements of the project work as per standard practices
1.6 Prepare the working modules / equipment required for the project work
1.7 Estimate the cost of project, technological need, computer skills, materials and other equipment
1.8 Prepare the plan and schedule of starting time and sequence of operations to be carried out at various stages of the project work in detail
1.9 Prepare critical activities at various stages of the project work
1.10 Test various conditions with different electrical input parameter if required
1.11 Implement project work and record the results.
1.12 Draw Appropriate Conclusions
1.13 Preparation of project report.

2. Communication

2.1 Communicate effectively.
2.2 Present Ideas Clearly.
2.3 Present Ideas Coherently.
2.4 Report writing.

3. Collaboration

3.1. Discuss the ideas.
3.2. Coordinate with team members
3.3. Team work in accomplishing the task.

4. Independent Learning

4.1. Involves in the group task.
4.2. Analyse the appropriate actions.
4.3. Compares merits and demerits
4.4. Analyse the activities for sustainability
4.5. Analyse the activities to ensure ethics

5. Ethics

5.1 Give respect and value to all classmates, educators, colleagues, and others
5.2 Understand the health, safety, and environmental impacts of their work
5.3 Recognize the constraints of limited resources
5.4 Develop sustainable products and processes that protect the health, safety, and prosperity of future generations
5.5 Maintain integrity in all conduct and publications and give due credit to the contributions of others

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2		2	2		1	3	2	2
CO2						3		3		2
CO3			3			3		3		2
CO4						3		3		2
Average	2	2	3	2	2	3	1	3	2	2

3=strongly mapped, 2=moderately mapped and 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quiz (vii) Industry Visits (viii) Tech Fest (ix) Mini Projects (x) Library Visits.

COURSE CONTENT

1. Conduct a need survey to identify a problem.
2. Gather relevant data and select an appropriate software life cycle model.
3. Estimate project costs, required technology, and resources.
4. Develop a detailed project plan and schedule.
5. Prepare a comprehensive Software Requirement Specification (SRS) document.
6. Design the system architecture and elements using standard models like UML.
7. Develop the software modules as per the design.
8. Thoroughly test, debug, and validate the project to ensure it meets requirements.
9. Record results and prepare the final project report and, if applicable, a user manual.

Weightage of marks for Assessment of Learning Outcomes of Project work

S.No	Item	Marks
1	**Internal Marks** Completion of Assigned task in the group/individual to complete the project	**40**
2	**End Exam Marks:** i) Demonstration of skill relevant to the project (30) ii) Project Report (20) iii) Viva Voce (10)	**60**
Total marks		**100**

- Each group should have a project guide assigned by the HOS/Principal.
- End Examination assessment shall be done by HOS, external examiner and faculty supervisor who guided the students during project work.
- The external examiner shall be from an industry/organisation/Head of Section of other polytechnic/Senior faculty of other polytechnic.

Internal Assessment Guidelines:

- First Review: To be conducted after the completion of 4 weeks.
- Second Review: To be conducted after the completion of 10 weeks.
- Third Review: To be conducted after the completion of 14 weeks.

SCHEME OF EVALUATION

Internal marks

Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 Marks)
COMMITTEE : 5 Marks PROJECT GUIDE : 5 Marks	COMMITTEE : 7.5 Marks PROJECT GUIDE : 7.5 Marks	COMMITTEE : 7.5 Marks PROJECT GUIDE : 7.5 Marks

-0o0-

Suggested Project Domains & Ideas (Aligned with C26 Curriculum)

Projects can be chosen from the following domains. These categories are directly linked to the subjects you have studied, allowing you to apply your specialized knowledge.

1. Full-Stack Web and Database Applications

- Relevant Subjects: WEB TECHNOLOGIES, DBMS, OOP THROUGH JAVA, PYTHON PROGRAMMING, UI/UX DESIGN.
- Project Ideas:
  - E-commerce Platform: Develop a complete online store with user accounts, product catalogs, a shopping cart, and an integrated payment gateway.
  - Online Learning Management System (LMS): Create a portal for students and teachers to manage courses, submit assignments, and track progress.

- Real-time Polling/Survey Application: Build a web app where users can create polls and see live results, similar to Mentimeter or Kahoot!
- Hostel or Mess Management System: An application for managing student accommodations, fee payments, and meal preferences.

2. AI/ML and Data Science Projects

- Relevant Subjects: FUNDAMENTALS OF AIML, AI USING PYTHON, DATA STRUCTURES THROUGH PYTHON.
- Project Ideas:
  - Student Performance Predictor: Use college data to build a model that predicts student academic outcomes, helping identify at-risk students early.
  - College Admissions Chatbot: Develop an NATURAL LANGUAGE PROCESSING-based chatbot to answer prospective students' questions about courses, fees, and campus life.
  - Sentiment Analysis of Social Media: Create a tool to analyze public sentiment on a specific topic (e.g., a new policy or event) by scraping data from social media.
  - Handwritten Digit or Object Recognizer: Build and train a neural network to recognize handwritten text or objects in images.

3. Mobile and Android Applications

- Relevant Subjects: ANDROID PROGRAMMING, JAVA, MOBILE COMMUNICATIONS, UI/UX DESIGN.
- Project Ideas:
  - Campus Navigator App: An app that provides indoor maps and navigation for the college campus, helping new students find labs, classrooms, and offices.
  - Event Notification App: A mobile application for the college that sends real-time notifications about events, workshops, and placement drives.
  - Personal Finance Tracker: Develop an Android app to help users track their income and expenses, with features for budgeting and generating reports.
  - Fitness and Wellness App: An app to track daily physical activity, set fitness goals, and provide simple workout routines.

4. Internet of Things (IoT) and Embedded Systems

- Relevant Subjects: IoT, COMPUTER ORGANIZATION, DIGITAL ELECTRONICS.
- Project Ideas:
  - Smart Campus System: Design an IoT network to monitor and control classroom lights and fans based on occupancy, saving energy.
  - Automated Irrigation System: Create a system using soil moisture sensors to automatically water plants, with a dashboard to monitor water usage. * Smart Parking Solution: Develop a system using sensors to detect empty parking spots and an app to guide drivers to them.
  - Environment Monitoring Station: Build a device that measures air quality (PM2.5, CO2) and temperature, and uploads the data to a cloud platform for analysis.

5. Networking and Cyber Security Projects

- Relevant Subjects: COMPUTER NETWORKS, CYBER SECURITY, LINUX PRACTICALS, TROUBLESHOOTING OF COMPUTER NETWORKS.
- Project Ideas:
    - Phishing Website Detector: Create a browser extension or tool that analyzes URLs and web page content to detect and warn users about potential phishing scams.
    - Secure File Transfer Utility: Develop a client-server application for transferring files securely over a network using encryption algorithms.
    - Network Intrusion Detection System (NIDS): Design a basic NIDS that monitors network traffic for suspicious patterns or signatures of common attacks.
    - Folder/File Encryption Tool: A desktop utility that allows users to encrypt and password-protect their sensitive files and folders.

VI Semester

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI-SEMESTER

Course Code	Course Title	Duration	FA Marks	SA Marks	Credits
26AM601I	INDUSTRIAL TRAINING	One Semester	240	60	20

LEARNING OUTCOMES (In Industry):

The student shall be able to display the following skill sets

- Apply knowledge and skill already learnt in the institution.
- Acquire the required skills of analysis, design and development, testing, verification and Validation.
- Acquire skills of deployment and distribution of the product.
- Involve in product design, development, and quality testing and maintenance production by Exhibiting the strength, teamwork spirit and self-confidence
- Prepare product documents like user manual, installation guide and operational manuals.
- Perform the activities of deploying product at customer site and training the end-user.
- Maintaining the system at user site (Post product services)

S.No	Unit Title	Duration	Cos Mapped
1	Application of Knowledge acquired.	Semester	CO1
2	Skill Acquirement.		CO2
3	Participate in product development.		CO3
4	Preform onsite service.		CO4
	Total	Semester	

COURSE OUTCOMES

At the end of course student able to:		
CO1	AM601.1	Apply knowledge and skill already learnt in the institution.
CO2	AM601.2	Acquire the required skills of analysis, design and development, testing, verification and validation, deployment and distribution of the product.
CO3	AM601.3	Involve in product design, development, quality testing and maintenance production by exhibiting the strength, teamwork spirit and self-confidence
CO4	AM601.4	Prepare product document, gain the skills in deploying product at customer site ,training the end user, maintaining the system.

SCHEME OF INSTRUCTIONS AND EXAMINATIONS

Assessment No	Upon completion of	Conducted by	Based on	Max Marks
Pre-Assessment	15 Days to 30 Days from the commencement of training	Mentor faculty member visits the industry one month after commencement of training and will submit a detailed report to the principal outlining the each candidate's details and observed work culture		
1 (Formative Assessment)	Mid Semester Assessment (after three months - at industry	1.The mentor faculty member concerned 2. Industry Training In charge	Learning outcomes as given in the scheme of assessment, for Industrial Training	120
	COURSE-I	Registration at Nptel/Swayam/Moocs/course era/lectera/caltech/NASSCOM/APSKILL DEVELOPMENT/oxford/ hackerrank/udemy…etc.,	1.Learning 2.Mini Application development 3.Report preparation	
2 (Formative Assessment)	Last month of training (at industry)	1. The mentor faculty member concerned 2. Industry Training In charge	Learning outcomes as given in the scheme of assessment, for Industrial Training	120
	COURSE-II	Registration at Nptel/Swayam/Moocs/course era/lectera/caltech/NASSCOM/APSKILL DEVELOPMENT/oxford/ hackerrank/udemy…etc.,	1.Learning 2.Mini Application development 3.Report preparation	
3 (Summative Assessment)	After completion of the training (at Institution)	1.The faculty member concerned, 2.HoD concerned 3.An external examiner from Industry	1.Demonstration of any one of the skills listed in learning outcomes	30
			2.Training Report	20
			3. Viva Voce	10
			TOTAL	300

The Industrial Training shall carry maximum 300 marks. Pass mark is 50% in first and second assessment put together and also 50% in final summative assessment at the institution level.

Weightage of marks for Assessment of Learning Outcomes during first and second assessment (at industry)

Sl. No	Learning Outcome	Max Marks Allotted For first assessment	Max Marks Allotted For second assessment
1	Apply knowledge and skill already learnt in the institution.	50	10
2	Acquire the required skills of analysis, design and development, testing, verification and validation , deployment and distribution of the product.	70	30
3	Involve in product design, development, quality testing and maintenance production by exhibiting the strength, teamwork spirit and self-confidence	-	40
4	Prepare product document, gain the skills in deploying product at customer site, training the end user, maintaining the system.	-	40
	Total	120	120

During assessment the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the weightage assigned as above. In case the student has undergone training in a few skillsets then the total marks obtained shall be raised to 120 marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skillsets.

Illustration for First assessment:

If the student has undergone training in only in 2skillsets (namely 1 for 50 marks, and 2 for 40 marks) out of 3(namely 1 for 50marks,2 for 40marks and 3 for 30marks) in Firstassessment and marks awarded duringassessmentis60 out of 90marks, then the marks of 60 shall be enhanced to120 proportionately as (60/90) *120=80.

Illustration for second assessment:

If the student has underg one training in only in 5skill sets (namely 1 for 10 marks, 2 for 20 marks , 3 for 10 marks, 4 for 25 marks, 5 For 15 marks) out of 7 (namely 1 for 10 marks, 2 for 20 marks,3 For 10 marks,4 for 25 marks, 5 For 15 marks, 6 for 25 marks and 7 for 15marks) in second assessment and marks awarded during assessment is 65 out of 80 marks, then the marks of 65 shall be enhanced to 120 proportionately as (65/80) *120 = 97.5 = rounded to 98.

GUIDELINES FOR INDUSTRIAL TRAINING OF DIPLOMA IN ENGINEERING PROGRAMME

1. Duration of the training: One Semester.
2. Eligibility: The as per SBTET norms
3. Training Area: Students can be trained in either in In-house/Industry in the areas of
4. Application Software Development / system software Development / firmware development/ Mobile application development/ Database applications / Web development/ IoT application development / smart technologies / Hardware interfacing/ Networking.

5. The candidate shall put a minimum of 90% attendance during Industrial Training.

6. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.

7. Formative assessment at industry level shall be carried out by the Mentor from of the industry, where the student is undergoing training and the faculty in charge (Guide)from the concerned section in the institution.

8. The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e. 150 marks out of 300 marks.

9. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.

10. Final summative assessment at institution level is done by a committee including1. Head of the section (of concerned discipline ONLY), 2. External examiner from an industry and 3. Faculty member who assessed the student during Industrial Training as members.