PERIYAR CENTENARY POLYTECHNIC COLLEGE

PERIYAR NAGAR VALLAM–613403 –THANJAVUR

(AUTONOMOUS INSTITUTION)

NBA Accredited – (ECE, EEE, MECH, CT - upto 2026)

DIPLOMA IN ARTIFICIAL INTELLIGENCE

AND

MACHINE LEARNING

SYLLABUS

AIE/25/00

SEMESTER SYSTEM

E- SCHEME

PERIYAR CENTENARY POLYTECHNIC COLLEGE

Periyar Nagar, Vallam – 613 403, Thanjavur

AUTONOMOUS INSTITUTION
NBA Accredited (ECE, EEE, MECH & COMPUTER – upto 2026)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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Periyar Nagar, Vallam – 613 403, Thanjavur

AUTONOMOUS INSTITUTION
NBA Accredited (ECE, EEE, MECH & COMPUTER – upto 2026)

VISION

Periyar Centenary Polytechnic College aspires to be recognized as one of the leaders in imparting quality technical education and strives to prepare rural students with excellent technical and life skills for the benefit of the stakeholders and society at large.

MISSION

M1: To impart quality technical education to the students and equip them with knowledge, skills and attitudes that will lead to successful employment in industry/business, entrepreneurship and higher education.

M2: To provide conducive learning environment and adopt well structured teaching – learning practices to make the students technically competent.

M3: To strengthen the collaboration with industry and community for career development, placement and extension services.

M4: To develop the personality of the students and identify themselves as good individuals, professionals and responsible citizens with ethical values.

M5: To inculcate lifelong learning skills to face challenges with innovations.

PROGRAMME OUTCOMES (POs)

1. **Basic and Discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis**: Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/ development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering Tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **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.
7. **Life-long learning**: Ability to analyse individual needs and engage in updating in the context of technological changes.

OUTCOME BASED EDUCATION (OBE)

Our institution is practicing Outcome Based Education (OBE) which is a student centered instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitudes.

In the OBE model, the required knowledge and skill sets for a particular diploma programme is predetermined and the students are evaluated for all the required parameters (Outcomes) during the course of the program.

The OBE model measures the progress of the graduate in four parameters, which are

- Program Educational Objectives (PEO)
- Program Specific Outcomes (PSO)
- Program Outcomes (PO)
- Course Outcomes (CO)

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. PEO's are measured 4-5 years after graduation.

Program Specific Outcomes (PSOs) are the statements that describe what the graduates of specific engineering program should be able to do.

Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the time of graduation.

Course Outcomes (COs) are the measurable parameters which evaluates each students performance for each course that the student undertakes in every semester. The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. According to revised Bloom's taxonomy, the levels in cognitive domain are as follows:

Level	**Descriptor**	**Level of attainment**
1	Remembering	Recalling from memory of previously learned material
2	Understanding	Explaining ideas or concepts
3	Applying	Using information in another familiar situation
4	Analyzing	Breaking information into part to explore Understandings and relationships
5	Evaluating	Justifying a decision or course of action
6	Creating	Generating new ideas, products or new ways of Viewing things.

DEPARTMENT OF
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

VISION

To empower students with excellence in AI and Machine Learning for innovative and sustainable technological development.

MISSION

M1: To provide quality education in Artificial Intelligence and Machine Learning through innovative teaching and practical learning.

M2: To develop students' technical, analytical, and problem-solving skills for industry and research applications.

M3: To encourage research, innovation, and entrepreneurship in emerging AI technologies and to promote ethical and socially responsible by use of Artificial Intelligence technologies.

M4: To collaborate with industries and academic institutions for real-world exposure and lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 : Our Diploma graduates will acquire strong foundational knowledge in Artificial Intelligence, Machine Learning, programming, and data analytics to solve real-world problems effectively.

PEO2 : Our Diploma graduates will pursue higher education, entrepreneurship, research, certifications, and lifelong learning to adapt to emerging technologies and industry needs.

PEO3 : Our Diploma graduates will demonstrate professional ethics, communication skills, teamwork, leadership qualities, and social responsibility in multidisciplinary environments.

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PROGRAM SPECIFIC OUTCOMES(PSOs)

PSO1: Ability to design, develop and implement Artificial Intelligence and Machine Learning solutions using modern programming languages, tools and frameworks for real-world applications.

PSO2: Ability to apply data analytics, deep learning, computer vision and natural language processing techniques to solve domain-specific problems effectively.

PSO3: Ability to analyze datasets, build predictive models and optimize intelligent systems using mathematical, statistical and computational techniques.

DIPLOMA PROGRAMME IN ENGINEERING / TECHNOLOGY

(Implemented from 2023 -2024)

E SCHEME

RULES AND REGULATIONS

Objective :

To retain and further strengthen the quality of the human capital produced by our higher technical education at the diploma level as they play a major force behind the state's social, cultural, and economic pre-eminence.

To seed & nurture agents of change & transformation for the digital future with enduring skills and capabilities by cultivating technological capabilities through a skill-centred approach.

Admission :

Candidates seeking admission to the first semester of the Diploma program:

Should have passed the SSLC Examinations prescribed by the Government of Tamil Nadu or any examination of any other board or authority recognized by the Board of Secondary Education as equivalent thereto with eligibility for Higher Secondary Education in Tamil Nadu.

Lateral entry admission:

The candidates who possess a pass is the HSC [Academic] or equivalent prescribed in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board, with a pass in at least three of the following subjects: Physics / Chemistry / Mathematics / Computer Science / Electronics / Information Technology / Biology / Informatics Practices / Biotechnology / Technical Vocational Subjects / Agriculture / Engineering Graphics / Business Studies / Entrepreneurship are eligible to apply for Lateral entry admission to the third semester of Diploma programs, as per the rules fixed by the Government of Tamil Nadu. (or) The candidates who possess a pass in 2-year ITI with appropriate grade or equivalent examination.

There is no age limit prescribed for admissions to Diploma programs.

The medium of instruction is English for all courses, examinations, seminar presentations and project work reports, except for the programs offered in Tamil Medium.

Structure of the Program :

The Redesigning and revamp of the Diploma program in the State of Tamil Nadu will focus on improving the employability and entrepreneurship outcomes of the campuses through skill-centric and industry allied curriculum and syllabi. The following structure is being proposed for the new curriculum.

Pathways for Progressive Learning Experience

The program offers 4 different pathways for progressive learning. Entrepreneurs, Higher Education, Technocrats and Technologists have different pathways from which the students will pick one of these pathways that they find fascinating and work to ameliorate their knowledge base over the desired pathway.

There are courses offered for the specific pathways in their final semesters that will aid them to choose their career in their specific pathways. Pathway direction for the students can be assisted by faculty mentors from time to time.

● **Entrepreneur:**
Students who aspire to transform opportunity into reality, and create social and economic value for themselves and for others.

● **Higher Education:**
Students with aspirations of pursuing higher education to acquire higher-order skills and competencies in the domain of interest.

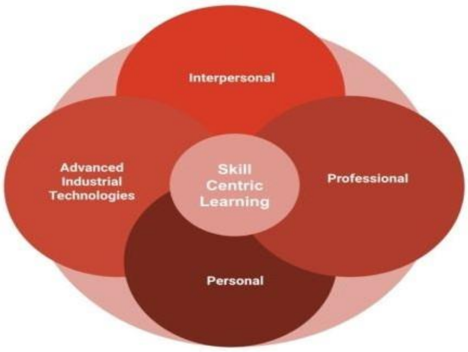
● **Technocrats:**
Students who aspire to acquire mastery of technical tools and methods to manage people who manage the processes.

● **Technologists:**
Students who aspire to gain leadership in a particular discipline / technology to evolve into Problem Solvers & Innovators.

Various Dimensions for Transformation:

Today's world is rapidly changing and increasingly interconnected, and the future talent pipeline to be sourced from the campuses needs to adapt to changes that will keep accelerating in the future. The new diploma program focuses on equipping learners with skills that will enable them to cope with the foreseeable social and economic changes and manage often unpredictable realities. The various dimensions of transformation are designed to nurture skills towards holistic human development. Such skills are acquired not only on formal courses but in a variety of contexts throughout the academic curriculum.

Four broad dimensions of skills to ensure holistic human development: (1) Personal, (2) Professional, (3) Interpersonal and (4) Advanced Industrial Technologies skills and competencies.



Integrated Curriculum :

An integrated curriculum is based on learning experiences that lead to the acquisition of disciplinary knowledge and its application in a professional environment interwoven with the teaching of personal, interpersonal, and professional skills, and ways in which the integration of emerging technological skills and multidisciplinary connections are made.

Course Levels :

A course is a component (a paper/subject) of a program. All the courses need not carry the same weightage. The course should have defined Course Objectives and Course Outcomes. A course may be designed to involve lectures / tutorials / laboratory work/project work / Internships / seminars or a combination of these, to effectively meet the teaching and learning needs and the credits may be assigned suitably.

The programs consist of various levels of courses, structured as (F) Foundation, (C) Concentration and the (S) Specialization courses for a greater understanding of the core concepts of the fundamentals in the initial year of learning and thereby moving towards the specialization areas by choice.

- **Foundation (F) | Year I:** Foundation courses build strong fundamental requirements across mathematics, statistics, science, engineering domain, advanced technologies, social sciences and humanities.
- **Concentration (Cn) | Year II:** Concentration courses shall deliver domain-specific knowledge and technological skills. They are offered as core and electives to provide the requisite mandatory working knowledge of the chosen domain.
- **Specialisation (S) | Year III:** Specialization courses are focused on a particular area of study leading to a specific pathway. Some of the courses can also be beyond the program, leading to skills and competencies in emerging technology domains.

Course Types :

Every diploma program shall have a curriculum with syllabi comprising Theory, Practicum and Practical courses with well-defined Program Outcomes (POs) as per the Outcome Based Education (OBE) model. The content of each course is designed based on the intended Course Outcomes (COs). Every program shall have a distinct curriculum with syllabi consisting of courses broadly categorized under:

- **Core(C)/Elective (E)** – Core / Elective courses are offered to students of a particular program to gain basic and specialized knowledge/skills in a selected field. Core courses are mandatory to complete the program and shall not be exempted or provided with credit equivalence. Elective Courses may be grouped into different domains / streams / specialisations to enable the students to have at least 3 to 5 options. At least 20 students need to express their willingness, for the case of an elective course, to be offered.
- **Practicum (P)** – Integrated course taught in a hands-on learning environment. This may be offered wherever theoretical concepts are to be learned simultaneously with relevant practical sessions. Such courses shall be offered only if sufficient laboratory facilities are available to conduct such courses, and both laboratory and theory components shall be considered for continuous assessment. Final evaluation based on the proportion of the credit awarded for the respective component.
- **Lab (L)** - Practical Courses taught in a designated lab. This may be offered when conceptual learning has to be augmented by practical experiments and also to bring focus on

acquiring skills through doing. Such courses shall be offered only if sufficient laboratory facilities are available to conduct such courses.

- **Field Study(FS)** – Offered as a special / curriculum-enriching component to understand certain practical issues/work practices / hands-on training/immersion project/market survey. Field Study, if it forms a part of the course, then credit(s) shall be assigned accordingly, otherwise, such course(s) may be specified in the Grade Sheet without grades.

- **Certification (Cer)** – Industry-driven course shall be offered, jointly with an industry that would result in learning the emerging trends / employment potential topics / solving real-time problems. The contents of the course shall be jointly designed by an industry expert and a suitable faculty member, with relevant assessment and evaluation. Hybrid/Online learning options shall be available. Students are permitted to complete these courses through MOOCs / Professional Certification and credit equivalence (Program Elective or Open Elective), to a maximum of 6 credits.

- **In-House Projects (InP)** – Capstone Project shall be offered once a student completes >95% of the core courses related to the Diploma program. The Capstone Project is expected to involve concepts from fundamentals to recent developments and may be restricted to one domain or multidomains / multi-disciplines. Capstone Project shall be offered only after completing all the fundamental courses and offered during the final semester. It shall also focus on Environment, Society, Sustainability, Entrepreneurship and Project Management. In the case of a multidisciplinary project, a suitable co-supervisor shall be opted for the students from the relevant Department for successful completion. Capstone Project may be offered in phases, i.e. Phase I and Phase II (single topic or two different topics). Students are encouraged to submit the softcopy of the complete report for evaluation and abstract in the printed form during the final presentation.

- **Fellowship (Fs)** – Up to 6 Months for professional and/or academic development offered by an external organisation identified and nominated by DoTE in India or abroad. Students shall be shortlisted for the same under sponsorship/scholarship by competent authorities and approved by the Head of the Institution.

- **Boot Camp (B)** – 2-to-5-day training camps for imparting knowledge and skills in emerging areas. It may be offered jointly by a team of faculty members / external experts with course content that includes interdisciplinary topics from different domains, thereby enhancing the Professional Knowledge & Skills of the students. However, such courses shall not have any significant repetition of other courses offered in that particular diploma program. If a student fails to complete such a course on the first attempt or lacks attendance requirements, they may opt for a different course in the subsequent semester and meet the minimum credit requirements of the program or may redo the same course whenever offered.

- **Hackathon (H)** - 3 to 6 days of problem-solving and building a solution for real-world problems in an intensive/accelerated manner. It may be considered as one of the course types in situations where multiple solutions are expected to a problem or multiple problems are expected to be solved, in a particular industry/research laboratory. Such a course shall be essentially a

Practicum and may be offered in a workshop mode. Credit allocation, Assessment and Evaluation shall be based on the respective syllabi designed for the same.

- **Internship (I)** – Internship is offered as a credit course with the Industry/Research Laboratories/ other Universities in India or abroad. Credit allocation, Assessment and Evaluation shall be based on the procedures given. Every student is encouraged to gain Credits through an Internship.

- **Audit Courses** are optionally registered by a student to understand certain basic/advanced concepts in his / her own discipline or other disciplines offered by the college. In this case, if a candidate fails in an Audit Course, it is not mandatory to repeat that course and these courses shall not be considered for eligibility for awarding the Diploma. Grades shall be awarded as "Completed".

Dentition of Credit

Credit is a kind of weightage given to the contact periods* to teach the prescribed syllabus, which is in a modular form. The credit distribution for theory, laboratory and project courses are mentioned in the table below.

Theory (L) - 15 periods	**1 credit**
Tutorial (T) - 15 periods	**1 credit**
Practical (P) – 30 periods	**1 credit**
Internship (I) - 30 periods	**1 credit**
Project (J) - 30 periods	**1 credit**

* 1 period = 50 minutes of class

Curriculum Structure

Every program shall have a distinct curriculum with syllabi consisting of courses broadly categorized under Basic Sciences, Basic Engineering, Professional Core, Program Electives, Open Electives, and Certification Courses. Credit distribution for various categories of the courses will follow the guidelines given below, subject to minor variations, as may be suggested by the respective Boards of Studies.

Category	**Credit Range**
Humanities and social sciences	11
Basic Science Courses	17-20
Engineering Sciences	6-13
Program core	40-51
Program Elective	9-12
Open elective	10
Industrial Training / Project work	14
Audit Course	0
Integrated Learning Experiences	
Induction program	Non-Credits Course
I & E / Club Activity / Community Initiatives	Non-Credits Course
Shop Floor Immersion	Non-Credits Course

Health & Wellness	Non-Credits Course
Student-Led Initiative	Non-Credits Course
Special Interest Groups *(Placement Training)*	Non-Credits Course
Emerging technology seminars	Non-Credits Course

Each program will consist of Basic Science (BS), Engineering Sciences (ES), Professional Core (PC), Program Electives (PE), Open Electives (OE), Audit Courses and In-House Project/Internships/Fellowships.

1. **Basic Sciences:** This course is common to all programs to develop fundamental knowledge of science and mathematics; it also enhances the reasoning and analytical skills amongst students.

2. **Engineering Sciences:** Engineering Science shall create awareness of different specializations of engineering studies. The goal of these courses is to create engineers of tomorrow, who possess the knowledge of all disciplines and can apply their interdisciplinary knowledge in every aspect. It could be any branch of engineering - Civil, Computer Science and Engineering, Electrical, Mechanical, etc.

3. **Program Core:** This includes core courses designed in the program, which are major courses of the discipline, are required to attain desired outcomes and to ignite critical thinking skills amongst students.

4. **Program Elective:** This includes elective courses that can be chosen from a pool of courses which may be very specific or specialized or advanced or supportive to the program of study or nurtures the candidate's proficiency/skill. This is called a program elective course.

5. **Open Electives:** An elective course chosen generally from another discipline/ subject, to seek interdisciplinary exposure is called an open elective. While choosing the electives, students shall ensure that they do not opt for courses with syllabus contents which are similar to that of their departmental core/elective courses.

6. **Audit Courses:** An audit course is one in which the student attends classes, does the necessary assignments and takes exams. The Institute encourages students towards extra learning by auditing for the additional number of courses. The results of audit courses shall not be considered for the prescribed “carry over courses” limit.

7. **Humanities and Social Science:** Basic courses offered across language, communication and social science subjects, including any management skills and shall be categorized as Humanities and Social science.

8. **In-House Project/Internships/Fellowships:** Every student must do one major project in the Final year of their program. Students can do their major project in Industry or R&D Lab or in-house or a combination of any two or a fellowship in a reputed organization.

Outcome-Based Education

Outcome-based education aims to create a clear expectation of results that students must achieve. Here, the outcome includes skills, knowledge and attitude. Outcomes inform both the way students are evaluated on a course and the way a course will be organized. Effective learning outcomes are student-centred, measurable, concise, meaningful, achievable and outcome-based (rather than task-based). To identify achievable learning goals and develop plans to meet them, revised Bloom's Taxonomy framework is introduced to allow educators to assess learning on an ongoing basis, encouraging students to reflect on their progress.

All the programs offered should adopt Outcome Based Education (OBE) in order to enhance the opportunities for the students with respect to their career track (through a student-centric approach). The Program Outcomes (POs) of the respective program of study are achieved through the Course Outcomes (COs). Necessary remedial actions are taken at regular intervals to ensure the proper attainment of outcomes by the students. The evaluation procedures outlined are to be followed by the departments before arriving at the data for the Outcome attainment analysis.

1. OBE is an approach to education in which the decisions about the curriculum instruction and assessment are driven by the learning outcomes that the students should display at the end of a program or course.

2. The vision and mission statements are the guiding forces behind an institute / department. The vision statement provides insight into what the department focuses to achieve or become in the future. The mission statement communicates the process involved in achieving the vision. An effective vision statement should be concise, unambiguous, futuristic, and realistic. aspirational, and inspirational. Furthermore, it shouldn't be generic but rather focus on outcomes specific to the department. A good mission statement should focus on the ways to achieve the vision of the department. It should be brief, clear, informative, simple, and direct.

3. Graduate Attributes (GAs) represent the standard abilities to be looked for in a graduate of any diploma program. They form the Program Outcomes (POs) that reflect the skills, knowledge, and abilities of diploma graduates regardless of the field of study. At the same time, POs are necessarily independent of disciplinary knowledge; rather, these qualities may be developed in various disciplinary contexts. POs are composite statements made-up of multiple aspects relevant to a broader outcome like domain knowledge, design, analysis, etc. They also ensure the holistic development of the students by covering aspects like communication, ethics, project management, etc.,

4. Assessments are designed to measure the POs, and POs give useful guidance at the program level for the curriculum design, delivery, and assessment of student learning. However, they represent fairly high-level generic goals that are not directly measurable. Real observability and measurability of the POs at the course level are very difficult. To connect high-level learning outcomes (POs) with course content, course outcomes and assessments are designed, they are necessary to bring further clarity and specificity to the program outcomes.

5. For each PO, the skills and competencies implied generally require a different assessment methodology. This helps us to create a shared understanding of the competencies that students want to achieve.

6. Course Outcomes (COs) are specific, measurable statements that help the learners to understand the capabilities to be attained by them at the end of the course. COs should highlight what the learner can attain by studying the course and undergoing the evaluation of outcomes

prepared for the same. It includes the knowledge to be gained, skills to be acquired and the application of the same towards solving problems specific to the context. The topics for the course should be decided based on the course outcomes in such a way that the specific topics alone do not map to the specific course outcomes.

7. Revised Bloom's Taxonomy for Assessment Design: It attempts to divide learning into three types of domains (cognitive. affective, and behavioural) and then defines the level of performance for each domain. Conscious efforts to map the curriculum and assessment to these levels can help the programs to aim for higher-level abilities which go beyond remembering or understanding, and require application, and analysis, evaluation or creation.

8. CO-PO course articulation matrix should indicate the correlation between the CO and PO based on the extent to which the CO contributes to the PO. This is mapped at three levels 1, 2 or 3 representing low, medium and high respectively. This also ensures that every PO is covered across the courses offered as a part of the program. The matrix will be adopted for all the courses run by the department.

9. The attainment of COs of any course can be assessed from the performance of the students through continuous and final assessments. The goal of continuous assessment is to understand/realise the critical information about student comprehension throughout the learning process and provides an opportunity for the facilitator to improve their pedagogical approach and for students to improve learning outcomes. The goal of the final assessment is to evaluate student learning outcomes at the end of the course instruction. According to the new regulation, 40% weightage is for the continuous assessment, and 60% weightage is for the final assessment.

10. The POs assessment should be carried out by both direct and indirect assessment. The assessment can be estimated by giving 80% weightage to direct assessment and 20% weightage to indirect assessment. Direct assessment is purely based on COs attainment through the course Assessment Method, and indirect assessment is through the feedback taken from the relevant stakeholders of the system. Indirect assessment can be done in the form of a graduate exit survey where the student is required to answer a questionnaire that reflects their satisfaction with respect to the attainment of POs. The questionnaire should be carefully designed so as to not have the POs themselves as direct questions.

11. Each PO attainment corresponding to a specific course can be determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values. The threshold value of 60%, shall be set for the POs and the same can be modified with due approval of the Authorities.

12. The gap identified in the attainment of the COs and POs can be addressed by organising talks from the industry, bridge courses, organising workshops, arranging field visits (industrial visits) with respect to the course, improving the student performance under the innovative teaching-learning process of the institution, etc.,

Academic and Curriculum Flexibility

Academic and curriculum flexibility enhance a student's learning experience by providing various options such as adjusting the timeframe of courses, horizontal mobility, interdisciplinary opportunities, and other benefits through curricular transactions. The types of Academic and curriculum flexibilities are listed below.

1. Break of Study
2. Course Add / Drop
3. Course Withdrawal
4. Credit Equivalence
5. Credit Transfer
6. Examination Withdrawal
7. Fast-Track Option
8. Flexi-Credit System
9. Bridge Course

Break of Study

If a student intends to take a break / temporarily discontinue the program in the middle of a semester/year, during the period of study, for valid reasons (such as Internships, accident or hospitalization due to prolonged ill health) and wishes to re-join the program in the next academic year, student shall intimate stating the reasons.

Break of study is permitted only once during the entire period of the degree program for a maximum period of one year. The student is permitted to rejoin the program after the break and shall be governed by the rules and regulations in force, at the time of rejoining. The break shall be notified in the grade sheet. If a student is detained for want (shortage) of attendance or disciplinary issues, the period spent in that semester shall not be considered a permitted Break of Study.

Course Add / Drop

Subject to resource availability, a student has the option to add additional courses within a week after the regular semester begins. Furthermore, a student can drop registered courses before completing the first Continuous Assessment (CA) test in a semester, limited to a maximum of 6 credits. These dropped courses will not be considered as arrears, but the student will need to retake them when they are offered by the institution. In order to carry out these actions, students must obtain permission from the head of the institution.

Credit Equivalence

It is an option that can be exercised by a student under the following circumstances –

(i) credits earned through Extra and Co-curricular Activities (only against program elective / open elective – Global)

(ii) credits earned through online courses (only against Open Electives - Technical and Global and program electives)

(iii) credits accumulated through Capsule courses, One-Credit courses Such courses and credits earned shall be presented in the Academic Board.

Credit Transfer

Credits earned by a student through Credit Equivalence (as said above) and credits earned by attending and completing the courses successfully, offered by other approved Universities / Institutions / Professional Bodies (only against Technical and Global Open Electives and program electives) shall be considered as "Transferred Credits (specified in the Grade Sheet)" and considered for the calculation of CGPA.

Examination Withdrawal

A student may be permitted to withdraw from appearing for the end semester examination in any course or courses for valid reasons (medically unfit / unexpected family situations / sports approved by the Physical Director / HOD/Principal).

This privilege can be availed ONLY ONCE during the entire program. Valid documents, for medically unfit / unexpected family situations, shall be submitted by the student within seven days before the commencement of the examination in that course or courses and also recommended by the Head of the Department, approved by the Head of the Institution.

Special cases under extraordinary conditions will be considered on the merit of the case if any student applies for withdrawal, notwithstanding the requirement of mandatory seven days' notice.

Those students who withdraw from any course or courses during the program are eligible for the award of first class and first class with distinction as per the requirement in this regard.

Withdrawal is permitted for the end semester examinations in the final semester, only if the period of study, the student concerned, does not exceed 1 semester after the regular period of 3 years so that his eligibility for distinction is considered.

The final approval for withdrawal will depend on the merit of the case and will be decided by the Head of the Institution.

Fast-Track

This option enables a student to complete the minimum credit requirements of a program, to enable

(i) his / her own entrepreneurial venture (start-up),
(ii) an internship in industry/research laboratories / fellowship.

This option is currently available for students to complete the two elective papers offered in Semester 6 in advance [Recommended to be completed in Semester 4 or 5] to avail the last semester for internship/fellowship/do his own start-up/enterprise/project outside the campus. However, such an option shall not be exercised to pursue higher education elsewhere. The duration of the study shall remain the same as per the prescribed syllabi for the fast-track option also.

Flexi-Credit System

It offers a student to earn additional credits than that specified (minimum credits) to a program for which student has enrolled. Such additional credits earned shall be mentioned in the Grade Sheet, as 'Additional Credits Earned'. Credits earned through Flexi-Credit System shall not be considered for the calculation of SGPA or CGPA.

Bridge Course

This is specifically designed for Lateral Entry (LE) students who join the Diploma Program in 2nd year (3rd Semester). This course will be a 40 period in which the faculty gives the gist of important topics that the LE students may have missed in the first year of the program specific to the department concerned.

Integrated Learning Experience

Integrated learning experiences encompass activities that foster the acquisition of disciplinary knowledge,personal and interpersonal skills, and technological proficiency. These experiences promote active engagement in meaningful real-life situations and establish connections between different curricula, cocurricular activities, and extracurricular pursuits across diverse disciplines. Integrated learning experiences are concatenated in the academic curriculum for each semester enabling the students to learn, adapt and transform through experiential learning pedagogy.

This approach enriches the curriculum by incorporating dynamic and up-to-date co-curricular courses and activities that may not be directly aligned with the students' program of study. It prioritizes the holistic development of students, fostering their growth and well-roundedness.

1. Innovation & Entrepreneurship
2. Peer 2 Peer Learning
3. Growth Lab
4. Shop Floor Immersion
5. Health & Wellness
6. Induction Program
7. Special Interest Groups
8. Club Activity
9. Community Initiatives
10. Emerging Tech Seminars
11. Student Led Initiative
12. Industry-Specific Training

Innovation Track

They are offered to the student, to bring awareness on start-up / entrepreneurial ventures through a series of courses/activities. Based on the inputs gained, students can select their electives, specialisation, capstone project and deferred placement option.

Peer to Peer Learning

PTP learning involves interactions between students from senior classes, leading to valuable additions and deepening the understanding of certain concepts. This may happen as a part of a scheduled time-table or after instructional hours in a day, by Peers (from senior classes), leading to value addition, enriching the understanding of certain concepts and implementing practically (developing models, prototypes, proofs of-concept) for learning satisfaction, participating in competitions / competitive examinations. These efforts are expected to improve teamwork, communication, understanding of societal needs, project management and life-long learning activities.

Growth Lab

Growth labs play an integral role to stimulate and develop a student's personality & skills in various fields of life. It also teaches about a growth mindset to tackle real-world problems and life challenges. It brings self-confidence and empowerment to transform the inter-personality of the student. The process brings the progression to achieve higher goals in life.

Shop floor immersion

This introduces new ideas, inspires participants to further explore them on their own or may illustrate and promote actual process practice through seminars, workshops, Industrial Visits etc that results in learning hands-on skills as it gives the students an opportunity to try out new methods and fall in a safe environment.

Health & Wellness

This aims to teach students about various aspects of health and fitness, including exercise, nutrition, yoga, mental health, and substance awareness.

Induction Program

It shall be organised to all the students, admitted into first year, to offer the course on Universal Human Value, awareness sessions on campus facilities, academic regulation and curriculum, highlight the culture, values and responsibilities of an Engineer in the Society and the Nation as a whole, besides Institutional infrastructure and facilities and student support systems. Awareness of domain-specific requirements to be organised in the second year of induction.

Special Interest Groups

The training is especially based on the placements on campus. Concepts required for aptitude tests, group discussions, resume building, personal interviews, industry-specific orientation and Business Case Competition are taught to the students.

Club Activity

A small community that attracts people who share the same interests such as music, arts, or sports working on a common goal to develop a sense of unity and teamwork, learning how to work with others in reaching the same goals.

Community Initiatives

Community Initiatives involve activities that aim to define values, cultivate empathy, foster social skills, and enhance students' understanding of their community. Through these initiatives, students have the opportunity to build meaningful relationships, gain insights into different perspectives, and engage with diverse cultures. This engagement enables the development of crucial interpersonal skills.

Emerging Tech Seminars

A technical presentation made by the Students & the cross-functional Members of the Faculty to showcase the technology adopted in the Industry. This collaborative teaching-learning session between the student & the faculty results in a better understanding of the use of technology in various applications.

Student-Led Initiative

A student-led session will help students to acquire and share knowledge on emerging industrial technologies that will comprehend & introduce the emerging technology to the students. This includes student-led Tech talk series & other initiatives.

Industry - Specific Training

Gaining information about the industry’s way of working and understanding the process. This enables one to understand the various non-technical skills & competencies required for the transformation from a student to a professional.

Duration of the Program

- A student is ordinarily expected to complete the Diploma program in 6 semesters (for SSLC students) and four semesters (for Lateral Entry students) but in any case, not more than 12 Semesters for SSLC (or equivalent) students and not more than 10 semesters for Lateral Entry students.
- Each semester shall normally consist of 15 weeks with periods of 50 minutes each. The Head of the Institution shall ensure that every faculty imparts instruction as per the number of periods specified in the syllabus and that the faculty teaches the full content of the specified syllabus for the course being taught.
- The Head of the Institution may conduct additional classes for improvement, special coaching, conduct model tests etc., over and above the specified periods.
- The End Semester Examination will normally follow immediately after the last working day of the semester as per the academic schedule prescribed from time to time.
- The total period for completion of the program from the commencement of the first semester to which the student was admitted shall not exceed the maximum period specified irrespective of the period of break of study in order that student may be eligible for the award of the diploma. The minimum and maximum period of study shall be,

Diploma Programme	Min. Period	Max. Period
Full Time	3 Years	6 Years
Full Time [Lateral Entry]	2 Years	5 Years
Sandwich	3.5 Years	6.5 Years
Part Time	4 Years	7 Years

Attendance Requirements

A student who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.

- Ideally every student is expected to attend all classes of all the courses and secure 100% attendance.
- However, in order to make provision for certain unavoidable reasons such as medical / participation in sports, the student is expected to attend at least 75% of the classes.
- Therefore, the student shall secure not less than 75% (after rounding off to the nearest integer) of overall attendance for each semester.
- However, a student who secures overall attendance between 65% and 74% in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) / participation in sports events may be permitted to appear for the current semester examinations, subject to the condition that the student shall submit the medical certificate / sports participation certificate attested by the Head of the Institution.
- Students who secure less than 65% overall attendance shall not be permitted to write the end semester examination and not permitted to move to the next semester. They are required to repeat the incomplete semester in the next academic year, as per the norms prescribed.
- Candidates who have earned more than 50% attendance but fall short of the basic requirement of 65% attendance (in all subjects of the current semester put together) shall be permitted to proceed to the next semester, only one time during the course of study by considering all the papers in that current semester as absent and to complete the program of study. For such candidates by default, the classification of class shall be Second class on successful passing of course.

Class Committee

Every class shall have a class committee consisting of faculty of the class concerned, student representatives and a chairperson, who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching learning process. The functions of the class committee include:

- Solving problems experienced by students in the classroom and in the laboratories. Clarifying the regulations of the diploma program and the details of rules therein.

- Informing the student representatives, the academic schedule including the dates of assessments and the syllabus coverage for each assessment.

- Informing the student representatives the details of regulations regarding weightage used for each assessment. In the case of practical courses (laboratory / drawing / project work /

seminar etc.) the breakup of marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students.

- Analysing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the slow-learners, if any, and requesting the faculty concerned to provide some additional help or guidance or coaching to such students.
- The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first semester which is generally common to all branches), the class committee is to be constituted by the Head of the Institution.
- The class committee shall be constituted within the first week of each semester. At least 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee, covering all the elective courses.
- The chairperson of the class committee may invite the class counsellor and the Head of the Department to the class committee meeting.
- The Head of the Institution may participate in any class committee meeting of the institution.
- The chairperson is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate it among the students and faculty concerned. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the Head of the Institution.
- The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the regulations.
- Two or three subsequent meetings may be held in a semester at suitable intervals.
- During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

Course Committee for Common Courses

Each common theory course offered to more than one discipline or group, shall have a "Course Committee" comprising all the faculty teaching the common course with one of them nominated as the course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Head of the Institution depending upon whether all the faculty teaching the common course belong to a single department or to several departments. The 'Course Committee' shall meet in order to arrive at a common scheme of evaluation for the test and shall ensure a uniform evaluation of the tests. Wherever feasible, the Course Committee may also prepare a common question paper for the internal assessment test(s).

Assessment and Examination

Performance in each course of study shall be evaluated for a maximum of 100 marks based on one of the following:

(i) Continuous Assessment [40%]:

- Continuous assessment shall be carried out for 100 marks [summation of multiple CAs] for all types of courses and converted to 40 marks.
- Every subject shall have its own framework for continuous assessment designed by the course committee and approved by the academic board as part of the curriculum. The continuous assessment shall be awarded as per the assessment proposed in respective syllabi.
- For One credit courses and Advanced Skill Certification programs, no end semester examination shall be conducted, and final grade will be awarded based on continuous assessment only for 100 marks.

(ii) End Semester Examination [60%]:

The End Semester Examination will be conducted for 100 marks and shall be converted to 60 marks in the final results.

The End Semester Examinations (Theory, Practical, Project) of three hours duration will be conducted.

For Practicum courses, the end semester examination will be conducted as a theory or a practical or a project examination based on the credits for each component, the decision on the mode of exam could be based on the recommendation by the internal committee duly forwarded and approved by Head of the Institute.

Every practical exercise/experiment shall be evaluated based on conduct of exercise / experiment and records to be maintained, students shall submit a record work duly completed and signed by faculty in charge and the Head of the Department.

For the project works, the Department will constitute a three member faculty committee to monitor the progress of the project and conduct reviews regularly.

If the projects are done in-house, the students must obtain the bonafide certificate for project work from the project guide and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the project Viva Voce examination.

For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular bonafide certificate mentioned above. For Industry related projects there must be one Mentor / Supervisor from Industry (External), this is in addition to the regular faculty supervision.

The final examination for project work will be evaluated based on the final report submitted by the project group (of not exceeding four students), and the viva voce by an external examiner.

The split up of marks for Internal and End Semester Viva Voce can follow the below mentioned rubrics,

Internal Mark Split (40 Marks)			End Semester (60)		
Review 1 (10 Marks)	**Review 2 (15 Marks)**	**Review 3 (15 marks)**	**Record (20 Marks)**	**Presentation (20 Marks)**	**Viva Voce (20 Marks)**
Committee: 5 Supervisor: 5	Committee: 7.5 Supervisor: 7.5	Committee: 7.5 Supervisor: 7.5	External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5

- Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for a period of a maximum of two months. For those students who extend the project work for two months, Viva Voce will be carried out and results will be declared separately. If the project report is not submitted even beyond the extended time, then students are not eligible to appear for Project Viva Voce Examination.
- The performance of each student in the project group would be evaluated in a viva voce examination conducted by a committee consisting of an external examiner and the Department project coordinator as an internal examiner.
- If a student indulges in malpractice in any of the End Semester Examination / Internal Examinations, student will be liable for punitive action as prescribed by the college from time to time.

Passing Requirement for Award of Diploma

A student who secures not less than 40% of total marks prescribed for the course [Internal Assessment + End semester Examinations] with a minimum of 35% of the marks prescribed for the end semester examination, shall be declared to have passed the course and acquired the relevant number of credits. This is applicable for both theory and laboratory courses (including project work).

(i) No Minimum marks for continuous assessment (Internal).

(ii) (ii) Minimum Marks to be secured in end semester exam is 35 out of 100,

(iii) (iii) Those who secure minimum mark (35) in end semester examination need to secure minimum of 19 out of 40 in continuous assessment to achieve overall pass percentage of 40% in that particular subject.

If a student fails to secure a pass in a theory course / laboratory course / elective course (same elective course), the student shall register and appear only for the end semester examination in the subsequent semester. In such cases, the internal assessment marks obtained by the student in the first appearance shall be retained and considered valid for all subsequent attempts till the student secures a pass. However, from the third attempt onwards if a student fails to obtain pass marks (Internal Assessment + End Semester Examination), then the student shall be declared to have passed the examination if the student secures a minimum of 35% marks prescribed for the end semester examinations alone.

If any other Elective course is opted by the student, the previous registration is cancelled and henceforth it is to be considered as a new Elective course. The student has to register and attend the classes, earn the continuous assessment marks, fulfil the attendance requirements and appear for the end semester examination.

If a student is absent during the viva - voce examination, it would be considered a failure. If a student fails to secure a pass in Project Work, the student shall register for the course again in the subsequent semester and can do Project Work.

The passing requirement for the courses which are assessed only through purely internal assessments, the passing requirement is 50% of the internal assessment (continuous assessment) marks only.

A student can apply for revaluation of the student's semester examination answer paper in a theory course, as per the prescribed fee along with prescribed application to the COE (Controller of Examination) through the Head of the Institution.

The COE will arrange for the revaluation and the results will be intimated to the student. Revaluation is not permitted for laboratory courses and projects.

Award of Grades

The award of letter grades will be decided using relative grading principle. The performance of a student will be reported using letter grades, each carrying certain points as detailed below:

Letter Grade	Grade Points	Marks
0 (Outstanding)	10	91-100
A+ (Excellent)	9	81-90
A (Very Good)	8	71-80
B+(Good)	7	61-70
B (Average)	6	51-60
C (Satisfactory)	5	40-50
RA (Re-Appearance)	0	<40
SA (Shortage of Attendance)	0	0
W (Withdrawal)	0	0

A student is deemed to have passed and acquired the corresponding credits in a particular course if the student obtains any one of the following grades: "O", "A+", "A", "B+", "B", "C".

'SA' denotes shortage of attendance and hence prevents students from writing the end semester examinations. 'SA' will appear only in the result sheet.

"RA" denotes that the student has failed to pass in that course. "W" denotes withdrawal from the exam for the particular course. The grades RA and W will figure both in the Grade Sheet as well as in the Result Sheet. In both cases, the student has to appear for the end semester examinations as per the regulations.

If the grade RA is given to Theory Courses/ Laboratory Courses it is not required to satisfy the attendance requirements, but has to appear for the end semester examination and fulfill the norms to earn a pass in the respective courses.

If the grade RA is given to courses which are evaluated only through internal assessment, the student shall register for the course again in the subsequent semester, fulfilling the norms as to earn a pass in the course. However, attendance requirements need not be satisfied.

For the Audit Course and Integrated Learning Experience, on its successful completion a ‘completed’ certificate will be issued by the head of the institute. Every student needs a minimum of 75% attendance in the Audit / integrated Learning experience compulsorily. However, for valid reasons, the Head of the Institution may permit a student to exempt/complete this requirement in the subsequent years. Successful completion of these courses is compulsory for the award of Diploma. These courses will be monitored by the central committee constituted by Autonomous. The grades O, A+, A, B+, B, C obtained for the one/two credit course (not the part of curriculum) shall figure in the Grade Sheet under the title ‘Value Added Courses/Internship/Industrial training’.

The courses for which the grades obtained are SA will not figure in the Grade Sheet.

Grade Sheet

After results are declared, Grade Sheets will be issued to each student which will contain the following details: The college in which the student has studied, the list of courses registered during the semester and the grade scored. The Grade Point Average (GPA) for the semester and the Cumulative Grade Point Average (CGPA) of all courses enrolled from the first semester onwards. GPA for a semester is the ratio of the sum of the products of the number of credits acquired for courses and the corresponding points to the sum of the number of credits acquired for the courses in the semester. CGPA will be calculated in a similar manner, considering all the courses registered from the first semester. RA grades will be excluded for calculating GPA and CGPA.

$$CGPA = \frac{\sum_{i=1}^{n} C_i \; GP_i}{\sum_{i=1}^{n} C_i}$$

where Ci is the number of Credits assigned to the course
GPi is the point corresponding to the grade obtained for each course
n is number of all courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA.

Award of Diploma

A student shall be declared to be eligible for the award of the Diploma provided the student has,

- Successfully gained the required number of total credits as specified in the curriculum corresponding to the student’s program within the stipulated time.
- Successfully completed the course requirements, appeared for the end semester examinations and passed all the subjects within the period as prescribed.
- Successfully passed any additional courses prescribed whenever the student is readmitted under E - Scheme from the earlier regulations.
- Successfully completed the Integrated Learning Experience requirements.
- No disciplinary action pending against the student.
- The award of Diploma must have been approved by the Board of Examinations.

Classification of Diploma Awarded

FIRST CLASS WITH DISTINCTION

A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

- Should have passed the examination in all the courses of all the six semesters (4 semesters in the case of Lateral Entry) in the student's First Appearance. The duration of the program shall be extended up to one additional semester in case of any withdrawals from end semester examination. Withdrawal from examination will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50.
- One-year authorized break of study (if availed of) shall be permitted within the four years period (three years in the case of lateral entry) for award of First class with Distinction.
- The candidates should NOT have been prevented from writing the end semester examination due to lack of attendance in any semester.

FIRST CLASS

A student who satisfies the following conditions shall be declared to have passed the examination in First class:

- Should have passed the examination in all the courses in all six semesters (4 semesters in the case of Lateral Entry). The duration of the program shall be extended up to one additional semester in case of any withdrawals from end semester examination. Withdrawal from examination will not be considered as an appearance.
- One-year authorized break of study (if availed of) or prevention from writing the end semester examination due to lack of attendance (if applicable) shall be provided with the duration of four years (three years in the case of lateral entry) for award of First class.
- Should have secured a CGPA of not less than 6.50.

SECOND CLASS

All other students who qualify for the award of the Diploma shall be declared to have passed the examination in Second Class.

Discipline

Every student is expected to maintain disciplined and respectable behaviour both within and outside the college premises, refraining from engaging in any activities that may tarnish the reputation of the college.

The Head of the Institution shall constitute a disciplinary committee consisting of the Head of the Institution, Two Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline and notify the authorities about the disciplinary action recommended for approval.

In case of any serious disciplinary action which leads to suspension or dismissal, then a committee shall be constituted.

If a student indulges in malpractice in any of the end semester examinations, student shall be liable for punitive action as prescribed by the Autonomous Examination from time to time. For any malpractices in any continuous assessment, the same shall be reported to the Head of the Institution for disciplinary actions.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Credit Distribution

Semester	No of Courses	Periods	Credits
Semester I	9	640	20
Semester II	9	625	20
Semester III	8	640	21
Semester IV	7	640	19
Semester V	7	640	21
Semester VI	3	675	19
Total Credits			**120**

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

ANNEXURE - I

E – SCHEME

(Implemented from the Academic Year 2023 – 2024 (onwards)

CURRICULUM OUTLINE

THIRD SEMESTER

S. No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	AIE3110	Introduction to Python Programming	4-0-0	60	4	Theory
2	Program Core	Practicum	AIE3230	Fundamentals of data science	3-0-2	75	4	Theory
3	Program Core	Practical	AIE3320	Programming Paradigms with Python	0-0-4	60	2	Practical
4	Program Core	Practicum	AIE3440	OOPS with JAVA	2-0-2	60	3	Practical
5	Program Core	Practicum	AIE3540	Introduction to Database Concepts	1-0-4	75	3	Practical
6	Program Core	Practicum	AIE3640	Operating Systems	1-0-2	45	2	Practical
7	Open Elective	Advanced Skill Certification	AIE3760	Advanced Skills Certification - 3	1-0-3	60	2	NA
8	Humanities & Social Science	Integrated Learning Experience	GLE3880	Growth Lab	0-0-2	30	0	NA
9	Audit Course	Integrated Learning Experience	ACE3881	Induction Program II	-	16	0	-
10	Audit Course	Integrated Learning Experience	ACE3882	I&E/ Club Activity/ Community Initiatives	-	16	0	-
11	Audit Course	Integrated Learning Experience	ACE3883	Shop floor Immersion	-	8	0	-
12	Audit Course	Integrated Learning Experience	ACE3884	Student-Led Initiative	-	6	0	-
13	Audit Course	Integrated Learning Experience	ACE3885	Emerging Technology Seminars	-	14	0	-
14	Audit Course	Integrated Learning Experience	ACE3886	Health & Wellness	-	30	1	-
	Test & Revisions					**70**		
	Library					**15**		
	TOTAL PERIODS					**640**	**21**	

FORTH SEMESTER

S. No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	AIE4110	Probability and Statistics	3-0-0	45	3	Theory
2	Program Core	Practicum	AIE4230	Data Structures Using Python *	3-0-2	75	4	Theory
3	Program Core	Practicum	AIE4340	R Programming	1-0-4	75	3	Practical
4	Program Core	Practicum	AIE4440	Data Exploration and visualization	1-0-4	75	3	Practical
5	Program Core	Practicum	AIE4540	Embedded Systems and IOT	1-0-2	60	2	Practical
6	Program Core	Project / Internship	AIE4640	Real Time Mini project	0-0-4	60	2	Practical
7	Open Elective	Advanced Skill Certification	AIE4760	Advanced Skills Certification - 4	1-0-3	60	2	NA
8	Audit Course	Integrated Learning Experience	ACE4882	I&E/ Club Activity/ Community Initiatives		20	0	
9	Audit Course	Integrated Learning Experience	ACE4883	Shop floor Immersion	-	16	0	-
10	Audit Course	Integrated Learning Experience	ACE4884	Student-Led Initiative	-	16	0	-
11	Audit Course	Integrated Learning Experience	ACE 4885	Emerging Technology Seminars	-	22	0	-
12	Audit Course	Integrated Learning Experience	ACE4886	Health & Wellness	-	15	0	-
13	Audit Course	Integrated Learning Experience	ACE4887	Special Interest Groups	-	16	0	-
	Test and Revisions					70		
	Library					15		
	TOTAL PERIODS					**640**	**19**	

FIFTH SEMESTER

S. No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Practicum	AIE5110	Introduction to AI	3-0-0	45	3	Theory
2	Program Elective	Theory		Elective-1	2-0-2	60	3	Theory
3	Program Core	Practical/Lab	AIE5320	Artificial Intelligence Laboratory	0-0-6	90	3	Practical
4	Program Core	Practicum	AIE5440	Fundamentals of Machine learning	2-0-2	60	3	Practical
5	Program Elective	Practicum		Elective-2	1-0-4	75	3	Practical
6	Humanities & Social Science	Practicum	AIE5654	Innovation and Startup	1-0-2	45	2	Project
7	Project / Internship	Project/Internship	AIE5773	Industrial Training * [Summer Vacation - 90 Hours]		-	2	Project
8	Open Elective	Advanced Skill Certification	AIE5860	Advanced Skills Certification - 5	1-0-3	60	2	NA
9	Audit Course	Integrated Learning Experience	ACE5882	I&E/ Club Activity/ Community Initiatives		30	0	
10	Audit Course	Integrated Learning Experience	ACE5883	Shop floor Immersion	-	8	0	-
11	Audit Course	Integrated Learning Experience	ACE5884	Student-Led Initiative	-	14	0	-
12	Audit Course	Integrated Learning Experience	ACE5885	Emerging Technology Seminars	-	8	0	-
13	Audit Course	Integrated Learning Experience	ACE5886	Health & Wellness	-	30	0	-
14	Audit Course	Integrated Learning Experience	ACE5887	Special Interest Groups	-	30	0	-
	Test and Revisions					**70**		
	Library					**15**		
	TOTAL PERIODS					**640**	**21**	

SIXTH SEMESTER

S.No	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	AIE6110	Artificial Intelligence and Robotics	4-0-0	60	4	Theory
2	Open Elective	Practicum		Elective-3	1-0-4	75	3	Practical
3	Project / Internship	Project / Internship		In-house Project / Internship / Fellowship	-	540	12	Project
TOTAL PERIODS						**675**	**19**	

FIFTH SEMSTER (ELECTIVE I)								
S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	AIE5211	Essentials of Software Engineering	2-0-2	60	3	Theory
2	Program Elective	Theory	AIE5212	Deep Learning	2-0-2	60	3	Theory
3	Program Elective	Theory	AIE5213	Data Science and Big Data	2-0-2	60	3	Theory

FIFTH SEMSTER (ELECTIVE II)								
S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Practicum	AIE5541	Web Analytics	1-0-4	75	3	Practical
2	Program Elective	Practicum	AIE5542	Cloud Computing & IOT	1-0-4	75	3	Practical
3	Program Elective	Practicum	AIE5544	Multimedia Systems*	1-0-4	75	3	Practical
4	Program Elective	Practicum	AIE5546	Robotic Process Automation*	1-0-4	75	3	Practical

ELECTIVE-III								
S. No.	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective	Practicum	AIE6241	Game Development	1-0-4	75	3	Practical
2	Elective	Practicum	AIE6242	Applied AI	1-0-4	75	3	Practical
3	Elective	Practicum	AIE6245	Mobile Application Development*	1-0-4	75	3	Practical
4	Elective	Practicum	AIE6246	UI & UX Design*	1-0-4	75	3	Practical

PROJECT/INTERNSHIP

S. No.	Course Category	Course Type	Code	Course Title	L-T-P	Period (Hrs.)	Credit	End Exam
1	Project / Internship	Project / Internship	AIE6351	Internship	-	540	12	Project
2	Project / Internship	Project / Internship	AIE6353	Fellowship	-	540	12	Project
3	Project / Internship	Project / Internship	AIE6374	In-house Project	-	540	12	Project

ANNEXURE – II

SCHEME OF EXAMINATIONS

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (FULL TIME)

THIRD SEMESTER

S.No	Course Code	Course	Examination Marks		Total Marks	Min. For Pass	Duration of Exam Hours	End Exam
			Internal Assessment Marks	Autonomous Exam Marks#				
1	AIE3110	Introduction to Python Programming	40	60	100	40	2	Theory
2	AIE3230	Fundamentals of data science	40	60	100	40	3	Theory
3	AIE3320	Programming Paradigms with Python	40	60	100	40	3	Practical
4	AIE3440	OOPS with JAVA	40	60	100	40	3	Practical
5	AIE3540	Introduction to Database Concepts	40	60	100	40	3	Practical
6	AIE3640	Operating Systems	40	60	100	40	3	Practical
7	AIE3760	Advanced Skills Certification - 3						NA
8	GLE3880	Growth Lab						NA
9	ACE3881	Induction Program II						**
10	ACE3882	I&E/ Club Activity/ Community Initiatives						**
11	ACE3883	Shop floor Immersion						**
12	ACE3884	Student-Led Initiative						**
13	ACE3885	Emerging Technology Seminars						**
14	ACE3886	Health & Wellness						**
	TOTAL		**240**	**360**	**600**	**-**	**-**	**-**

Autonomous Examinations will be conducted for 100 marks and will be converted to 60 marks.

ANNEXURE – II

SCHEME OF EXAMINATIONS

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (FULL TIME)

FOURTH SEMESTER

S.No	Course Code	Course	Examination Marks		Total Marks	Min. For Pass	Duration of Exam Hours	End Exam
			Internal Assessment Marks	Autonomous Exam Marks#				
1	AIE4110	Probability and Statistics	40	60	100	40	2	Theory
2	AIE4230	Data Structures Using Python *	40	60	100	40	3	Theory
3	AIE4340	R Programming	40	60	100	40	3	Practical
4	AIE4440	Data Exploration and visualization	40	60	100	40	3	Practical
5	AIE4540	Embedded Systems and IOT	40	60	100	40	3	Practical
6	AIE4640	Real Time Mini project	40	60	100	40	3	Practical
7	AIE4760	Advanced Skills Certification - 4						NA
8	ACE4882	I&E/ Club Activity/ Community Initiatives						**
9	ACE4883	Shop floor Immersion						**
10	ACE4884	Student-Led Initiative						**
11	ACE 4885	Emerging Technology Seminars						**
12	ACE4886	Health & Wellness						**
13	ACE4887	Special Interest Groups						**
	TOTAL		**240**	**360**	**600**			

Autonomous Examinations will be conducted for 100 marks and will be converted to 60 marks.

ANNEXURE – II

SCHEME OF EXAMINATIONS

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (FULL TIME)

FIFTH SEMESTER

S.No	Course Code	Course	Examination Marks		Total Marks	Min. For Pass	Duration of Exam Hours	End Exam
			Internal Assessment Marks	Autonomous Exam Marks#				
1	AIE5110	Introduction to AI	40	60	100	40	2	Theory
	Elective – 1							
2	AIE5211	Essentials of Software Engineering	40	60	100	40	3	Theory
	AIE5212	Deep Learning						
	AIE5213	Data Science and Big Data						
3	AIE5320	Artificial Intelligence Laboratory	40	60	100	40	3	Practical
4	AIE5440	Fundamentals of Machine learning	40	60	100	40	3	Practical
	Elective – 2							
5	AIE5541	Web Analytics	40	60	100	40	3	Practical
	AIE5542	Cloud Computing & IOT						
	AIE5544	Multimedia Systems*						
	AIE5546	Robotic Process Automation*						
6	AIE5654	Innovation and Startup	40	60	100	40	3	Project
7	AIE5773	Industrial Training * [Summer Vacation - 90 Hours]						Project
8	AIE5860	Advanced Skills Certification - 5						NA
9	ACE5882	I&E/ Club Activity/ Community Initiatives						
10	ACE5883	Shop floor Immersion						
11	ACE5884	Student-Led Initiative						
12	ACE5885	Emerging Technology Seminars						
13	ACE5886	Health & Wellness						
14	ACE5887	Special Interest Groups						
	TOTAL		**200**	**300**	**600**			

Autonomous Examinations will be conducted for 100 marks and will be converted to 60 marks.

ANNEXURE – II

SCHEME OF EXAMINATIONS

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (FULL TIME)

SIXTH SEMESTER

S.No	Course Code	Course	Examination Marks: Internal Assessment Marks	Examination Marks: Autonomous Exam Marks#	Total Marks	Min. For Pass	Duration of Exam Hours	End Exam
1	AIE6110	Artificial Intelligence and Robotics	40	60	100	40	2	Theory
2	**Elective-3**		40	60	100	40	3	Practical
	AIE6241	Game Development						
	AIE6242	Applied AI						
	AIE6245	Mobile Application Development*						
	AIE6246	UI & UX Design*						
3.	AIE6351	Internship	40	60	100	40	3	Project
	AIE6353	Fellowship						
	AIE6374	In-house Project						
	TOTAL		**120**	**180**	**300**			

Autonomous Examinations will be conducted for 100 marks and will be converted to 60 marks.

III SEMESTER

AIE3110 - INTRODUCTION TO PYTHON PROGRAMMING

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE3110
Semester : III SEMESTER
Course Title : INTRODUCTION TO PYTHON PROGRAMMING
Course Type : THEORY

L	T	P	C
4	0	0	4

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
INTRODUCTION TO PYTHON PROGRAMMING	4	60	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	Introduction	12
II	Decision making, Control structure and functions	12
III	Strings and lists	12
IV	Tuples and Dictionaries	12
V	File and exception handling	12
TOTAL HOURS		**60**

COURSE DESCRIPTION

Python is a versatile and powerful programming language that has gained immense popularity in recent years. Known for its simplicity and readability, Python is favored by beginners and seasoned developers alike. Due to its ease of learning and usage, python codes can be easily written and executed much faster than other programming languages. Python has several modules to write programs to solve Artificial Intelligence, Machine Learning, Data Analysis problems.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To read and write simple python programs.
- To define strings in python and operations on string.
- Represent compound data using python lists, tuples, dictionaries.
- To define and access multi-dimension al arrays.
- To do input/output with files in python.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E3110.1	Demonstrate the installation process of python IDE and modules
E3110.2	Write and predict the output of simple python programs.
E3110.3	Knowledge of the syntax and semantics of python language.
E3110.4	Create and access string, list, tuple, and dictionary
E3110.5	Read and write text files using python.

Pre-requisites: NIL

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E3110.1	3	2	2	3	3	2	3	3	3	2
E3110.2	3	2	2	3	3	2	3	3	3	2
E3110.3	3	2	2	3	3	2	3	3	3	2
E3110.4	3	2	2	3	3	2	3	3	3	2
E3110.5	3	2	2	3	3	2	3	3	3	2
Total	**15**	**10**	**10**	**15**	**15**	**10**	**15**	**15**	**15**	**10**
Correlation Level	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- Use technology and simulations to help students visualize and explore the logic behind the programming concepts.
- Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology

<table>
<tr><th rowspan="2"></th><th colspan="3">Continuous Assessment (40 marks)</th><th rowspan="2">End Semester Examination (60 marks)</th></tr>
<tr><th>CA1</th><th>CA2</th><th>CA3</th></tr>
<tr><td>Mode</td><td>Written test (Unit-1 & II)</td><td>Written test (Unit-III & IV)</td><td>Written test (Unit- V)</td><td>Written Examination (Entire Syllabus)</td></tr>
<tr><td>Duration</td><td>2 Periods</td><td>2 Periods</td><td>1 Period</td><td>2 hours</td></tr>
<tr><td>Exam Marks</td><td>30</td><td>30</td><td>20</td><td>60</td></tr>
<tr><td>Converted to</td><td>15</td><td>15</td><td>10</td><td>(No Conversion)</td></tr>
<tr><td>Marks</td><td colspan="3">40</td><td>60</td></tr>
<tr><td>Tentative Schedule</td><td>6th Week</td><td>12th Week</td><td>13-14th Week</td><td></td></tr>
</table>

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks
(Understand, Apply levels)</th><th colspan="3">Short Answer Questions
(Apply, Analyze, Evaluate and Create levels)</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="3">30 Marks</td></tr>
<tr><td>20</td><td>1</td><td>20</td><td>5</td><td>2</td><td>10</td></tr>
<tr><td colspan="3">➢ 10 questions from each unit
➢ All questions are compulsory</td><td colspan="3">➢ 2 questions from each unit and one question from either unit.
➢ All questions are compulsory</td></tr>
</table>

CONTINUOUS ASSESSMENT – 3 (CA3)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	20 Marks
10	1	10	5	2	10	
➢ 10 questions from the unit ➢ All questions are compulsory			➢ 5 questions from the unit. ➢ All questions are compulsory			

END EXAMINATION

PART - A			PART - B			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			Long Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	60 Marks
20	1	20	5	2	10	3	10	30	
➢ 4 questions from each unit ➢ All questions are compulsory			➢ Questions from the entire unit. ➢ Out of 8 questions, 5 questions to be answered			➢ 1 questions from each unit. ➢ Out of 5 questions, 3 questions to be answered			

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 5 questions under Part-B. Each question carries 2 marks.
3. Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	Lower order thinking skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE3110 - INTRODUCTION TO PYTHON PROGRAMMING

AIE3110	INTRODUCTION TO PYTHON PROGRAMMING	L	T	P	C
THEORY		4	0	0	4

Unit I	INTRODUCTION	[12 Hrs]
	Features of Python	[1Hr]
	Installing and running Python	[1Hr]
	Interpreter and interactive Model identifiers	[1Hr]
	Reserved Keywords.	[1Hr]
	Variables- comments in Python.	[1Hr]
	Data Types- Numeric , String , List, Sets, Tuple ,Dictionary.	[1Hr]
	Operators -Arithmetic, Relational, Assignment,	[1Hr]
	Logical, Bitwise, Membership operator,	[1Hr]
	identity operator , Statements and Expressions, string operations. Expressions,	[1Hr]
	Data Type conversion, Type coercion; Input from keyboard.	[1Hr]
	input function, Raw-input function,	[1Hr]
	Mutable and immutable objects.	[1Hr]
Unit II	**DECISION MAKING, CONTROL STRUCTURE AND FUNCTIONS**	**[12 Hrs]**
	Decision Making, Simple if,	[1Hr]
	if…else and if… elif Statement;	[1Hr]
	Control Statement,	[1Hr]
	for loop ,range(),	[1Hr]
	While, break, Continue, pass Functions;	[1Hr]
	Built in functions.	[1Hr]
	Mathematical functions,	[1Hr]
	Date and Time, dir (), help() Functions;	[1Hr]
	User defined functions- Return values,	[1Hr]
	Parameters and arguments , function calls.	[1Hr]
	Local and global scope, function Composition,	[1Hr]
	recursion, anonymous functions.	[1Hr]
Unit III	**STRINGS AND LISTS**	**[12 Hrs]**
	Strings- Strings in Python.	[1Hr]
	String functions and methods.	[1Hr]
	String slicing, immutable property.	[1Hr]
	String Traversal, Escape Characters,	[1Hr]
	String Formatting operators and functions.	[1Hr]
	Lists- Creation of list,	[1Hr]
	values Accessing elements	[1Hr]
	Mutable property,	[1Hr]

Traversing a list.	[1Hr]
Copying the list, altering values.	[1Hr]
Deleting elements from list.	[1Hr]
Built- in List operators and Built-in methods.	[1Hr]
Unit IV **TUPLES AND DICTIONARIES**	**[12 Hrs]**
Tuples – creating accessing values, immutable property.	[2 Hrs]
Assignment of tuples ,retuning Tuples, Tuples as arguments,	[1Hr]
Variable length arguments.	[1Hr]
Basic tuple operations. Built-in tuple functions.	[1Hr]
Dictionaries: Creating a dictionary, accessing values.	[2 Hrs]
Updating dictionary,	[1Hr]
deleting elements from dictionary, dictionary keys –Properties,	[2 Hrs]
operations in Dictionary,	[1Hr]
Built- in dictionary methods.	[1Hr]
Unit V **NETWORK SECURITY APPLICATION**	**[12 Hrs]**
Files: Text files, opening a file, closing a file.	[2 Hrs]
Reading from a file and writing into a file.	[1Hr]
File opening modes, closing a file.	[1Hr]
Directory :Directory methods-Mkdir(),	[1Hr]
chdir() , getcwd(), rmdir().	[1Hr]
Exceptions in Python,	[1Hr]
Definition-Built- in exceptions.	[1Hr]
Handling Exceptions-try..except,	[1Hr]
except with No Exception , Except with Multiple Exception,	[2 Hrs]
try …finally User defined exceptions.	[1Hr]
TOTAL HOURS	**60 Hrs**

Suggested List of Students Activity

- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Think Python: How to Think like a Computer	AllenB. Downey	2nd Edition, O'Reilly Publishers, 2016.
2.	Computational Thinking: A Beginner 's Guide to Problem Solving and programming,	Karl Beecher	1st Edition,BCS Learning & Development Limited,2017.
3.	Python for Programmers, Pearson Education	Paul deitel and Harvey Deitel	1st Edition, 2021.

Web-based/Online Resources

S.NO	WEBSITES
1.	**The Joy of computing using Python.** **https://nptel.ac.in/courses/106106182**

MODEL QUESTION PAPER

AIE3110 INTRODUCTION TO PYTHON PROGRAMMING

Time : [2 Hrs]. **Max. Marks : 60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**What keyword is used to define a function in Python?** A) function B) define C) def D) fun
2.	**What is the output of print("Hello" + "World")?** A) Hello+World B) Hello World C) HelloWorld D) Error
3.	**Python was developed by:** A) Guido van Rossum B) Dennis Ritchie C) James Gosling D) Bjarne Stroustrup
4.	**How do you insert comments in Python?** A) // This is comment B) /* This is comment */ C) <!-- comment --> D) # This is comment
5.	**What is the output of `range(2, 10, 2)`?**** A) [2, 4, 6, 8, 10] B) [2, 4, 6, 8] C) [2, 3, 4, ..., 9] D) [2, 5, 8]
6.	**What is the purpose of the `pass` statement?**** A) Skip code execution B) Exit loop C) Placeholder with no action D) Break loop
7.	**To access a global variable inside a function, you use:**** A) global keyword B) def keyword C) extern D) access
8.	**Which module is required for working with dates and times?**** A) date B) date time C) time D) calendar
9.	**Which of the following is used for string slicing?** A) () B) {} C) [] D) <>
10.	**What does print("Name: %s" % "Alice") output?** A) Name: Alice B) Name % Alice C) Name: % s Alice D) Error
11.	**What is the output of [1, 2] + [3, 4]?** A) [1, 2, 3, 4] B) [1, 2, [3, 4]] C) [1, 2, 3][4] D) Error
12.	**What will list1 = list2 do?** A) Copy contents B) Create reference C) Create a clone D) Compare lists
13.	**Tuples support:** A) Indexing B) Slicing C) Nesting D) All of the above
14.	**What is the correct way to create a dictionary?** A) d = (1: "a", 2: "b") B) d = {1: "a", 2: "b"} C) d = [1: "a", 2: "b"] D) d = <1: "a", 2: "b">
15.	**What will d = {}; d[1] = "one" do?** A) Error B) Add a new key-value pair C) Delete dictionary D) Convert list to dict
16.	**What is the output of len((10, 20, 30))?** A) 2 B) 3 C) 1 D) Error
17.	**What is the default mode of the open() function?** A) write (w) B) append (a) C) read (r) D) binary (b)

18.	**What does os.mkdir("test") do?** A) Deletes directory B) Makes new directory named test C) Opens a file D) Changes working directory
19.	**What happens when an exception is not handled?** A) Program continues B) Program stops C) Nothing D) File gets deleted
20.	**Which is a built-in exception in Python?** A) File Not Open B) Not Found C) File Not Found Error D) Error404

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following

21. List out key features of the Python programming language 2
22. What is a "built-in function" in Python, and provide two examples.
23. What is an "anonymous function" in Python, and what keyword is used to define it?
24. What is string formatting using % operator?
25. Name any two built-in list methods in Python.
26. What is a Python tuple? How is it created?
27. How do you add and delete elements from a dictionary?
28. Give any two example of a valid identifier.

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Explain the purpose of identifiers in Python .
30. Explain the difference between local and global scope in functions?
31. What are escape characters in strings? List two examples.
32. Name some built-in dictionary methods and explain their purpose.
33. Describe two methods for reading data from a text file in Python. Provide a code example for each method

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance withthe revised Blooms Taxonomy. The question paper should consist of 90% questionsbased on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking(HOTs) as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order ThinkingSkills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE3230 - FUNDAMENTALS OF DATA SCIENCE

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE3230
Semester : III SEMESTER
Course Title : FUNDAMENTALS OF DATA SCIENCE
Course Type : PRACTICUM

L	T	P	C
3	0	2	4

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
FUNDAMENTALS OF DATA SCIENCE	5	75	40	100*	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time (Hrs)
I	Introduction to data science	15
II	Data preprocessing	15
III	Data visualization	15
IV	Introduction to graph data Science and Graph Data Analytics	15
V	Introduction to natural language processing	15
TOTAL HOURS		**75**

COURSE DESCRIPTION

Data Science is a combination of multiple disciplines that uses statistics, data analysis, and machine learning to analyse data and to extract knowledge and insights from it. Data Science is about data gathering, analysis and decision-making. Data Science is about finding patterns in data, through analysis, and makes future predictions. By using Data Science, companies can make better decisions (should we choose A or B), Predictive analysis (what will happen next?), Pattern discoveries (find pattern, or maybe hidden information in the data). Data Science is used in many industries in the world today e.g. banking, consultancy, healthcare, and manufacturing. In this course, data science involving numbers, graphs and Natural language processing are being taught for making the student industry ready.

COURSE OBJECTIVES

- To understand the data science fundamentals and process
- To utilize the Python libraries for Data Wrangling
- To present and interpret data using visualization libraries in Python
- To explore graph in real time situations.
- To define the terminologies in NLP and Text analytics.

COURSE OUTCOMES

On successful completion of this course, the students should be able to	
E3230.1	Define the processes in data science.
E3230.2	Use the Python Libraries for handling data and manipulating them.
E3230.3	Apply visualization Libraries in Python to interpret and explore data
E3230.4	Explore graph and its hidden properties in real time applications.
E3230.5	Understand the basics of Natural Language Processing and Text Analytics

Pre-requisites :

Knowledge of basic mathematics and python.

CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E3230.1	3	3	2	3	3	2	3	3	3	3
E3230.2	3	3	2	3	3	2	3	3	3	3
E3230.3	3	3	2	3	3	2	3	3	3	3
E3230.4	3	3	2	3	3	2	3	3	3	3
E3230.5	3	3	2	3	3	2	3	3	3	3
Total	**15**	**15**	**10**	**15**	**15**	**10**	**15**	**15**	**15**	**15**
Correlation level	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Prerequisites: Knowledge of basic mathematics and python.

Instructional Strategy:

- Provide instructional content (lectures, videos, PPTs)for students to review and learn.
- Present students with real-world problems that require critical thinking and problem-solving skills.
- In corporate a variety of instructional modalities, such as visualizations, simulations, and demonstrations.
- Utilize demonstrations and plan interactive student activities for an engaging learning experience.

ASSESSMENT METHODOLOGY

<table>
<tr><th rowspan="2"></th><th colspan="3">Continuous Assessment (40 marks)</th><th rowspan="2">End Semester Examination (100 marks)</th></tr>
<tr><th>CA1</th><th>CA2</th><th>CA3</th></tr>
<tr><td>Mode</td><td>Integrated Test (Theory + Practical) (Unit I & II)</td><td>Integrated Test (Theory + Practical) (Unit-III & IV)</td><td>Integrated Test (Theory + Practical) (Unit-V)</td><td>Integrated Test (Theory + Practical) (Entire Syllabus)</td></tr>
<tr><td>Duration</td><td>2 Periods</td><td>2 Periods</td><td>1 Period</td><td>3 hours</td></tr>
<tr><td>Exam Marks</td><td>50</td><td>50</td><td>25</td><td>100</td></tr>
<tr><td>Converted to</td><td>15</td><td>15</td><td>10</td><td>60</td></tr>
<tr><td>Marks</td><td colspan="3">40</td><td>60</td></tr>
<tr><td>Tentative Schedule</td><td>6th Week</td><td>12th Week</td><td>15th Week</td><td></td></tr>
</table>

Note:

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th colspan="3">PART – C</th><th>PART – D</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks</th><th colspan="3">Short Answer Questions</th><th colspan="3">Long Answer Questions</th><th>Practical Activity</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="2">20 marks</td><td rowspan="3">50 Marks</td></tr>
<tr><td>10</td><td>1</td><td>10</td><td>4</td><td>2</td><td>8</td><td>4</td><td>3</td><td>12</td></tr>
<tr><td colspan="3">➢ 5 questions from each unit
➢ All questions are compulsory</td><td colspan="3">➢ 2 questions from each unit and one question from either unit.
➢ All questions are compulsory</td><td colspan="3">➢ 4 questions from each unit
➢ Out of 8 questions, 4 questions to be answered by selecting two questions from each unit</td><td>➢ Lab activity
➢ Demonstration
➢ Execution
➢ Viva-voce</td></tr>
</table>

CONTINUOUS ASSESSMENT – 3 (CA3)

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th colspan="3">PART – C</th><th>PART – D</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks</th><th colspan="3">Short Answer Questions</th><th colspan="3">Long Answer Questions</th><th>Practical Activity</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="2">10 marks</td><td rowspan="3">25 Marks</td></tr>
<tr><td>5</td><td>1</td><td>5</td><td>2</td><td>2</td><td>4</td><td>2</td><td>3</td><td>6</td></tr>
<tr><td colspan="3">➢ 5 questions from the unit
➢ All questions are compulsory</td><td colspan="3">➢ 2 question from the unit
➢ All questions are compulsory</td><td colspan="3">➢ 4 questions from the unit
➢ Out of 4 questions, 2 question to be answered</td><td>➢ Lab activity
➢ Demonstration
➢ Execution
➢ Viva-voce</td></tr>
</table>

END EXAMINATION

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th colspan="3">PART – C</th><th>PART – D</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks</th><th colspan="3">Short Answer Questions</th><th colspan="3">Long Answer Questions</th><th>Practical Activity</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="2">50 marks</td><td rowspan="3">100 Marks</td></tr>
<tr><td>25</td><td>1</td><td>25</td><td>5</td><td>2</td><td>10</td><td>5</td><td>3</td><td>15</td></tr>
<tr><td colspan="3">➢ 5 questions from each unit
➢ All questions are compulsory</td><td colspan="3">➢ 2 questions from each unit
➢ Out of 10 questions, 5 questions to be answered by selecting 1 question from each unit.</td><td colspan="3">➢ 2 questions from each unit
➢ Out of 10 questions, 5 questions to be answered by selecting 1 question from each unit.</td><td>➢ Lab activity
➢ Demonstration
➢ Execution
➢ Viva-voce</td></tr>
</table>

Question Pattern - End Semester Examination Practical Exam

1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 1 question in each section under Part-A. Each question carries 2 marks.
3. Answer any 1 question in each section under Part-B. Each question carries 3 marks.
4. Answer all questions under Part-C. Practical task based question carries 50 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

<table>
<tr><th rowspan="2">Revised Bloom’s Taxonomy Level</th><th>Lower order thinking skills (LOTs)</th><th>Higher Order Thinking Skills (HOTs)</th></tr>
<tr><td>R-Remember, U-Understand, AP-Apply</td><td>An- Analyse, E-Evaluate, C-Create</td></tr>
<tr><td>% to be included</td><td>90 %</td><td>10 %</td></tr>
</table>

AIE3230 FUNDAMENTALS OF DATA SCIENCE

<table>
<tr><td>AIE3230</td><td rowspan="2">FUNDAMENTALS OF DATAS CIENCE</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>PRACTICUM</td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>UNIT I</td><td colspan="4">INTRODUCTION TO DATA SCIENCE</td><td>[15 Hrs]</td></tr>
<tr><td colspan="5">THEORY
Data Science-An Introduction- Artificial intelligence vs Machine learning
Traditional programming vs Machine learning,
Skill and Role of a data scientist
Real time Applications Data science,Data Mining
Data Warehousing- Basic statistical descriptions of Data.
Introduction to Numpy library and function, Properties of Num Py Array .
Introduction to pandas, Creating Objects – Viewing Data – Selection –
Manipulating Data – Grouping Data -Merging ,joining and concatenating.
Working with Text Data -working with CSV and Excel files.</td><td>
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="5">PRACTICAL
Exercise 1: Creating NumPy Array using various built-in functions like the Array() Function, Zeros() Function, Ones() Function, Full() Function, Arange() Function, Eye() Function , Linspace() Function and Random() Function .
Exercise 2:Creating Objects in Pandas-Viewing Data in pandas, Selecting. and Manipulating Data in Pandas- Grouping data –Merging, Joining and Concatenating in Pandas.</td><td>[3Hrs]

[3Hrs]</td></tr>
<tr><td>UNIT II</td><td colspan="4">DATA PREPROCESSING</td><td>[15 Hrs]</td></tr>
<tr><td colspan="5">THEORY
Data-information ,
Types of Data-
Type of variables.
Describing Data With Tables and Graphs .
Describing Data with Averages
Data cleaning, Handling Missing values,
Data Science process workflow
Label-Encoding for Categorical Data,
Data normalization.</td><td>
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="5">PRACTICAL
Exercise 3: Importing library to read and slice the data. Understand the data and handling missing values.
Exercise 4: Applying label Encoding, Hot- Encoding for Categorical Data.
Exercise 5: Applying Data normalization using Standard Scalar and minmax.</td><td>[2Hrs]

[2Hrs]
[2Hrs]</td></tr>
<tr><td>UNIT III</td><td colspan="4">DATA VISUALIZATION</td><td>[15 Hrs]</td></tr>
</table>

THEORY Data Visualization- Introduction. Some Theoretical Principles Behind Data visualization. Histograms- Visualize the Distribution Continuous Numerical Variables- Box plots-Visualize the Distribution of Continuous Numerical variables Scatter plot, Visualize the Relationship Between two continuous variables Bar plot- Pie Chart – Line Chart.		[1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 6:** Create line Plots Bar chart, and Histogram of data. **Exercise 7:** Plotting a Boxplot and Creating Visualization for Categorical Data. **Exercise 8:** Create Pie Charts, Scatter Plots and multiple plots.		[2 Hrs] [2 Hrs] [2 Hrs]
UNIT IV	**INTRODUCTION TO GRAPH DATA SCIENCE AND GRAPH DATA ANALYTICS**	**[15 Hrs]**
THEORY Graph Data Science – Graph Data Statistics Graph Data Analytics – Graph Algorithms for Data Science Random Walks – Path Analytics Connectivity Analytics Community Analytics Centrality Analytics.		[2 Hrs] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [2 Hrs]
PRACTICAL **Exercise 9:** Construct a graph and apply Graph algorithms and compute Centrality measures using network library.		[6Hrs]
UNIT V	**INTRODUCTION TO NATURAL LANGUAGE PROCESSING**	**[15Hrs]**
THEORY Natural Language Processing. Concepts and Definitions , Tex Analytics Text Mining, Text Mining Applications Text Mining Process,. Text Mining Tools.		[2 Hrs] [1Hr] [1Hr] [2 Hrs] [2 Hrs] [1Hr]
PRACTICAL **Exercise 10:** Preprocess a text document using NLTK of Python and perform a. Stop word elimination, b. Stemming, c. Lemmatization, d. POS tagging.		[2 Hrs] [2 Hrs] [2 Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text book for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	“Introducing Data Science”,	David Cielen Arno, D.B.Meysman ,and Mohamed Ali	Manning Publications,2016.
2.	Python Data Science Hand book”	Jake Vander Plas,	O’Reilly,2016.
3.	Think Stats: Exploratory Data Analysis in Python	Allen B .Downey	Green Tea Press,2014.

Web-based/Online Resources:

S.NO	WEBSITES
1.	Nptelcourse:PythonforDatascience-https://nptel.ac.in/courses/106106212
2.	Nptel course: Data Analytics With Python https://nptel.ac.in/courses/106107220

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirement

S.NO	HARDWARE
1.	Desk top Computers/Laptop
2.	Printer

Software Requirement

S.NO	SOFTWARE
1.	Windows / Linux Operating System
2.	Python IDLE / Spyder.

MODEL QUESTION PAPER

AIE3230 - FUNDAMENTALS OF DATA SCIENCE

Time : [3 Hrs]. **Max. Marks : 100**

PART-A (25 X 1 Marks = 25 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**What is the primary goal of data science?** A) Build websites B) Develop mobile apps C) Extract knowledge from data D) Design games
2.	**Machine Learning is a subset of:** A) Programming B) Robotics C) Data Structures D) Artificial Intelligence
3.	**Traditional programming uses:** A) Data + Rules = Output B) Data + Output = Rules C) Data = Program D) Machine + Input = Output
4.	**A data scientist primarily needs to have:** A) Graphic designing skills B) Business, programming, and statistics skills C) Only programming skills D) Only math knowledge
5.	**Which technique measures how data values vary around the mean?** A) Variance B) Mode C) Sum D) Count
6.	**Which of the following is a type of variable?** A) Categorical B) Numerical C) Ordinal D) All of the above
7.	**The middle value in a sorted data set is:** A) MeanV B) Mode C) Median D) Variance
8.	**What is data cleaning?** A) Deleting all data B) Formatting files C) Removing errors and inconsistencies in data D) None of the above
9.	**Encoding categorical variables means:** A) Deleting them B) Converting to numerical form C) Replacing them with null D) Adding them to text files
10.	**After normalization, all features have:** A) Equal values B) Same units C) Same data type D) Similar scale
11.	**Which is NOT a typical goal of data visualization?** A) Exploration B) Explanation C) Confusion D) Presentation
12.	**The line inside the boxplot represents:** A) Mean B) Mode C) Median D) Range
13.	**Boxplots are used to:** A) Visualize data spread and detect outliers B) Show correlations C) Display proportions D) Show time trends
14.	**Which plot is useful to identify outliers visually?** A) Histogram B) Boxplot C) Scatter plot D) Pie chart
15.	**Which plot is best for showing trends over time?** A) Bar plot B) Scatter plot C) Line chart D) Histogram
16.	**A graph is composed of:** A) Nodes and edges B) Rows and columns C) Keys and values D) Tables and fields

17.	**Graph statistics typically measure:** A) Number of nodes, edges, and density B) File size C) Number of columns D) Data encryption level
18.	**What is the goal of graph analytics?** A) Store data B) Analyze relationships and patterns in graph data C) Visualize images D) Encrypt data
19.	**Communities in social networks often represent:** A) Friend groups or clusters B) Random users C) Inactive accounts D) Data errors
20.	**Natural Language Processing (NLP) deals with:** A) Structured numeric data B) Human language data C) Image processing D) Graph storage
21.	**Named Entity Recognition (NER) is:** A) Detecting dates, names, locations in text B) Encrypting data C) Summarizing text D) Translating languages
22.	**Topic modeling helps to:** A) Identify main topics in a large text corpus B) Encrypt data C) Translate text D) Compress files
23.	**SpaCy is:** A) A web browser B) A text mining and NLP library C) An image editor D) A database
24.	**Which of the following is NOT a text mining tool?** A) RapidMiner B) WEKA C) Photoshop D) KNIME
25.	**Sentiment classification can be:** A) Binary (positive/negative) B) Multi-class (positive/neutral/negative) C) Both A and B D) None of the above

PART – B (5X2=10 Marks)	
Note: Answer the any one Question from each section. Each question carries 2 marks	
26.	A) Differentiate between Artificial Intelligence and Machine Learning
	B) List two essential skills required for a Data Scientist
27.	A) Artificial Intelligence vs. Machine Learning
	B) Define Data and Information in the context of data science
28.	A) List two common techniques used to handle missing values in a dataset.
	B) What is the importance of data normalization in data preprocessing?
29.	A) What is data visualization, and why is it important?
	B) What kind of data is typically represented by a pie chart?
30.	A) What is the main purpose of graph data analytics?
	B) Give two examples of real-world applications of graph data science.

PART – C (5X3=15 Marks)	
Note: Answer the any one Question from each section. Each question carries 3 marks	
31.	A)Differentiate between Artificial Intelligence and Machine Learning.
	B) List three essential skills of a Data Scientist.
32.	A)Outline the steps involved in the Data Science Process Workflow.
	B) Explain the difference between Data and Information with suitable examples.
33.	A)What is Data Visualization, and why is it important?
	B) Explain the purpose and characteristics of a Bar Plot.
34.	A)What is Graph Data Science?
	B) What are some applications of graph data science?
35.	A)Explain the concept of Sentiment Analysis in NLP.
	B) Briefly explain two future trends in Natural Language Processing.

PART – D (Lab Exercises) (1X50 =50 Marks) Note: Execute any one Lab Exercises.

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the Revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE3320 PROGRAMMING PARADIGMS WITH PYTHON

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code : AIE3320

Semester : III SEMESTER

Course Title : PROGRAMMING PARADIGMS WITH PYTHON

Course Type : PRACTICAL

L	T	P	C
0	0	4	2

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	Duration
PROGRAMMING PARADIGMS WITH PYTHON	4	60	40	100*	100	3Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

COURSE DESCRIPTION

Programming Paradigms is a practical course designed to provide hands-on experience and practical understanding of various concepts in Python. Through a series of 10 experiments, students will explore the basic datatypes, operators, and various built-in functions available with the Python programming language. The laboratory exercises will cover areas so as to equip the students with the nuances of python programming language.

COURSE OBJECTIVES

The objective of this course is to

- To familiarize students with Python syntax and semantics
- To design and implement simple python programs
- To provide practical experience in working with lists, tuples and dictionaries
- To read and write data from/to files in Python.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to	
E3320.1	Write, test, and debug simple Python programs.
E3320.2	Construct sequential logic circuits and verify their truth tables.
E3320.3	Develop Python programs step-wise by defining functions and calling them.
E3320.4	Use Python lists, tuples, dictionaries for representing compound data.
E3320.5	Read and write data from/to files in Python.

- **Pre-requisites :** NIL

CO- POs & PSOs MAPPING MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E3320.1	3	2	2	3	3	2	3	3	3	3
E3320.2	3	2	2	3	3	2	3	3	3	3
E3320.3	3	2	2	3	3	2	3	3	3	3
E3320.4	3	2	2	3	3	2	3	3	3	3
E3320.5	3	2	2	3	3	2	3	3	3	3
Total	**15**	**10**	**10**	**15**	**15**	**10**	**15**	**15**	**15**	**15**
Correlation level	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- The laboratory sessions will be conducted in a computer lab equipped with necessary software and tools.
- Each experiment will consist of a theoretical introduction followed by practical implementation and analysis.
- Students will work individually or in small groups to complete the experiments .
- Instructors will provide guidance and support as needed, fostering an environment of active learning and collaboration.

Assessment Methodology:

	Continuous Assessment (40 marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Practical Document	Practical Test	Practical Examination
Portion	Part A Exercises	Part B Exercises	All Exercises	All Exercises	All Exercises
Duration	2 Periods	2 Periods	Regularly	3 Hours	3 Hours
Exam Marks	50	50	Each Practical 10 Marks	100	100
Converted to	10	10	10	10	60
InternalMarks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th week	

Note:

- **CA1 and CA2:** All the exercises/experiments as per the portions mentioned above should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below.

  The marks awarded will be converted to 10 Marks for each assessment test.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim & Circuit diagram	35
B	Execution and Result	15
TOTAL		**50**

- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencementof next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded should be converted to 10 Marks for the internal assessment

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

PART	DESCRIPTION	MARKS
1	Aim (05), Circuit diagram for the experiment from Part-A (30)	35
2	Aim (05), Circuit diagram for the experiment from Part-B (30)	35
3	Execution of any one experiment from Part-A OR Part-B	25
4	Viva Voce	05
TOTAL		**100**

AIE3320 PROGRAMMING PARADIGMS WITH PYTHON

<table>
<tr><td>AIE3320</td><td rowspan="2">PROGRAMMING PARADIGMS WITH PYTHON</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>PRACTICAL</td><td>0</td><td>0</td><td>4</td><td>2</td></tr>
</table>

	PART -A	
1.	(i) Write a Python program to compute HCF and LCM of two numbers. (ii) Write a Python program to print ASCII Value of a character.	[6 Hrs]
2.	(i) Write a Python program to read three numbers and print the smallest of three numbers. (ii) Write a Python program to calculate Simple Interest.	[6 Hrs]
3.	(i) Write a Python Program to print perfect square numbers between given range. (ii)Write a Python Program to accept line of text and find the number of characters, vowels and blank spaces on it.	[6 Hrs]
4.	(i) Write a Python Program using function to display all such numbers which is divisible by 3 but are not multiple of 5 in a given range. (ii) Write a Python Program using recursion to print 'n' terms in Fibonacci series.	[6 Hrs]
5.	(i) Write a Python program to find minimum and maximum of a list of numbers (ii) Write a Python program to display a list in reverse order.	[6 Hrs]
	PART - B	
6.	(i) Write a Python Program to add 'ing' at the end of a given string if the string has 3 or more characters. If the given string is already ends with 'ing' then add 'ly' instead. If the string has less than 3 characters, leave it unchanged. (ii) Write a Python Program to do basic trim and slice operations on String.	[6 Hrs]
7.	(i) Write a python program to create a tuple and convert into a list and print the list in sorted order. (ii) Write a python program to create a dictionary and check whether a key or value exists in the dictionary.	[6 Hrs]
8.	Write a Python Program to print the first half values of tuple in one line and last half values in next line	[6 Hrs]
9.	Write a Python Program to multiply two matrices.	[6 Hrs]
10.	Write a Python Program to copy file contents from one file to another and display number of words copied.	[6 Hrs]
	TOTAL HOURS	**60**

Suggested List of Students Activity

Python Programming Practice: Students can engage in coding exercises to reinforce their Python skills, focusing on syntax and data structures.

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Automate the Boring Stuff with Python	AI Sweigart,	Second Edition, No Starch Press,2019
2.	Python Data Science Handbook, Essential tool for working with data	Jake Vanderplas	First Edition, O'Reilly Media, Inc,2017
3.	Python for Data Analysis: Data Wrangling with Pandas, NumPy and Ipython, Wes McKinney	Wes McKinney	Second Edition, O'REILLY, 2017

Web-based/Online Resources:

S.No.	WEBSITES/LINK
1.	https://www.w3schools.com/python/
2.	File Handling in Python: https://www.geeksforgeeks.org/file-handling-python/

Equipment / Facilities required to conduct the Practical Course (Batch Strength: 30 Students)

Software Requirement:

S.No.	SOFTWARE
1.	Windows / Linux Operating System
2.	Python IDLE / Spyder

Hardware Requirement:

S.No.	HARDWARE
1.	Desktop Computers / Laptop
2.	Printer

AIE3320 - PROGRAMMING PARADIGMS WITH PYTHON

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	(i) Write a Python program to compute HCF and LCM of two numbers. (ii) Write a Python program to print ASCII Value of a character.	E3320.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	(i) Write a Python program to read three numbers and print the smallest of three numbers. (ii) Write a Python program to calculate Simple Interest.	E3320.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	(i) Write a Python Program to print perfect square numbers between given range. (ii) Write a Python Program to accept line of text and find the number of characters, vowels and blank spaces on it.	E3320.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	(i) Write a Python Program using function to display all such numbers which is divisible by 3 but are not multiple of 5 in a given range. (ii) Write a Python Program using recursion to print 'n' terms in Fibonacci series.	E3320.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	(i) Write a Python program to find minimum and maximum of a list of numbers (ii) Write a Python program to display a list in reverse order.	E3320.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
6	(i) Write a Python Program to add 'ing' at the end of a given string if the string has 3 or more characters. If the given string is already ends with 'ing' then add 'ly' instead. If the string has less than 3 characters, leave it unchanged. (ii) Write a Python Program to do basic trim and slice operations on String.	E3320.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	(i) Write a python program to create a tuple and convert into a list and print the list in sorted order. (ii) Write a python program to create a dictionary and check whether a key or value exists in the dictionary.	E3320.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Write a Python Program to print the first half values of tuple in one line and last half values in next line	E3320.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	Write a Python Program to multiply two matrices.	E3320.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	Write a Python Program to copy file contents from one file to another and display number of words copied.	E3320.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

AIE3440 OOPS WITH JAVA

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE3440
Semester : III SEMESTER
Course Title : OOPS WITH JAVA
Course Type : PRACTICUM

L	T	P	C
2	0	2	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
OOPS WITH JAVA	4	60	40	100*	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time(Hrs)
I	Introduction to java	12
II	Control structures, array and string	12
III	Class and objects	12
IV	Inheritance and interface	12
TOTAL HOURS		**60**

COURSE DESCRIPTION

Java is a class-based, object-oriented programming language. Java programming is a versatile and widely-used programming language known for its platform independence, robustness, and scalability. Java is widely used for developing applications for desktop, web, and mobile devices. Students will learn Java tokens, variables, datatypes, control structures, functions, arrays, strings, object - oriented programming concepts and swing components. Through hands-on students will develop proficiency in writing structured and efficient Java programs to solve a variety of computational problems.

COURSE OBJECTIVES

The objectives of this course are enabling the students

- To understand the concepts of Object Oriented Programming.
- To learn about the control structures, class with attributes and methods used in Java.
- To gain knowledge of arrays and strings.
- To understand the concept of exception handling mechanism.
- To comprehend the basics of swing components and its importance in application development

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E3440.1	Demonstrate knowledge on Java Programming fundamentals.
E3440.2	Develop programs in Java using control structures, array and string.
E3440.3	Demonstrate use of object - oriented programming concepts in Java.
E3440.4	Apply programming skills to solve overriding problems using inter face.
E3440.5	Develop applications using swing components.

Pre-requisites : Nil

CO/PO & PSO Mapping:

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E3440.1	3	3	3	3	1	1	2	2	3	3
E3440.2	3	3	3	3	1	1	2	2	3	3
E3440.3	3	3	3	3	1	2	2	2	3	3
E3440.4	3	3	3	3	1	2	2	2	3	3
E3440.5	3	3	3	3	1	3	2	2	3	3
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**15**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: In corporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure out come-driven learning and employ ability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim (05) ,Program from Part – A (30)	35
B	Aim (05) ,Program from Part – B (30)	35
C	Executing any one program (Part A or Part –B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE3440 OOPS WITH JAVA

AIE3440 PRACTICUM	OOPS WITH JAVA	L	T	P	C
		2	0	2	3

UNIT I	**INTRODUCTION TO JAVA**	**[12 Hrs]**
THEORY Introduction to OOPS : Basic concepts of Object- Oriented Programming –Benefits of OOPs– Java Features–Java Environment–JDK–API. Creating and Executing a Java program Java Tokens- Java Virtual Machine (JVM)- Command Line Arguments Constants – Variables – Data types- Scope of variables – Type casting – Operators.		[1 Hr] [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 1:** Write a Java program to read the temperature in Celsius and convert into Fahrenheit. **Exercise 2:** Write a Java program to compute the factorial of a number.		[4 Hrs] [4 Hrs]
UNIT II	**CONTROL STRUCTURES, ARRAY AND STRING**	**[12 Hrs]**
THEORY Control structures: Decision making statements- looping statements, Branching statement–Arrays: One Dimension Array Multidimensional Array- String: String Arrays.		[1 Hr] [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 3:** Write a Java program to find the sum and average of your tenth standard marks. **Exercise 4:** Write a Java program to multiply two matrices.		[4 Hrs] [4 Hrs]
UNIT III	**CLASS AND OBJECTS**	**[12 Hrs]**
THEORY Class and objects: Defining a class – Methods – Creating objects – Accessing class members – Constructors Method overloading – Static members – Destructors.		[1 Hr] [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 5 :**Write a Java program to find the Fibonacci series using recursive and non-recursive functions. **Exercise 6 :** Write a Java program for method over loading. **Exercise 7 :** Write a Java program for Constructor over loading.		[4 Hrs] [2 Hrs] [2 Hrs]
UNIT IV	**INHERITANCE AND INTERFACE**	**[12 Hrs]**
THEORY Inheritance: Defining Inheritance–Types of Inheritances. Overriding Methods Final Variables and Methods Abstract Class Interfaces: Defining Interfaces and Introduction to Interfaces		[1 Hr] [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 8**: Write a Java program to create a class called Vehicle with a method called drive(). Create a subclass called Car that overrides the drive() method to print "Repairing a car". **Exercise 9**: Write a Java program that creates class hierarchy for employees of a company. The base class should be Employee, with subclasses Manager, Developer, and Programmer. Each subclass should have properties such as name, address, salary, and job title. Implement methods for calculating bonuses, generating performance reports, and managing projects.		[4 Hrs] [4 Hrs]

UNIT V	EXCEPTION HANDLING AND SWING	[12 Hrs]
THEORY Exception Handling :Basics of Exception Handling Try and catch block Swing Components and Event Handlers: Event Handlers Event Listeners – Input Events.		 [1 Hr] [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise10:** Write a Java program that simulates a traffic light. The program let the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.		[8Hr]
TOTAL HOURS		**60**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technologic a developments based on the course.
- Programming assignments.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore there cent trends and developments in the field.

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Programming with Java	E. Balagurusamy	5th Edition, TataMc-Graw Hill
2.	Java Programming for Core and advanced learners,	Sagayaraj, Denis, Karthick and Gajalakshmi	Universities Press (INDIA) Private Limited, 2018
3.	The complete reference Java	Herbert Schildt Tata Mc-Graw Hill	TataMc-Graw Hill, 7th Edition

Web-based/Online Resources:

S.No.	WEBSITES/LINK
1	NPTEL & MOOC courses titled Java: https://nptel.ac.in/courses/106105191/

Equipment / Facilities required to conduct the Practical Course

Software Requirement:

S.No.	Software
1.	Windows / Linux Operating System
2.	Net Beans 8.0.2 / 8.2 with JDK

Hardware Requirement:

S.No.	Hardware
1.	Desktop Computers / Laptop
2.	Printer

AIE3440 OOPS WITH JAVA

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Write a Java program to read the temperature in Celsius and convert into Fahrenheit.	E3440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	Write a Java program to compute the factorial of a number.	E3440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Write a Java program to find the sum and average of your tenth standard marks.	E3440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	Write a Java program to multiply two matrices.	E3440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Write a Java program to find the Fibonacci series using recursive and non-recursive functions.	E3440.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
	PART – B		
6	Write a Java program for method over loading.	E3440.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Write a Java program for Constructor over loading.	E3440.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Write a Java program to create a class called Vehicle with a method called drive(). Create a subclass called Car that overrides the drive() method to print "Repairing a car".	E3440.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	Write a Java program that creates class hierarchy for employees of a company. The base class should be Employee, with subclasses Manager, Developer, and Programmer. Each subclass should have properties such as name, address, salary, and job title. Implement methods for calculating bonuses, generating performance reports, and managing projects.	E3440.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	Write a Java program that simulates a traffic light. The program let the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.	E3440.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

AIE3540 INTRODUCTION TO DATABASE CONCEPTS

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE3540
Semester : III SEMESTER
Course Title : INTRODUCTION TO DATA BASE CONCEPTS
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
INTRODUCTION TO DATA BASE CONCEPTS	5	75	40	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Part	Topics	Time(Hrs)
I	MySQL installation and database concepts	15
II	Interactive MySQL	15
III	Querying the database	15
IV	Performance tuning	15
V	Stored Program Concepts & Development	15
	TOTAL HOURS	**75**

COURSE DESCRIPTION

All modern database management systems like SQL, MSSQL Server ,IBM DB2, ORACLE, My- SQL, and Microsoft Access are based on RDBMS. It is called Relational Database Management System (RDBMS) because it is based on the relational model introduced by E.F. CODD. A relational data base is the most commonly used data base. Due to a collection of an organized set of tables, data can be accessed easily in RDBMS.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To know the fundamentals of DBMS
- To share of data and speedy forming of new applications , restrict repetition or redundancy of data
- To avoid data in consistencies providing better integrity
- To familiarize all the possible operations of data in the database
- To familiarize programming skills for all the operations in database

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E3540.1	Describe fundamentals of DBMS, installation and working with admin.
E3540.2	Apply SQL commands to create, insert, retrieve, update, delete data from the Relational databases. redundancy of data
E3540.3	Describe MySQL programming constructs, control statements and subprograms.
E3540.4	Describe how indexes increases the performance.
E3540.5	Apply cursors, triggers and Exception handling concepts.

Pre-requisites : NIL

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E3540.1	2	3	3	3	3	3	2	3	3	2
E3540.2	2	3	3	3	3	3	2	3	3	2
E 3540.3	2	3	3	3	3	3	2	3	3	2
E3540.4	2	3	3	3	3	3	2	3	3	2
E3540.5	2	3	3	3	3	3	2	3	3	2
Total	**10**	**15**	**15**	**15**	**15**	**15**	**10**	**15**	**15**	**10**
Correlation level	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable ,real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan inter active student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory- demonstrate-practice-activity strategy throughout the course to ensure out come-driven learning and employ ability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	Part A Exercises	Part B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 hours	3 hours	3 hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th week	

Note:

CA1 and CA2: All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.

Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.
The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100Marks**

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim (05) ,Program from Part – A (30)	35
B	Aim (05) ,Program from Part – B (30)	35
C	Executing any one program (Part A or Part –B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE3540 INTRODUCTION TO DATA BASE CONCEPTS

AIE3540 PRACTICUM	INTRODUCTION TO DATA BASE CONCEPTS	L	T	P	C
		1	0	4	3

UNIT I	**MY SQL INSTALLATION AND DATA BASE CONCEPTS**	**[15 Hrs]**
THEORY **My SQL Installation:** Install, configure and test MySQL server on Microsoft Windows. Creating, selecting and describing database – show command – backing up databases Introduction to database concepts – Components of DBMS – Table Structure – Keys: types of Keys – Data Constraints and types of Constraints.		[1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 1:** Install, configure and connect to MySQL server and MySQL work bench in Windows. **Exercise 2**: Write a query to create a data base, show and backing up data bases.		[5Hrs] [5Hrs]
UNIT II	**INTERACTIVE MYSQL**	**[15 Hrs]**
THEORY MySQL data types–Data Definition Commands–Data Manipulation Commands Data Retrieval Commands. Types of operators – Arithmetic, Comparison and Logical Operators Pattern Matching – Import and Export Data.		[2Hrs] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 3:** Create a data base named college and create a table for student and employee with the 1ields as you like. **Exercise 4:** Create able student with marks field for10 students .Apply built in functions to do calculations.		[5Hrs] [5Hrs]
UNIT III	**QUERYING THE DATA BASE**	**[15 Hrs]**
THEORY **Querying the table:** Selecting rows using where, order by, group by and Having clauses Sub-queries –correlated sub queries Views Introduction : Advantage of views–creating, Updating and deleting views		[1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 5:** Create a table bank and select the accounts having balance greater that Rs.1,00,000 and sort them in ascending order. **Exercise 6:** Create a table library with proper fields and create another table library1and inset rows from library using views.		[5Hrs] [5Hrs]
UNIT IV	**PERORMANCE TUNING**	**[15Hrs]**
THEORY **Indexes and Sequences:** Index Types – simple and compound. Sequences. Creation Joins–definition–types of joins Natural join, inner join, self join, outer join. Union types: union, Union All, Union Distinct order by and limit handling.		[1Hr] [1Hs] [1Hr] [1Hr] [1Hr]

PRACTICAL		
Exercise 7: Create a table named student with sequences. **Exercise 8:** Create any two tables with common column name and perform join and union. **Exercise 9:** Create two tables and perform union and union all on these tables.		[3Hrs] [3Hrs] [4Hrs]
UNIT V	**STORED PROGRAM CONCEPTS & DEVELOPMENT**	**[15Hrs]**
THEORY **MySQL Procedures & Functions:** Creating, executing and deleting stored procedures creating – executing and deleting stored functions –advantages **MySQL Trigger:** Use of trigger – creating trigger – types of triggers		[2Hrs] [1 Hr] [2Hrs]
PRACTICAL **Exercise 10:** Create a stored procedure to get employee details from employee table. **Exercise 11:** Create a program using function. **Exercise 12:** Create a program to illustrate triggers.		[3Hrs] [3Hrs] [4Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

- Presentation/ Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore there cent trends and developments in the field.

Text books for Reference:

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Querying MySQL: Make your MySQL data base analytics accessible with SQL operations, data extraction, and custom queries	Adam Aspin	1st Edition, BPB Publication ,2022
2.	MySQL: The Complete Reference (Os borne Complete Reference Series)	Vikram Vaswani, MySQL	1st edition, McGraw Hill Education,2017
3.	MySQL Pocket Reference	George Reese	2nd Edition, O'Reilly Media 2007
4.	High Performance MySQL: Optimization, Backups, Replication	Baron Schwartz, Peter Zaitsev, et al	Third Edition, O'Reilly Media,2012

Web-based/Online Resources

S.NO	WEBSITE/ LINKS
1.	https://www.w3schools.com/mysql/
2.	https://www.mysqltutorial.org/
3.	https://www.javatpoint.com/mysql-tutorial
4.	https://www.guru99.com/mysql-tutorial.html

Equipment / Facilities required to conduct the Practical Portion

Software Requirement:

S.NO.	SOFTWARE
1.	Desktop Computers/Laptop
2	Printer

Hardware Requirement:

S.NO.	HARDWARE
1.	• Windows /Linux Operating System
2.	• https://dev.mysql.com/downloads/installer/

AIE3540 INTRODUCTION TO DATABASE CONCEPTS

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Install, configure and connect to MySQL server and MySQL work bench in Windows.	E3540.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	Write a query to create a data base, show and backing up databases.	E3540.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Create a data base named college and create a table for student and employee with the fields as you like.	E3540.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	Create able student with marks field for10 students. Apply built in functions to do calculations.	E3540.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Create a table bank and select the accounts having balance greater that Rs.1,00,000 and sort them in ascending order.	E3540.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
	PART – B		
6	Create a table library with proper fields and create another table library1and inset rows from library using views.	E3540.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Create a table named student with sequences.	E3540.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Create any two tables with common column name and perform join and union.	E3540.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	Create two tables and perform union and union all on these tables.	E3540.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	Create a stored procedure to get employee details from employee table.	E3540.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7
11	Create a program using function.	E3540.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7
12	Create a program to illustrate triggers.	E3540.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

AIE3640- OPERATING SYSTEMS

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE3640
Semester : III SEMESTER
Course Title : OPERATING SYSTEMS
Course Type : PRACTICUM

L	T	P	C
1	0	2	2

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
OPERATING SYSTEMS	3	45	40	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and will beconverted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Part	Topics	Time(Hrs)
I	INTRODUCTION TO OS	23
II	SHELL SCRIPTS	22
TOTAL HOURS		**45**

COURSE DESCRIPTION

Students have to be conversant with computer, it terminology and functioning. The heart of a computer is base around its Operating System. An operating system act a an interface between the user of a computer and the computer hardware. The processor deals with request coming from all directions asynchronously. The operating system has to deal with the problems of contention, resource management and both program and user data management, and provide a useful no-wait user interface. The course provides clear vision, understanding and working of Operating Systems.

COURSE OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- To understand the purpose, goals, functions and evolution of Operating Systems. Login and logoff Procedures.
- To know how to use of General purpose and communication commands.
- To study the use of Search patterns, simple filters and advanced filters.
- To know the details of process status.
- To understand shell scripts, define the elements of the shell script and write shell script for various problems.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E3640.1	Understand functional architecture of an operating system
E3640.2	Distinguish CPU scheduling algorithms.
E3640.3	Analyze process coordination.
E3640.4	Classify File System and directory implementations.
E3640.5	Resource Management

Prerequisites : Nil

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E3640.1	2	3	2	3	2	2	3	3	3	3
E3640.2	2	3	2	3	2	2	3	3	3	3
E3640.3	2	3	2	3	2	2	3	3	3	3
E3640.4	2	3	2	3	2	2	3	3	3	3
E3640.5	2	3	2	3	2	2	3	3	3	3
Total	**10**	**15**	**10**	**15**	**10**	**10**	**15**	**15**	**15**	**15**
Correlation level	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable ,real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory- demonstrate-practice-activity strategy throughout the course to ensure out come-driven learning and employ ability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology

Note:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 hours	3 hours	3 hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th} Week	14^{th} Week	15^{th} Week	16^{th} week	

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PAR	DESCRIPTIO	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
TOTAL		**100**

AIE3640 OPERATING SYSTEMS

AIE3640	OPERATING SYSTEMS	L	T	P	C
PRACTICUM		1	0	2	2
UNIT I	**INTRODUCTION TO OS**				**[23 Hrs]**
THEORY					
Introduction to operating system: Basics of Operating System					[1Hr]
Types of operating system –operating system services					[1Hr]
operating system structures - Process Management					[1Hr]
Process scheduling - Basics of Linux OS: Entering and Exiting from a Linux System					[1Hr]
User Accounts– Different shells – Learn the syntax and usage of Directory Management					[1Hr]
Commands – Check the process status					[1Hr]
process management commands - search patterns					[1Hr]
Deadlocks–Virtual Memory–Page Replacement Algorithms					[1Hr]
PRACTICAL					
Exercise 1: Write a syntax and execute the directory management commands :ls, cd, pwd, mkdir, rmdir					[4Hrs]
Exercise 2: Write a syntax and execute the file management commands such as cat, chmod, cp, mv, rm, more					[4Hrs]
Exercise 3: Write a syntax and execute the general purpose commands: wc,cal, date, who, tty, ln					[4Hrs]
Exercise 4: Using the simple filters verify pr, head, tail, cut, paste, nl, sort grep, egrep, fgrep, write and wall					[3Hrs]
UNIT II	**SHELL SCRIPTS**				**[22 Hrs]**
THEORY					
File operations (New, Open, Close, Save, Save and Exit, Print)					[1Hr]
Text Editing. operations (inserting ,deleting ,finding, replacing, copying and moving)					[1Hr]
use of shell scripts–Numerical operations–Looping–Swapping techniques					[1Hr]
string operations–using command line argument					[1Hr]
operations–using command line arguments–filters–date function–Relational Operations–					[1Hr]
Logical Operations–Boolean operations–Basic Arithmetic operations–					[1Hr]
case statement–search director or file.					[1Hr]
PRACTICAL					
Exercise 5: Write a shell script that accepts numerical value N and find sum.					[3Hrs]
Exercise 6: Write a shell script to find factorial of the given number.					[3Hrs]
Exercise 7: Write a shells script to perform arithmetic calculator using case statement.					[3Hrs]
Exercise 8: Write a shells crept using command line arguments and reports on Whether it is a directory, file or something else.					[3Hrs]
Exercise 9: Check the details of process name, PID, status using PS Command. Process management commands:&, nohup, kill, nice.					[3Hrs]
TOTAL HOURS					**45 Hrs**

Suggested List of Students Activity

- Presentation/ Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore there cent trends and developments in the field.

Text books for Reference:

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Operating System Principles	Abraham Silberchatz, Peter B. Galvin, Greg Gagne	9th Edition, John Wiley &Sons,2018
2.	Operating Systems–Internal and Design Principle	William Stallings	9thEdition,Pearson Education/PHI,2018.
3.	Modern Operating Systems	Andrew S Tanenbaum	3rd Edition, Pearson/PHI,2014.

Web-based/Online Resources

S.NO	WEBSITE/ LINKS
1.	https://nptel.ac.in/courses/106/105/106105214/
2.	https://ocw.mit.edu/courses/6-828-operating-system-engineering-fall-2012/pages/lecture-notes-and-readings/
3.	https://www.geeksforgeeks.org/what-is-an-operating-system/
4.	https://www.w3schools.in/operating-system/intro

Equipment / Facilities required to conduct the Practical Portion

Software Requirement:

S.NO.	SOFTWARE
1.	Desktop Computers/Laptop
2	Printer

Hardware Requirement:

S.NO.	HARDWARE
1.	Linux Operating System

AIE3640 OPERATING SYSTEMS

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Write a syntax and execute the directory management commands :ls, cd, pwd, mkdir, rmdir	E43640.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	Write a syntax and execute the file management commands such as cat, chmod, cp, mv, rm, more	E43640.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Write a syntax and execute the general purpose commands: wc,cal, date, who, tty, ln	E43640.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	Using the simple filters verify pr, head, tail, cut, paste, nl, sort grep, egrep, fgrep, write and wall	E43640.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
	PART – B		
5	Write a shell script that accepts numerical value N and find sum.	E43640.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
6	Write a shell script to find factorial of the given number.	E43640.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Write a shells script to perform arithmetic calculator using case statement.	E43640.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Write a shells crept using command line arguments and reports on Whether it is a directory, file or something else.	E43640.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	Check the details of process name, PID, status using PS Command. Process managementcommands:&, nohup, kill, nice.	E43640.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7

IV SEMESTER

AIE4110 – PROBABILITYAND STATISTICS

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE4110
Semester : IV SEMESTER
Course Title : PROBABILITYAND STATISTICS
Course Type : THEORY

L	T	P	C
3	0	0	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
PROBABILITY AND STATISTICS	3	45	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Periods)
I	COMBINATORICS	10
II	BASICS OF PROBABILITY	9
III	ONE DIMENSIONAL RANDOM VARIABLES	10
IV	TWO DIMENSIONAL DISCRETE RANDOM VARIABLES	8
V	STATISTICS	8
TOTAL HOURS		**45**

COURSE DESCRIPTION

Uncertainty is the absence of perfectly detailed knowledge. In the field of Artificial Intelligence and other engineering, science discipline sit so happens and to deal with uncertainty having knowledge on mathematical notions that deals with uncertainty becomes vital. This course is designed to give that mathematical framework so-called probability and statistics which deals with uncertainty at an introductory level and their application in AI and other engineering domains.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To understand the basic concepts of combinatorics.
- To provide necessary basic concepts in probability for applications in the field of Artificial Intelligence.

- To understand the basic concepts of probability, one dimensional random variables and to introduce some standard distributions.
- To introduce the basic concepts of two dimensional random variables.
- To introduce basic concepts of statistics which are needed for handling various real-world problems.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E4110.1	Be aware of the counting principles.
E4110.2	Understand the fundamental knowledge of the concepts of probability.
E4110.3	Understand the basic concepts of one dimensional random variables and standard distributions.
E4110.4	Understand the basic concepts of two dimensional random variables.
E4110.5	Have the notion of statistical techniques used in real-world problems.

Pre-requisites Knowledge of High School Mathematics

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E4110.1	3	3	3	2	2	2	3	3	3	3
E4110.2	3	3	3	2	2	2	3	3	3	3
E4110.3	3	3	3	2	2	2	3	3	3	3
E4110.4	3	3	3	2	2	2	3	3	3	3
E4110.5	3	3	3	2	2	2	3	3	3	3
Total	**15**	**15**	**15**	**10**	**10**	**10**	**15**	**15**	**15**	**15**
Correlation level	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy

- Use technology and simulations to help students visualize and explore probability concepts.
- Introduce concrete and familiar examples that relate to their interests and experiences.
- Use graphs, tables, and charts to display and analyze data, and show how they are related to measures of central tendency and variability.

Assessment Methodology

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Written test (Unit-1 & II)	Written test (Unit-III & IV)	Written test (Unit- V)	Written Examination (Entire Syllabus)
Duration	2 Periods	2 Periods	1 Period	2 hours
Exam Marks	30	30	20	60
Converted to	15	15	10	(No Conversion)
Marks	40			60
Tentative Schedule	6^{th} Week	12^{th} Week	$13\text{-}14^{th}$ Week	

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	30 Marks
20	1	20	5	2	10	
➢ 10 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit and one question from either unit. ➢ All questions are compulsory			

CONTINUOUS ASSESSMENT – 3 (CA3)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	20 Marks
10	1	10	5	2	10	
➢ 10 questions from the unit ➢ All questions are compulsory			➢ 5 questions from the unit. ➢ All questions are compulsory			

END EXAMINATION

PART - A			PART - B			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			Long Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	60 Marks
20	1	20	5	2	10	3	10	30	
➢ 4 questions from each unit ➢ All questions are compulsory			➢ Questions from the entire unit. ➢ Out of 8 questions, 5 questions to be answered			➢ 1 questions from each unit. ➢ Out of 5 questions, 3 questions to be answered			

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 5 questions under Part-B. Each question carries 2 marks.
3. Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	Lower order thinking skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE4110 – PROBABILITY AND STATISTICS

AIE4110	PROBABILITY AND STATISTICS	L	T	P	C
THEORY		3	0	0	3

Unit I	COMBINATORICS	[10 Hrs]
	The basics of counting (fundamental principle of addition, multiplication)	[1Hr]
	The pigeonhole principle	[1Hr]
	Permutations: Concept	[1Hr]
	Permutation of objects not all distinct	[1Hr]
	Permutation when objects can repeat,	[1Hr]
	Circular permutations	[1Hr]
	Combinations: Concept,	[1Hr]
	Combinations with repetition (0 - n objects, at least 1 object)	[1Hr]
	Principle of inclusion and exclusion (two sets, three sets, concept only for multiple sets).	[2Hrs]
Unit II	**BASICS OF PROBABILITY**	**[9 Hrs]**
	Basic Concepts: Random experiment	[1Hr]
	Sample space	[1Hr]
	Event–Classical definition of probability	[1Hr]
	Axioms of probability	[1Hr]
	Conditional probability	[1Hr]
	Mutually exclusive events and addition rule	[1Hr]
	Independent Events and multiplication rule	[1Hr]
	Chain rule–Total probability	[1Hr]
	Baye's Theorem.	[1Hr]
Unit III	**ONE DIMENSIONAL RANDOM VARIABLES**	**[10 Hrs]**
	Random variables (RV)	[1Hr]
	Discrete RV: probability mass function (pmf),	[1Hr]
	cumulative distribution function (cdf), properties	[1Hr]
	Continuous RV: probability density function (pmf),	[1Hr]
	cumulative distribution function (cdf), properties	[1Hr]
	Moments about origin –	[1Hr]
	Moments about mean (central moments) –	[1Hr]
	Mathematical Expectation and properties–	[1Hr]
	Variance and properties.	[1Hr]
	Special Distributions : Bernoulli, Binomial, Poisson, Normal, Uniform, Exponential.	[1Hr]

UNIT IV	TWO DIMENSIONAL DISCRETE RANDOM VARIABLES	[8 Hrs]
Bivariate random variable		[1Hr]
Joint probability mass function		[1Hr]
Properties–		[1Hr]
Marginal pmf		[1Hr]
Joint cumulative distribution function		[1Hr]
Properties–Marginal cdf		[1Hr]
Independence		[1Hr]
Covariance and Correlation Coefficient.		[1Hr]
UNIT V	**STATISTICS**	**[8 Hrs]**
Population and sample		[1Hr]
Measures of central tendency: Mean, Median, Mode, Geometric mean, Harmonic mean		[1Hr]
Empirical relationship between Mean, Median, and Mode		[1Hr]
Relationship between AM,GM and HM		[1Hr]
Root mean square		[1Hr]
Quartiles, Deciles, Percentiles		[1Hr]
Measures of dispersion: Range, Mean deviation		[1Hr]
Standard deviation, Variance - Moments, Skewness, Kurtosis.		[1Hr]
TOTAL HOURS		**45 Hrs**

Suggested List of Students Activity

- Solving puzzles involving the concepts of probability (like 3 hats and strange probability), combinatorics.
- Finding out the various measures of central tendency and dispersion from the results obtained by the students of the class or the data gathered from a sports event.
- Explore the permutation and combinations of student participants in a sports event or cultural event.

Text Books for Reference:

S. No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Higher Secondary First Year Statistics	Tamilnadu Textbook and Educational Services Corporation	Government of Tamilnadu, 2022
2.	Introductory Combinatorics	Richard A. Brualdi	5th Edition, Pearson Education, 2009.
3.	Probability, Statistics and Random Processes	T. Veerarajan	3rd Edition, Tata Mc Graw Hill Education Publishing Company Limited, 2008.
4.	Theory and Problems of Statistics	Murray R. Spiegel, Larry J. Stephens	4th Edition, The McGraw-Hill Companies, 2011.

Web-based/Online Resources

S.NO	WEBSITES
1.	Introduction to probability and Statistics https://nptel.ac.in/courses/111106112
2.	https://brilliant.org/wiki/combinatorics/

MODEL QUESTION PAPER

AIE4110 – PROBABILITY AND STATISTICS

Time : [2 Hrs]. **Max. Marks : 60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**The fundamental principle of addition is used when:** A) Tasks must happen simultaneously B) One of multiple tasks can occur C) All tasks must happen D) Tasks depend on each other
2.	**If 10 socks are placed into 9 drawers, at least one drawer will have:** A) 1 sock B) 2 socks C) No socks D) 5 socks
3.	**Formula for permutations of n objects taken r at a time is:** A) nCr B) n^r C) n! / (n-r)! D) r! / (n-r)!
4.	**The formula for inclusion-exclusion for two sets A and B is:** A) $\|A\| + \|B\|$ B) $\|A \cup B\| = \|A\| + \|B\| - \|A \cap B\|$ C) $\|A \cup B\| = \|A\| \times \|B\|$ D) $\|A \cap B\| = \|A\| + \|B\|$
5.	**The sample space for tossing a coin once is:** A) {1, 2} B) {Head, Tail} C) {0, 1, 2} D) {H, T, HH}
6.	**If A and B are disjoint and P(A) = 0.3, P(B) = 0.4, then $P(A \cup B)$ =** A) 0.1 B) 0.7 C) 0.3 D) 1
7.	**Conditional probability is defined when:** A) P(B) = 0 B) P(B) > 0 C) B is impossible D) B is not defined
8.	**Bayes' Theorem formula is:** A) $P(A \mid B) = P(B \mid A) \times P(A) / P(B)$ B) $P(A \mid B) = P(A) \times P(B)$ C) $P(A \mid B) = P(B) / P(A)$ D) $P(A \mid B) = P(B \cap A$
9.	**For a discrete RV X, the condition for PMF is:** A) $P(x) \geq 0$ and $\Sigma P(x) = 1$ B) $P(x) < 0$ and $\Sigma P(x) > 1$ C) P(x) = 1 for all x D) P(x) can be negative
10.	**A Binomial distribution is defined by:** A) n and p B) λ only C) μ and σ^2 D) α and β
11.	**In standard normal distribution, mean and variance are:** A) 0 and 1 B) 1 and 0 C) 1 and 1 D) 0 and 0
12.	**The PDF of a Uniform(a, b) distribution is constant over:** A) All real numbers B) [a, b] C) $(-\infty, \infty)$ D) None of the above
13.	**The mean and variance of Poisson(λ) distribution are:** A) λ and λ B) λ and λ^2 C) λ^2 and λ D) λ and 0
14.	**A joint probability mass function (joint pmf) is defined for:** A) Continuous variables B) One variable C) Two discrete random variables D) No random variable
15.	**Marginal pmf of Y is obtained by:** A) Summing joint pmf over x B) Subtracting x C) Setting X = Y D) Ignoring x

16.	**Joint cumulative distribution function F(x, y) =** A) $P(X \geq x, Y \geq y)$ B) $P(X < x, Y < y)$ C) $P(X \leq x, Y \leq y)$ D) $P(X = x, Y = y)$
17.	**For a positively skewed distribution:** A) Mean < Median < Mode B) Mode < Median < Mean C) Mean = Median = Mode D) Mean < Mode < Median
18.	**Percentiles divide data into:** A) 2 equal parts B) 10 equal parts C) 50 equal parts D) 100 equal parts
19.	**Variance is defined as:** A) $E[X]$ B) $E[(X - \mu)^2]$ C) $E[X^2]$ D) $E[XY]$
20.	**Range is calculated as:** A) Max + Min B) Max × Min C) Max – Min D) (Max + Min)/2

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following

21. What is the fundamental principle of multiplication in counting?
22. What is a combination?
23. Define sample space. What is the sample space for rolling a single die?
24. List the three axioms of probability.
25. Define a Random Variable (RV).
26. Name four special distributions and briefly describe one application for each
27. List two properties of the Joint CDF.
28. Define Root Mean Square (RMS) and its purpose.

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Explain the principle of inclusion and exclusion for three sets.
30. Explain the difference between the Theorem of Total Probability and Bayes' Theorem.
31. What is Mathematical Expectation? State its key properties.
32. What is the correlation coefficient and what does it tell us?
33. Define Root Mean Square (RMS). Explain its applications.

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance withthe revised Blooms Taxonomy. The question paper should consist of 90% questionsbased on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking(HOTs) as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order ThinkingSkills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE4230 - DATA STRUCTURS USING PYTHON

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE4230
Semester : IV SEMESTER
Course Title : DATA STRUCTURES USING PYTHON
Course Type : PRACTICUM

L	T	P	C
3	0	2	4

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
DATA STRUCTURES USING PYTHON	5	75	40	100*	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time (Periods)
I	Introduction to data Science	11
II	Linear data structures - linked lists	12
III	Linear data structures – stack & queue	18
IV	Non-Linear data structures – Trees	13
V	Sequential storage representation – sorting & searching	21
TOTAL HOURS		**75**

COURSE DESCRIPTION

Data structure is a subject of primary importance in Information and Communication Technology. Knowledge of data structures is essential for implementation of efficient algorithms and program development. Learning data structures with Python offer flexibility and ease of programming with many built in data structures and libraries.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- Provide the knowledge of various types of data structures
- Familiarize with the representation of data structures
- Use various data structures in organizing data
- Reinforce theoretical concepts by writing relevant programs
- Gain knowledge in practical applications of data structures

.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E4230.1	Understand the fundamental data structures
E4230.2	Understand the concepts of linked lists.
E4230.3	Apply the operations of stack and queue
E4230.4	Illustrate tree structure and apply trees traversal techniques
E4230.5	Implement various sorting and searching techniques

Pre-requisites :

Knowledge in C and python Programming

CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E4230.1	3	3	2	3	3	2	3	3	3	3
E4230.2	3	2	2	3	3	2	3	3	3	3
E4230.3	3	3	2	3	3	2	3	3	3	3
E4230.4	3	3	2	3	3	2	3	3	3	3
E4230.5	3	3	2	3	3	2	3	3	3	3
Total	**15**	**15**	**10**	**15**	**15**	**10**	**15**	**15**	**15**	**15**
Correlation level	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

ASSESSMENT METHODOLOGY

<table>
<tr><th rowspan="2"></th><th colspan="3">Continuous Assessment (40 marks)</th><th rowspan="2">End Semester Examination (100 marks)</th></tr>
<tr><th>CA1</th><th>CA2</th><th>CA3</th></tr>
<tr><td>Mode</td><td>Integrated Test (Theory + Practical) (Unit I & II)</td><td>Integrated Test (Theory + Practical) (Unit-III & IV)</td><td>Integrated Test (Theory + Practical) (Unit-V)</td><td>Integrated Test (Theory + Practical) (Entire Syllabus)</td></tr>
<tr><td>Duration</td><td>2 Periods</td><td>2 Periods</td><td>1 Period</td><td>3 hours</td></tr>
<tr><td>Exam Marks</td><td>50</td><td>50</td><td>25</td><td>100</td></tr>
<tr><td>Converted to</td><td>15</td><td>15</td><td>10</td><td>60</td></tr>
<tr><td>Marks</td><td colspan="3">40</td><td>60</td></tr>
<tr><td>Tentative Schedule</td><td>6th Week</td><td>12th Week</td><td>15th Week</td><td></td></tr>
</table>

Note:

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th colspan="3">PART – C</th><th>PART – D</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks</th><th colspan="3">Short Answer Questions</th><th colspan="3">Long Answer Questions</th><th>Practical Activity</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="2">20 marks</td><td rowspan="3">50 Marks</td></tr>
<tr><td>10</td><td>1</td><td>10</td><td>4</td><td>2</td><td>8</td><td>4</td><td>3</td><td>12</td></tr>
<tr><td colspan="3">➢ 5 questions from each unit
➢ All questions are compulsory</td><td colspan="3">➢ 2 questions from each unit and one question from either unit.
➢ All questions are compulsory</td><td colspan="3">➢ 4 questions from each unit
➢ Out of 8 questions, 4 questions to be answered by selecting two questions from each unit</td><td>➢ Lab activity
➢ Demonstration
➢ Execution
➢ Viva-voce</td></tr>
</table>

CONTINUOUS ASSESSMENT – 3 (CA3)

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th colspan="3">PART – C</th><th>PART – D</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks</th><th colspan="3">Short Answer Questions</th><th colspan="3">Long Answer Questions</th><th>Practical Activity</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="2">10 marks</td><td rowspan="3">25 Marks</td></tr>
<tr><td>5</td><td>1</td><td>5</td><td>2</td><td>2</td><td>4</td><td>2</td><td>3</td><td>6</td></tr>
<tr><td colspan="3">➢ 5 questions from the unit
➢ All questions are compulsory</td><td colspan="3">➢ 2 question from the unit
➢ All questions are compulsory</td><td colspan="3">➢ 4 questions from the unit
➢ Out of 4 questions, 2 question to be answered</td><td>➢ Lab activity
➢ Demonstration
➢ Execution
➢ Viva-voce</td></tr>
</table>

END EXAMINATION

PART - A			PART - B			PART – C			PART – D	TOTAL MARKS
MCQ Questions Marks			Short Answer Questions			Long Answer Questions			Practical Activity	
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	50 marks	
25	1	25	5	2	10	5	3	15		
➢ 5 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit ➢ Out of 10 questions, 5 questions to be answered by selecting 1 question from each unit.			➢ 2 questions from each unit ➢ Out of 10 questions, 5 questions to be answered by selecting 1 question from each unit.			➢ Lab activity ➢ Demonstration ➢ Execution ➢ Viva-voce	**100 Marks**

Question Pattern - End Semester Examination Practical Exam

1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 1 question in each section under Part-A. Each question carries 2 marks.
3. Answer any 1 question in each section under Part-B. Each question carries 3 marks.
4. Answer all questions under Part-C. Practical task based question carries 50 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	Lower order thinking skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE4230- DATA STRUCTURES USING PYTHON

<table>
<tr><td>AIE4230</td><td rowspan="2" colspan="2">DATA STRUCTURES USING PYTHON</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>PRACTICUM</td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>UNIT I</td><td colspan="5">INTRODUCTION TO DATA STRUCTURES</td><td>[11 Hrs]</td></tr>
<tr><td colspan="6">THEORY
Data structures – Introduction
classification of data structures : primitive and non-primitive
data structures with python examples
Linear and nonlinear data structures with python examples.
Operations on data structures.
Abstract data types - Introduction, abstractions
Abstract data types, example of abstract data type (student, date)
Defining the ADT, Using the ADT, Implementing the ADT.
Algorithm Analysis – space complexity, time complexity
Asymptomatic notations: Big-O notation</td><td>
[1Hr]
[1Hr]

[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="6">PRACTICAL
Exercise 1: Write a program to implement any one python data structure with the following operations
A) Create B) Add elements
C) Access elements D) Remove elements</td><td>[2Hrs]</td></tr>
<tr><td>UNIT II</td><td colspan="5">LINEAR DATA STRUCTURES - LINKED LISTS</td><td>[12 Hrs]</td></tr>
<tr><td colspan="6">THEORY
Linked List - Terminology: node, address, information,
null pointer, empty list
Types – singly linked lists: creating nodes,
traversing the nodes, searching for a node
Prepending nodes, removing nodes –
doubly linked list & circular linked list – organization
Operations: traversal, searching, adding nodes,
Removing nodes (concepts only, no implementations)</td><td>
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="6">PRACTICAL
Exercise 2: Write a python program to implement a singly linked list
a) Create a singly linked list
b) Add element to singly linked list
c) Remove element from singly linked list</td><td>[4Hrs]</td></tr>
<tr><td>UNIT III</td><td colspan="5">LINEAR DATA STRUCTURES – STACK & QUEUE</td><td>[18 Hrs]</td></tr>
</table>

THEORY Stacks- Overview of stack Implementation of stack using python list: push, pop, display. Stack applications: balanced delimiters, Evaluating postfix expressions. Recursion - Properties of recursion Recursive functions: Factorials, Recursive call tree. Queues- Overview of queue Implementing the queue and its operations using python list Applications of queues - Circular queue and Priority queue (concepts only)		 [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 3:** Write a python program to implement stack **Exercise 4:**Write a python program to implement queue		 [4Hrs] [4Hrs]
UNIT IV	**NON-LINEAR DATA STRUCTURES - TREES**	**[13Hrs]**
THEORY Tree - Terminology: node, edge, parent, children, Path, Level of a node, depth of a node, height of a tree Binary tree: full binary tree, complete binary tree Linear representation of binary tree – binary tree traversals: in-order Pre-order, post order. Binary Search Tree –Introduction Creation of a Binary Search tree without duplicate node, Applications.		 [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [2Hrs]
PRACTICAL **Exercise 5:** Write the python program for pre-order traversal of a binary tree		 [4Hrs]
UNIT V	**SEQUENTIAL STORAGE REPRESENTATION- SORTING & SEARCHING**	**[21 Hrs]**
THEORY Sorting- Introduction to different sorting techniques Bubble sort, Insertion sort, Quick sort and Merge Sort. Searching- Introduction to different searching techniques Linear search and Binary search.		 [2Hrs] [1Hr] [1Hr] [1Hr] [2Hrs] [2Hrs]
PRACTICAL **Exercise 6 :** Write a python program to implement bubble sort **Exercise 7**: Write a python program to implement linear search **Exercise 8**: Write a python program to implement binary search		 [4Hrs] [4Hrs] [4Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class quizzes on a weekly / fortnightly based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text book for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Data Structures and Algorithms using Python	Rance D .Necaise,	John Wiley, 2011
2.	Python Data Structures and Algorithms	Benjamin Baka	Packt Publishing Ltd., 2017
3.	Data Structures and Algorithms in Python	Roberto Tamassia, Michael H. Gold wasser, Michael T. Goodrich	1st Edition, Wiley, 2013

Web-based/Online Resources:

S.NO	WEBSITES
1.	https://onlinecourses.nptel.ac.in/noc22_cs26/preview
2.	https://www.classcentral.com/classroom

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirement

S.NO	HARDWARE
1.	Desktop Computers / Laptop
2.	Printer

Software Requirement

S.NO	SOFTWARE
1.	Windows / Linux Operating System
2.	Python IDLE / Spyder.

AIE4230– DATA STRUCTURES USING PYTHON

MODEL QUESTION PAPER

Time : 3 Hrs **Max. Marks : 100**

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**Which of the following is a primitive data structure?** **A**) List B) Stack C) Integer D) Queue
2.	**A graph is best categorized as a:** A) Linear structure B) Static structure C) Dynamic linear structure D) Non-linear structure
3.	**Which data structure follows LIFO?** A) Queue B) Stack C) Linked list D) Tree
4.	**Removing an element from a queue is called:** A) Pop B) Peek C) Dequeue D) Push
5.	**Which is an example of an ADT?** A) Student Record B) Array C) Integer D) Boolean
6.	**What does each node in a singly linked list typically contain?** A) Data and two pointers B) Only data C) Data and one pointer D) Only pointer
7.	**Which of the following operations is not possible in a singly linked list?** A) Traversal B) Searching C) Prepending D) Backward Traversal
8.	**A doubly linked list node contains**: A) One link field B) Two link fields C) Three link fields D) No link field
9.	**Which of the following is not an advantage of doubly linked list?** A) Easier deletion B) Backward traversal C) Requires less memory D) Two-way navigation
10.	**Time complexity of searching in a linked list is:** A) O(1) B) O(log n) C) O(n) D) O(n log n)
11.	**What is the basic principle of a stack?** A) FIFO B) FILO C) LIFO D) LILO
12.	**Which Python method is used for pushing onto a list-based stack?** A) append() B) push() C) insert() D) extend()
13.	**What will be the output of stack = [1, 2, 3]; stack.pop()?** A) 1 B) 2 C) 3 D) Error
14.	**Which of the following postfix expression is valid?** A) + 5 6 B) 5 6 + C) 5 + 6 D) 5 6 + +
15.	**Recursive function for factorial is defined as:** A) n * factorial(n) B) n + factorial(n) C) n * factorial(n-1) D) n / factorial(n-1)
16.	**The height of a tree is the maximum:** A) Number of edges from root to any leaf B) Number of children of a node C) Level of any node D) Depth of the root

17.	**Which of the following is a complete binary tree?** A) All levels completely filled B) All levels filled except possibly last, filled left to right C) Each node has two children D) Each node has one child
18.	**In in-order traversal, the order is:** A) Left – Root – Right B) Root – Left – Right C) Left – Right – Root D) Right – Root – Left
19.	**Which traversal is used for deleting a binary tree?** A) Pre-order B) In-order C) Post-order D) Level-order
20.	**Which of the following is not a tree term?** A) Node B) Edge C) Path D) Row
21.	**What is the worst-case time complexity of bubble sort?** A) O(n) B) O(n log n) C) O(n^2) D) O(log n)
22.	**The time complexity of linear search is:** A) O(1) B) O(log n) C) O(n) D) O(n log n)
23.	**Which sorting algorithm is easiest to implement?** A) Merge sort B) Quick sort C) Bubble sort D) Heap sort
24.	**Merge sort requires:** A) Additional memory space for merging B) No additional memory C) Only swaps elements in-place D) Uses pivot element
25.	**Insertion sort is efficient for:** A) Large datasets B) Nearly sorted datasets C) Random datasets D) Reverse sorted datasets

PART – B (5X2=10 Marks)	
Note: Answer the any one Question from each section. Each question carries 2 marks	
26.	A) What are Primitive Data Structures? Give two examples in Python.
	B) Differentiate between Linear and Non-Linear Data Structures.
27.	A) What is a Node in a linked list?
	B) What is the key difference in organization between a singly linked list and a doubly linked
28.	A) Give two real-world applications of stacks.
	B) Mention two key properties of recursion.
29.	A) List two common applications of Binary Search Trees.
	B) What is a Binary Search Tree (BST)?
30.	A) How does Quick Sort work using a pivot?
	B) Explain how Sentinel Linear Search improves upon traditional Linear Search.

PART – C (5X3=15 Marks)	
Note: Answer the any one Question from each section. Each question carries 2 marks	
31.	A) List and briefly explain three common operations performed on data structures
	B) Give an example of an algorithm with O(n) time complexity and explain why.
32.	A) Types of linked lists
	B) Operations on linked lists
33.	A) Briefly explain the concepts of Circular Queue and Priority Queue.
	B) How are balanced delimiters checked using a stack? Provide a suitable example
34.	A) Tree Terminology:
	B) Creation of a Binary Search Tree without duplicate nodes
35.	A) Differentiate between Quick Sort and Merge Sort based on their worst-case time complexity and space complexity.
	B) Discuss the main advantage of Binary Search over Linear Search.

PART – D (Lab Exercises) (1X50 =50 Marks) Note: Execute any one Lab Exercises.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the Revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE4340 – R PROGRAMMING

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code : AIE4340

Semester : IV SEMESTER

Course Title : R PROGRAMMING

Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
R PROGRAMMING	5	75	40	100*	100	3Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Periods)
I	Introduction to R programming	15
II	Fundamentals of R programming	15
III	Creation of R programming	15
IV	R programming Storage	15
V	Working with data	15
TOTAL HOURS		**75**

COURSE DESCRIPTION

This course provides a comprehensive understanding of R Programming. The foundation on R Programming is laid to understand the core concepts and the techniques that underlie today's R Programming technologies. This course helps the students in identifying and applying appropriate techniques and tools to solve problems.

COURSE OBJECTIVES

- To study the fundamentals of R programming to apply in quantitative analysis.
- Apply regression models, such as simple and multiple regression, to analyze relationships among attributes and make predictions.
- Recognize the characteristics of Big Data and its handling techniques, including data identification, acquisition, filtering, extraction, validation, cleansing, aggregation, representation, and analysis.

- Describe the components and features of the Hadoop ecosystem, including its core components, distributed file system (HDFS), and tools for data processing.
- Explain the concepts of distributed data processing and the Hadoop framework, including batch processing with Map Reduce and real-time processing, and their application in handling large-scale datasets.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to	
E4340.1	Gain an understanding of fundamental concepts in R Programming, including its sub fields, basic programming languages, and common data problems.
E4340.2	Develop proficiency in regression analysis techniques, such as simple and multiple regression, to analyze and interpret relationships among attributes.
E4340.3	Acquire knowledge of R Programming characteristics, handling techniques, and challenges, enabling effective data management and analysis in large – scale environments.
E4340.4	Demonstrate comprehension of the Hadoop eco system, its core components, and tools for distributed data processing, facilitating efficient handling of massive datasets.
E4340.5	Attain competency in distributed data processing concepts and the Hadoop framework, enabling efficient batch and real-time processing of large datasets for actionable insights.

Pre-requisites : Programming Skills

CO- POs & PSOs MAPPING MATRIX:

CO/ PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E4340.1	3	3	3	3	2	2	3	3	3	3
E4340.2	3	3	3	3	2	2	3	3	3	3
E4340.3	3	3	3	3	2	2	3	3	3	3
E4340.4	3	3	3	3	2	2	3	3	3	3
E4340.5	3	3	3	3	2	2	3	3	3	3
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**15**	**15**	**15**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 hours	3 hours	3 hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th week	

1. Massive open on-line courses(MOOCs)may be used to teach various topics/subtopics
2. Different types of teaching methods such as flipped class room, tutorials, peer to peer learning and self-learning may be employed by teachers to develop the outcomes.

Assessment Methodology

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PAR	DESCRIPTIO	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
	TOTAL	**50**
C	Practical Documents (As per the portions)	10
	TOTAL	**60**

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

	Description	**Marks**	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
		TOTAL	**100 Marks**

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PAR T	DESCRIPTIO N	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
	TOTAL	**100**

AIE4340 – R PROGRAMMING

<table>
<tr><td>AIE4340</td><td rowspan="2">R PROGRAMMING</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>PRACTICUM</td><td>1</td><td>0</td><td>4</td><td>3</td></tr>
<tr><td>UNIT I</td><td>INTRODUCTION TO R PROGRAMMING</td><td colspan="4">[15 Hrs]</td></tr>
<tr><td colspan="2">THEORY
Evolution of R – Features of R –Essentials of R – R-Environment setup–
Basic syntax: command prompt, script file. Variables in R – Reserved Words –
Constants in R - Operators – Data types and R Objects – Accepting Input from keyboard.
R-Decision and Control Loop Statements – if condition, if else condition, switch condition,
repeat loop, while loop, for loop,
break statement, Next statement.</td><td colspan="4">[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="2">PRACTICAL
Exercise 1: (a)Write an R Program to Find the Factors of a Number
(b)Write an R Program to check if the given Number is a Prime Number.
Exercise 2: (a) Write a program to find list of even numbers from1to n using R-Loops.
(b)Write an R Program to check if the given Number is a Prime Number.</td><td colspan="4">[5Hrs]
[4Hrs]</td></tr>
<tr><td>UNIT II</td><td>FUNDAMENTALS OF R PROGRAMMING</td><td colspan="4">[15 Hrs]</td></tr>
<tr><td colspan="2">THEORY
Creating arrays – Accessing array elements – manipulating array elements
Calculations across array elements.
Creating matrices –Accessing elements of a Matrix
Operations on Matrices – Matrix transpose. Functions – Important Built-in functions and
Formal and Actual arguments–Named arguments–Global and local variables
Recursive functions- Debugging in R.</td><td colspan="4">[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="2">PRACTICAL
Exercise 3: Write an R Program to Find the Fibonacci sequence Using Recursive Function.
Exercise 4: Create a function in R to print squares of numbers in sequence.</td><td colspan="4">[5Hrs]
[4Hrs]</td></tr>
<tr><td>UNIT III</td><td>CREATION OF R PROGRAMMING</td><td colspan="4">[15 Hrs]</td></tr>
<tr><td colspan="2">THEORY
Creating strings–Reading and Writing Strings–String manipulation using string package – Dates in R.
Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts,
Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing Creating Lists,
General List Operations–List Indexing–Adding and Deleting List Elements
Getting the Size of a List–Accessing List Components and Values – Merge list-
Converting List to Vector.</td><td colspan="4">[1 Hr]
[1 Hr]
[1 Hr]
[1 Hr]
[1 Hr]
[1 Hr]</td></tr>
</table>

PRACTICAL **Exercise 5**: Implement different String Manipulation functions in R **Exercise 6:** Write an R Program to (a) Create a vector v1 with elements1 to 10. (b) Add 2 to every element of the vector v1. (c) Divide every element in v1 by 5 (d) Create a vector v2 with elements from11 to 20.Now add v1 to v2.		[5Hrs] [4Hrs]
UNIT IV	**R PROGRAMMING STORAGE**	**[15 Hrs]**
THEORY Tree – Terminology : node, edge, parent, children, path, level of a node depth of a node, height of a tree Binary tree: full binary tree, complete binary tree – Linear representation of binary tree binary tree traversals: in-order, pre-order, post- order. Binary Search Tree–Introduction, Creation of a Binary Search tree without duplicate node, Applications.		[1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 7**: (a) Write an R Program to create a Data Frame and access a Data Frame like a List. (b) Write a program to join columns and rows in a data frame using cbind() and rbind() in R. **Exercise 8**: Write an R Program to create a Factor and Access and Modify Components of a Factor.		[5Hrs] [4Hrs]
UNIT V	**WORKING WITH DATA**	**[15 Hrs]**
THEORY Working with files : CSV file : input CSV ,read CSV ,analyzing CSV, writing into CSV Excel file: install, load, input, read excel files – XML files: input and read XML files. MySQL package – connection R with MySQL – querying the table table manipulation: create, insert,drop and update-Need for data visualization R Pie charts :Pie chart title, color-slice percentages and chart legend–3D Pie chart Bar charts–Histograms–Line graphs–Scatter plots: creating scatter plot, Scatter plot matrices Bar plot–Plotting categorical data		[1Hr] [1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 9:** Write a program to read a csv file and analyze the data in the file in R. **Exercise 10:**(a) Create pie chart using R. (b)Plot a bar plot with matrix using R. **Exercise 11:** Create a data set and do statistical analysis on the data using R.		[3Hrs] [3Hrs] [3Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

- Give seminar on relevant topics.
- Undertake MOOCs on-line course.
- Conduct quiz, role play, group discussion, etc.,

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	The Book of R	Tilman M. Davies	First edition, publication William Pollock, 2016.
2.	The Art of R Programming: A Tour of Statistical Software Design	Norman Matloff	first edition, publication No Starch Press.
3.	R Programming for Dummies	Andriede Vries, Joris Meys	2^{nd} edition, Packt Publishing Ltd, 2016.

Web-based/Online Resources

S.NO	WEBSITES/LINKS
1.	https://onlinecourses.nptel.ac.in/noc19_ma33/preview

Equipment / Facilities required to conduct the Practical Portion

SOFTWARE REQUIREMENTS

S.NO.	SOFTWARE
1.	Windows /Linux Operating System
2.	R Programming

HARDWARE REQUIREMENTS

S.NO.	HARDWARE
1.	Desktop / Laptop
2.	Printer

AIE4340 – R PROGRAMMING

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	(a)Write an R Program to Find the Factors of a Number (b)Write an R Program to check if the given Number is a Prime Number.	E4340.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	(a) Write a program to find list of even numbers from1to n using R-Loops. (b)Write an R Program to check if the given Number is a Prime Number.	E4340.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Write an R Program to Find the Fibonacci sequence Using Recursive Function.	E4340.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	Create a function in R to print squares of numbers in sequence.	E4340.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Implement different String Manipulation functions in R	E4340.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
6	Write an R Program to a) Create a vector v1 with elements1 to 10. b) Add 2 to every element of the vector v1. c) Divide every element in v1 by 5 d) Create a vector v2 with elements from11 to 20.Now add v1 to v2.	E4340.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
	PART - B		
7	(a) Write an R Program to create a Data Frame and access a Data Frame like a List. (b) Write a program to join columns and rows in a data frame using cbind() and rbind() in R.	E4340.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Write an R Program to create a Factor and Access and Modify Components of a Factor.	E4340.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	Write a program to read a csv file and analyze the data in the file in R.	E4340.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	(a) Create pie chart using R. (b) Plot a bar plot with matrix using R.	E4340.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7
11	Create a data set and do statistical analysis on the data using R.	E4340.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

AIE4440 – DATA EXPLORATION AND VISUALIZATION

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE4440
Semester : IV SEMESTER
Course Title : DATA EXPLORATION AND VISUALIZATION
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
DATA EXPLORATION AND VISUALIZATION	5	75	40	100*	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time
I	Introduction	37
II	Data transformation, Visualization	38
TOTAL HOURS		**75**

COURSE DESCRIPTION

This course emphasizes practical application alongside theoretical knowledge of Data Exploration and Visualization. Data is a collection of discrete objects, events, and facts in the form of numbers, text, pictures, videos, objects, audio, and other entities. Processing data provides a great deal of information. To get meaningful information from data **Exploratory Data Analysis** (EDA) is used. EDA is an approach to data analysis that applies a variety of techniques to maximize specific insights into a dataset, reveal an underlying structure, extract significant variables, detect outliers and anomalies, test assumptions, develop models, and determine best parameters for future estimations. The main pillars of EDA are, data cleansing, data preparation, data exploration, and data visualization. Data visualization portrays data in graphical form and makes complex statistical data analyses and business intelligence more marketable.

COURSE OBJECTIVES

The objective of this course is

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib /ggplot.
- To perform univariate data exploration and analysis.

- To apply bivariate data exploration and analysis.
- To perform data transformation on raw data.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E4440.1	Interpret the fundamentals of exploratory data analysis.
E4440.2	Implement the data visualization using Matplotlib/ggplot.
E4440.3	Perform univariate data exploration and analysis.
E4440.4	Apply bivariate data exploration and analysis.
E4440.5	Apply data transformation on raw data.

Pre-requisites :

- Knowledge of basic Computer Science.
- Basic programming skills.

CO/PO & PSO Mapping:

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E4440.1	3	3	3	3	2	2	3	2	3	3
E4440.2	3	3	3	3	2	2	3	2	3	3
E4440.3	3	3	3	3	2	2	3	2	3	3
E4440.4	3	3	3	3	2	2	3	2	3	3
E4440.5	3	3	3	3	2	2	3	2	3	3
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**15**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- **Engage and Motivate**: Instructors should actively engage students to boost their learning confidence.
- **Real-World Relevance**: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- **Interactive Learning**: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- **Application-Based Learning**: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.

Assessment Methodology

Note:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 hours	3 hours	3 hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th week	

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PAR	DESCRIPTIO	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

Description		**Marks**	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
TOTAL		**100**

AIE4440 – DATA EXPLORATION AND VISUALIZATION

<table>
<tr><td>AIE4440</td><td rowspan="2">DATA EXPLORATION AND VISUALIZATION</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>PRACTICUM</td><td>1</td><td>0</td><td>4</td><td>3</td></tr>
<tr><td>UNIT I</td><td colspan="4">INTRODUCTION</td><td>[37 Hrs]</td></tr>
<tr><td colspan="5">Introduction to Data exploration
Exploratory Data Analysis (EDA) – Significance of EDA
Making sense of Data–Elementary Python and R packages for Data Analysis
Numpy, Pandas, SciPy, Matplotlib, tidyverse, janitor, seplyr, ggplot2
Loading dataset in Python and R
Descriptive Statistics– distribution function,
Measure of central tendency and dispersion, Correlation Analysis.</td><td>[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="5">PRACTICAL
Exercise 1: Working with R Variables and basic data structures - Vector, matrix, data frame
(a) Assume two vectors (2.1, 3.4, 2.5, 2.7, 2.9) and (0.3, 0.5, 0.6, 0.9, 1.1) are length and diameters of cylinders. Calculate the correlation between lengths and diameters.
(b) Assume the measurements are in centimeters. Recalculate the volumes so that their units are in cubic millimeters. Calculate the mean, standard deviation, and coefficient of variation of these new volumes.
(c) Construct a matrix with 10 columns and 10 rows, all filled with random numbers between 0 and 1.
(d) Calculate the row means of the above matrix. Also calculate the standard deviation across the row mean.</td><td>[5Hrs]</td></tr>
<tr><td colspan="5">Exercise 2: Working with data structures in Pandas–data frame, series
(a) Import the dataset chipotle.
(b) Find the number of observations in the dataset.
(c) Print the name of all the columns.
(d) How many items were ordered in total?
(e) Convert item price into a float.
(f) What was the total revenue generated during the period of the dataset?
(g) How many orders were made in the period?</td><td>[5Hrs]</td></tr>
<tr><td colspan="5">Exercise 3: Working with data structures in Numpy-arrays
(a) Create an1D array with a set of integer values.
(b) Createan1D, 2D and 3D Boolean array.
(c) Extract all odd numbers from the created 1D array and replace them with -1.
(d) Reshape a 1D array to a 2D array with 2 rows and convert an array of arrays into a flat 1d array.
(e) Count the unique values in a numpy array.
(f) Create a new column from existing columns of a numpy array.
(g) Create a 2D array with a set of values and compute the row wise counts of all possible values in an array.</td><td>[4Hrs]</td></tr>
</table>

(h) Get the positions of top n values from a numpy array. **Exercise 4:** Import Titanic dataset into python/R environment (a) Take 15 random names of passengers sort them alphabetically (b) What was the name of the oldest surviving male? (c) Make a new variable called ’Status’, based on the ’Survived’ variable already in the dataset. For passengers that did not survive, Status should be ’dead’, for those who did, Status should be ’alive’.	[4Hrs]
Exercise 5: Import Titanic dataset into python/R environment and perform descriptive analysis.	[4Hrs]
Exercise 6: Load Cereals dataset into python/R environment (a) Print first10 observations from the dataset and inspect the datatypes of the features. (b) Add a new variable to the dataset called 'totalcarb', which is the sum of 'carbo' and 'sugars'. (c) How many unique manufacturers are included in the dataset? (d) Rename the column 'Manufacturer’ to 'Producer'.	[4Hrs]
Exercise 7: Read Hydro dataset into python/R environment and perform the following analysis. (a) Change the first variable to a Date class. Are the successive measurements in the dataset always exactly one week apart? (b) How many weeks was the dam level equal to or lower than the value of 235 Gwh?	[4Hrs]
UNIT II **DATA TRANSFORMATION, VISUALIZATION**	**[38Hrs]**
Data Transformation	[1Hr]
Data cleansing,	[1Hr]
Data refactoring, Removing NA/NaN values, Dropping columns, Adding rows	[1Hr]
Summarizing and Grouping	[1Hr]
Data aggregation, Pivot tables and cross tabulations–Regression	[1Hr]
Data Visualization	[1Hr]
Charting–Line chart, Ba rchart, Scatter plot, Area plot, Stacked plot, Pie chart,	[1Hr]
polar chart, Histogram, Violin chart–plotting data sets.	[1Hr]
PRACTICAL **Exercise1:** On Cereals Dataset perform (a) How many cereals in the data frame are 'hot' cereals? (b) Take a subset of the data frame with only the Manufacturer 'K' (c) Take a subset of the data frame of all cereals that have less than 80 calories, AND have more than 20 units of vitamins. (d) Take a subset of the data frame containing cereals that contain atleast1 unit of sugar, and keep only the variables 'Cereal.name', 'calories' and 'vitamins'. (e) For one of the above subsets, write a new CSV file to disk	[6 Hrs]
Exercise 2: Use Titanic Dataset and find (a) How many observations of ’Age’ are missing from the data frame? (b) For what proportion of the passengers is the age unknown? Was this proportion higher for 3rd class than 1st and 2nd? (c) Count the number of passengers in each class (1st,2nd,3rd).	[6 Hrs]

Exercise 3: Use the Hydro dataset (a) Make a line plot of storage versus Date (b) Make the line thicker, and a dot-dashed style (c) Make the same plot with points and change the color of the points in the following way: green if storage is over 500, orange if storage is between 235 and 500, and red if storage is below 235. **Exercise 4:**Use coweeta dataset (a) Make a scatter plot of biomass versus height, with the symbol color varying by species. (b) Log - transform biomass, and redraw the plot. **Exercise 5:**Using data from titanic dataset (a) Plot the age distribution (b) Break the above distribution based on survival and plot this new distribution (c) Plot the distribution of age based on survival and sex features (d) Using bar plot visualize the percentage of survivors against sex grouped by class	[6 Hrs**]** [6 Hrs**]** [6 Hrs**]**
TOTAL HOURS	**75 Periods**

Suggested List of Students Activity

- Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
- Select some real-world datasets from www.kaggle.com, perform EDA and apply Data transformation techniques to gain insight on those datasets and make it useful for further analysis and model building.

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Hands-On Exploratory Data Analysis with Python	Suresh Kumar Mukhiya, Usman Ahmed	Packt Publishing, 2020
2.	Data Visualization and Exploration with R	Eric Pimple	Geo Spatial Training service, 2017.
3.	Fundamentals of Data Visualization	Claus O. Wilke	O'reilly publications, 2019.
4.	Interactive Data Visualization: Foundations, Techniques, and Applications	Matthew O. Ward, Georges Grinstein, Daniel Keim	2^{nd} Edition, CRC press, 2015.

Web-based/Online Resources

S.NO	WEBSITES
1.	https://www.westernsydney.edu.au/hie/hie_events_/data_analysis_r
2.	https://onlinecourses.nptel.ac.in/noc24_mg98/preview
3.	https://onlinecourses.swayam2.ac.in/cec24_ma20/preview

Equipment / Facilities required to conduct the Practical Course.(Batch Strength: 30Students)

Software Requirement:

S.No.	Software
1.	Anaconda is a distribution of the Python and R
2.	R studio

Hardware Requirement:

S.No.	Hardware
1.	30 Systems with minimum 8GB RAM, 500GB SSD, 1TB HDD, Core i5 processor.
2.	Internet connection to all 30 systems.

AIE4440- PYTHON PROGRAMMING

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Working with R Variables and basic data structures - Vector, matrix, data frame (a) Assume two vectors (2.1, 3.4, 2.5, 2.7, 2.9) and (0.3, 0.5, 0.6, 0.9, 1.1) are length and diameters of cylinders. Calculate the correlation between lengths and diameters. (b) Assume the measurements are in centimeters. Recalculate the volumes so that their units are in cubic millimeters. Calculate the mean, standard deviation, and coefficient of variation of these new volumes. (c) Construct a matrix with 10 columns and 10 rows, all filled with random numbers between 0 and 1. (d) Calculate the row means of the above matrix. Also calculate the standard deviation across the row mean.	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	Working with data structures in Pandas–data frame, series (a) Import the dataset chipotle. (b) Find the number of observations in the dataset. (c) Print the name of all the columns. (d) How many items were ordered in total? (e) Convert item price into a float. (f) What was the total revenue generated during the period of the dataset? (g) How many orders were made in the period?	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Working with data structures in Numpy-arrays (d) Create an1D array with a set of integer values. (e) Createan1D, 2D and 3D Boolean array. (f) Extract all odd numbers from the created 1D array and replace them with -1. (i) Reshape a 1D array to a 2D array with 2 rows and convert an array of arrays into a flat 1d array.	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7

	(j) Count the unique values in a numpy array. (k) Create a new column from existing columns of a numpy array. (l) Create a 2D array with a set of values and compute the row wise counts of all possible values in an array. (m) Get the positions of top n values from a numpy array.		
4	Import Titanic dataset into python/R environment (a) Take 15 random names of passengers sort them alphabetically (b) What was the name of the oldest surviving male? (c) Make a new variable called ’Status’, based on the ’Survived’ variable already in the dataset. For passengers that did not survive, Status should be ’dead’, for those who did, Status should be ’alive’.	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Import Titanic dataset into python/R environment and perform descriptive analysis.	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
6	Load Cereals dataset into python/R environment (a) Print first10 observations from the dataset and inspect the datatypes of the features. (b) Add a new variable to the dataset called 'totalcarb', which is the sum of 'carbo' and 'sugars'. (c) How many unique manufacturers are included in the dataset? (d) Rename the column 'Manufacturer’ to 'Producer'.	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Read Hydro dataset into python/R environment and perform the following analysis. (a) Change the first variable to a Date class. Are the successive measurements in the dataset always exactly one week apart? (b) How many weeks was the dam level equal to or lower than the value of 235 Gwh?	E4440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
PART - B			
8	On Cereals Dataset perform (a) How many cereals in the data frame are 'hot' cereals? (b) Take a subset of the data frame with only the Manufacturer 'K'	E4440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7

	(c) Take a subset of the data frame of all cereals that have less than 80 calories, AND have more than 20 units of vitamins. (d) Take a subset of the data frame containing cereals that contain atleast1 unit of sugar, and keep only the variables 'Cereal.name', 'calories' and 'vitamins'. (e) For one of the above subsets, write a new CSV file to disk		
9	Use Titanic Dataset and find (a) How many observations of ’Age’ are missing from the data frame? (b) For what proportion of the passengers is the age unknown? Was this proportion higher for 3rd class than 1st and 2nd? (c) Count the number of passengers in each class (1st,2nd,3rd).	E4440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	Use the Hydro dataset (a) Make a line plot of storage versus Date (b) Make the line thicker, and a dot-dashed style (c) Make the same plot with points and change the color of the points in the following way: green if storage is over 500, orange if storage is between 235 and 500, and red if storage is below 235.	E4440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
11	Use coweeta dataset (a) Make a scatter plot of biomass versus height, with the symbol color varying by species. Log - transform biomass, and redraw the plot.	E4440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
12	Using data from titanic dataset (a) Plot the age distribution (b) Break the above distribution based on survival and plot this new distribution (c) Plot the distribution of age based on survival and sex features (d) Using bar plot visualize the percentage of survivors against sex grouped by class	E4440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7

AIE4540– EMBEDDED SYSTEMS AND INTERNET OF THINGS (IoT)

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : CTE4540
Semester : IV SEMESTER
Course Title : EMBEDDED SYSTEMS AND INTERNET OF THINGS (IoT)
Course Type : PRACTICUM

L	T	P	C
1	0	2	2

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
	Hours/ Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
EMBEDDED SYSTEMS AND INTERNET OF THINGS (IoT)	4	60	40	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and will beconverted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

PART	TOPICS	TIME
I	EMBEDDED SYSTEMS AND ARM PROCESSOR ARCHITECTURE FUNDAMENTALS	16
II	UART FUNDAMENTALS AND INTRODUCTION TO ADC	14
III	INTRODUCTION TO SECURITY IN IOT	14
IV	AUTHENTICATION AND DATA SECURITY IN IoT	10
V	IoT APPLICATIONS	6
TOTAL HOURS		**60**

COURSE OBJECTIVES

- To provide students good foundation in mathematical, scientific, engineering fundamentals and hardware-software programming intelligence.
- To develop among students, the ability to develop embedded systems based smart solutions for purpose of system automation.
- To promote student awareness, for life-long learning and introduce them to professional ethics and code of practice.
- To encourage students, to work in inter disciplinary groups.

COURSE OUTCOMES

Aftersuccessful completion of this course, the students should be able to	
E4540.1	Students should be able to demonstrate over the area as per the specialization of the program.
E4540.2	Design and develop Embedded system automation based on dedicated ICs that have computation, networking, and control capacity.
E4540.3	Work on professional software languages, standard modeling and analysis tools&commercialpackageswithcommunicationprotocolsandcomputationplatformsfora nalysis and design of system automation.
E4540.4	Develop an innovative smart system with automation as a consumer product through project management.
E4540.5	Work efficiently in teams to develop embedded program applications.

Pre-requisites : NIL

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E4540.1	2	3	2	3	2	2	3	3	3	3
E4540.2	2	3	2	3	2	2	3	3	3	3
E4540.3	2	3	2	3	2	2	3	3	3	3
E4540.4	2	3	2	3	2	2	3	3	3	3
E4540.5	2	3	2	3	2	2	3	3	3	3
CTE4540 Total	**10**	**15**	**10**	**15**	**10**	**10**	**15**	**15**	**15**	**15**
Correlation level	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 hours	3 hours	3 hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th} Week	14^{th} Week	15^{th} Week	16^{th} week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
TOTAL		**100**

AIE4540– EMBEDDED SYSTEMS AND INTERNET OF THINGS (IoT)

AIE4540 PRACTICUM	EMBEDDED SYSTEMS AND INTERNET OF THINGS (IoT)	L	T	P	C
		1	0	2	2
UNIT I	**EMBEDDED SYSTEMS AND ARM PROCESSOR ARCHITECTURE FUNDAMENTALS**				**[16 Hrs]**

THEORY

Definition of embedded systems – Features of embedded systems	[1Hr]
Types of Embedded Systems–List of Embedded System Devices.	[1Hr]
Block diagram of ARM based embedded system with hardware components.	[1Hr]
Pipeline–Data Flow Model – CPU registers. Memory and I/O Devices Interfacing –Programming Embedded Systems in C	[1Hr]
Need For RTOS –Multiple Tasks and Processes Arithmetic Operations: Embedded arithmetic programs involve performing basic arithmetic operations such as addition, subtraction, multiplication, and division	[1Hr]
Vector Interrupt controller (VIC)–Register description–External Interrupts. Interrupt handling and prioritization.	[1Hr]

PRACTICAL

Exercise 1:

Install the necessary development tools and software for programming ARM- based microcontrollers. This might include installing Keil µVision, STM32CubeIDE, or other IDEs recommended by the microcontroller manufacturer. [5Hrs]

Exercise 2: [5Hrs]

(a) Write assembly language program for addition, subtraction and Multiplication and simulate.

(b) Write code to control the LEDs (e.g., blinking patterns) and read input from the push button.

UNIT II	**UART FUNDAMENTALS AND INTRODUCTION TO ADC**	**[14 Hrs]**

THEORY

Understanding UART data format (start bit, data bits, stop bits) UART frame structure, transmitting and receiving data using UART, Interfacing UART with microcontrollers, Configuring UART parameters (baud rate, parity, stop bits).	[1Hr]
Successive Approximation ADC, Flash ADC, Sigma-Delta ADC, Dual Slope ADC,	[1Hr]
Serial vs. Parallel interfacing, Communication protocols: SPI, Temperature sensing using ADC. Overview of digital and analog signals, Need for DAC in embedded systems,	[1Hr]
Types of DAC: Binary Weighted, R-2R Ladder, Delta-Sigma etc	[1Hr]

<table>
<tr><td colspan="2">PRACTICAL
Exercise 3:
(a) Write and execute C program for serial transmission and reception using on chip UART. Send the received character back to the PC by Interrupt method.
(b) Write and execute C program for serial transmission and reception using on chip UART. Send the received character back to the PC by Polling method.
Exercise 4:
(a) Write and execute C program for accessing an internal ADC and display the binary output in LEDs.
(b) Write and execute C program to generate square wave using on chip DAC.</td><td>[5Hrs]

[5Hrs]</td></tr>
<tr><td>UNIT III</td><td>INTRODUCTION TO SECURITY IN IOT</td><td>[14 Hrs]</td></tr>
<tr><td colspan="2">THEORY
Introduction–Security Requirements in IoT architectures
Security in Enabling Technologies – IoT Security Life Cycle
Cryptographic Fundamentals for IoT Security Engineering.
Introduction – Security Requirements in IoT – Insufficient Authentication/Authorization
Insecure Access Control – Threads to Access Control, Privacy, and Availability
Attacks Specific to IoT
Malware Propagation and Control in Internet of Things.</td><td>[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="2">PRACTICAL
Exercise 5:
Build a simple IoT device using a temperature and humidity sensor (e.g.,DHT11 or DHT22) connected to a microcontroller (e.g., Arduino or Raspberry Pi).
Exercise 6:
Create a basic smart home system by connecting IoT devices such as smart bulbs, smart switches, and motion sensors to a central hub.</td><td>[5Hrs]

[5Hrs]</td></tr>
<tr><td>UNIT IV</td><td>AUTHENTICATION AND DATA SECURITY IN IoT</td><td>[10 Hrs]</td></tr>
<tr><td colspan="2">THEORY
Trust and Trust Models for IoT – Emerging Architecture Model for IoT Security and Privacy–preventing Unauthorized Access to Sensor Data
Authentication in IoT–Computational Security for the IoT
Secure Path Generation Scheme for real- Time Green IoT
Security Protocols for IoT Access Network.</td><td>[1Hr]
[1Hr]
[1Hr]
[1Hr]</td></tr>
<tr><td colspan="2">PRACTICAL
Exercise 7:
Test the effectiveness of secure firmware update mechanisms for ensuring the integrity and authenticity of firmware updates in IoT devices.</td><td>[6 Hrs]</td></tr>
<tr><td>UNIT V</td><td>IoT APPLICATIONS</td><td>[6 Hrs]</td></tr>
<tr><td colspan="2">THEORY
Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications.</td><td>[1Hr]
[1Hr]</td></tr>
</table>

PRACTICAL **Exercise 8:** Test the effectiveness of IoT-enabled predictive maintenance strategies in industrial equipment.	[4 Hrs]
TOTAL HOURS	**60 Hrs**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text books for Reference:

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	8051 Microcontroller and Embedded Systems	Mohamammad Ali Mazidi & Mazidi	Pearson Education, 2007
2.	PIC Microcontroller and Embedded Systems	Mohammad Ali Mazidi, Rolind Mckinley and Danny Causey	Pearson Education
3.	Make Action-with Arduino and RaspberryPi	Simon Mon	SPD,2016

Web-based/Online Resources

S.NO	WEBSITE/ LINKS
1.	https://onlinecourses.nptel.ac.in/noc20_ee98/preview.
2.	https://chatgpt.com/g/g-rzi6bDI69-embedded-systems-developer.

AIE4540– EMBEDDED SYSTEMS AND INTERNET OF THINGS(IoT)

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Install the necessary development tools and software for programming ARM- based microcontrollers. This might include installing Keil µVision, STM32CubeIDE, or other IDEs recommended by the microcontroller manufacturer.	E4540.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	(a) Write assembly language program for addition, subtraction and Multiplication and simulate. (b) Write code to control the LEDs (e.g., blinking patterns) and read input from the push button.	E4540.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	(a) Write and execute C program for serial transmission and reception using on chip UART. Send the received character back to the PC by Interrupt method. (b) Write and execute C program for serial transmission and reception using on chip UART. Send the received character back to the PC by Polling method.	E4540.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	(a) Write and execute C program for accessing an internal ADC and display the binary output in LEDs. (b) Write and execute C program to generate square wave using on chip DAC.	E4540.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Build a simple IoT device using a temperature and humidity sensor (e.g.,DHT11 or DHT22) connected to a microcontroller (e.g., Arduino or Raspberry Pi).	E4540.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
	PART – B		
6	Create a basic smart home system by connecting IoT devices such as smart bulbs, smart switches, and motion sensors to a central hub.	E4540.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Test the effectiveness of secure firmware update mechanisms for ensuring the integrity and authenticity of firmware updates in IoT devices.	E4540.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Test the effectiveness of IoT-enabled predictive maintenance strategies in industrial equipment.	E4540.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

AIE4640– REAL TIME MINI PROJECT

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE4640
Semester : IV SEMESTER
Course Title : REAL TIME MINI PROJECT
Course Type : PROJECT

L	T	P	C
0	0	60	2

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

<table>
<tr><th rowspan="3">Course</th><th colspan="2">Instructions</th><th colspan="4">Examination</th></tr>
<tr><th rowspan="2">Hours/ Week</th><th rowspan="2">Hours / Semester</th><th colspan="3">Marks</th><th rowspan="2">Duration</th></tr>
<tr><th>Internal Assessment</th><th>Autonomous Examination</th><th>Total</th></tr>
<tr><td>REAL TIME MINI PROJECT</td><td>4</td><td>60</td><td>40</td><td>100*</td><td>100</td><td>3 Hrs</td></tr>
</table>

*** Examinations will be conducted for 100 marks and will beconverted to 60 marks**

COURSE DESCRIPTION

Every student must do one mini project in the Final year of their program. Students can do their mini project in Industry or R&D Lab or in-house or a combination of any two for the partial fulfillment for the award of Diploma in Engineering.

For the project works, the Department will constitute a three-member faculty committee to monitor the progress of the project and conduct reviews regularly.

If the projects are done in-house, the students must obtain the bonafide certificate for project work from the Project supervisor and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the Project Viva Voce examination.

For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular bonafide certificate mentioned above. For Industry related projects there must be one internal faculty advisor/Supervisor from Industry (External), this is in addition to the regular faculty supervision.

The final examination for project work will be evaluated based on the final report submitted by the project group **of not exceeding three students**, and the viva voce by an external examiner.

COURSE OBJECTIVES

Academic project work plays a crucial role in the education of Diploma in Engineering students, as it helps them apply theoretical knowledge to practical situations and prepares them for real-world engineering challenges.

- **Integration of Knowledge:** Consolidate and integrate theoretical knowledge acquired in coursework to solve practical engineering problems.

- **Skill Development:** Enhance technical skills related to the specific field of engineering through hands-on experience and application.

- **Problem-Solving Abilities:** Develop critical thinking and problem-solving abilities by addressing complex engineering issues within a defined scope.
- **Project Management:** Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.
- **Teamwork and Collaboration:** Foster team work and collaboration by working in multi disciplinary teams to achieve project goals and objectives.
- **Research Skills:** Acquire research skills by conducting literature reviews, gathering relevant data, and applying research methodologies to investigate engineering problems.
- **Innovation and Creativity:** Encourage innovation and creativity in proposing and developing engineering solutions that may be novel or improve upon existing methods.
- **Communication Skills:** Improve communication skills, both oral and written, by presenting project findings, writing technical reports, and effectively conveying ideas to stakeholders.
- **Ethical Considerations:** Consider ethical implications related to engineering practices, including safety, environmental impact, and societal concerns.
- **Professional Development:** Prepare for future professional roles by demonstrating professionalism, initiative, and responsibility throughout the project lifecycle.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E4640.1	Demonstrate the ability to apply theoretical concepts and principles learned in coursework to solve practical engineering problems encountered during the project.
E4640.2	Developandenhancetechnicalskillsspecifictothefieldofengineeringrelevant to the project, such as design, analysis, simulation, construction, testing, and implementation.
E4640.3	Apply critical thinking and problem-solving skills to identify, analyze, and propose solutions to engineering challenges encountered throughout the project lifecycle.
E4640.4	Acquire project management skills by effectively planning, organizing, and executing project tasks within defined timelines and resource constraints.
E4640.5	Improve communication skills through the preparation and delivery of project reports, presentations, and documentation that effectively convey technical information to stakeholders.

Important points to consider to select the In-house project.

- Selecting a project work in Diploma Engineering is a significant decision that can greatly influence your learning experience and future career prospects.
- Chooseaprojectthatalignswithyourcareeraspirationsandinterestswithinthefield of engineering. Consider how the project can contribute to your professional development and future opportunities.
- Ensure the project aligns with your course work and specialization within the Diploma program. It should complement and build upon the knowledge and skills you have acquired in your studies.
- Evaluate the scope of the project to ensure it is manageable within the given timeframe, resources, and constraints. Avoid projects that are overly ambitious or impractical to complete effectively.

- Assess the availability of resources needed to conduct the project, such as equipment, materials, laboratory facilities, and access to relevant software or tools. Lack of resources can hinder project progress.
- Select a project that genuinely interests and motivates you. A project that captures your curiosity and passion will keep you engaged and committed throughout the project duration.
- Consider the availability and expertise of faculty advisors or industry mentors who can provide guidance and support throughout the project. Effective mentorship is crucial for success.
- Clearly define the learning objectives and expected outcomes of the project. Ensure that the project will help you achieve specific learning goals related to technical skills, problem-solving, and professional development.
- Look for opportunities to propose innovative solutions or explore new methodologies within your project. Projects that encourage creativity can set you apart and enhance your learning experience.
- Consider ethical implications related to the project, such as safety protocols, environmental impact, and compliance with ethical guidelines in research and engineering practices.
- Evaluate whether the project offers opportunities for collaboration with peers, experts from other disciplines, or industry partners. Interdisciplinary projects can broaden your perspective and enhance your teamwork skills.
- Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

By carefully considering these points, Diploma Engineering students can make informed decisions when selecting project work that not only enhances their academic learning but also prepares them for successful careers in engineering.

Duties Responsibilities of the internal faculty advisor.

Each group should have an internal faculty advisor assigned by the HOD/Principal.

- The in-house project should be approved by the project monitoring committee constituted by the Chairman Board of Examinations.
- The in-house project should be selected in the fifth semester itself. Each in-house project shall have a maximum of four students in the project group.
- Provide comprehensive academic advising to help in the selection of appropriate in-house project that align with their interests and career goals.
- Offer expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between students and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure students have access to necessary resources, including research materials, lab equipment, software, and academic literature.

- Regularly monitor and evaluate the progress of the in-house project, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging students to practice integrity and responsibility in their work.
- Assist in preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the students.

- Regularly meet with your internal faculty advisor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your faculty advisor.
- Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in in-house projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

Documents to be submitted by the student for an in-house project.
Submit a printed report of your in-house project work along with the fabrication model / analysis report for the End Semester Examination.

Rubrics for In-House Project Work

Sl.No.	Topics	Description
1	Objectives	Clearly defined and specific objectives outlined. Objectives align with the project's scope and purpose.
2	Literature Review	Thorough review of relevant literature. Identification of gaps and justification for the project's contribution.
3	Research Design and Methodology	Clear explanation of the research design. Appropriateness and justification of chosen research methods.
4	Project Management	Adherence to project timeline and milestones. Effective organization and planning evident in the project execution.
5	Documentation	Comprehensive documentation of project details. Clarity and completeness in recording methods, results, and challenges.
6	Presentation Skills	Clear and articulate communication of project findings. Effective use of visuals, if applicable.
7	Analysis and Interpretation	In-depth analysis of data. Clear interpretation of results in the context of research questions.
8	Problem-Solving	Demonstrated ability to identify and address challenges encountered during the project. Innovative solutions considered where applicable.
9	Professionalism and Compliance	Adherence to ethical standards in research. Compliance with project guidelines and requirements.
10	Quality of Work	Overall quality and contribution of the project to the field. Demonstrated effort to produce high-quality work.

SCHEME OF EVALUATION

The mark allocation for Internal and End Semester Viva Voce are as below.

Internal Mark Split (40Marks)*		
Review 1 (10Marks)	Review 2 (15Marks)	Review 3 (15marks)
Committee: 5 Marks. Supervisor: 5 Marks	Committee : 7.5Marks Supervisor : 7.5Marks	Committee : 7.5Marks Supervisor : 7.5Marks

Note:*The rubrics should be followed for the evaluation of the internal marks during reviews.

END SEMESTER EXAMINATION- Project Exam

The performance of each student in the project group would be evaluated in a viva voce examination conducted by a committee consisting of an external examiner and the Department project supervisor and an internal examiner.

End Semester (100)#			
Record (20Marks)	Presentation (20 Marks)	Viva Voce (20Marks)	Model/Analysis Report (40Marks)
External:10 Internal:5	External:10 Internal:5	External:10 Internal:5	External:20 Internal:10
Supervisor:5	Supervisor:5	Supervisor:5	Supervisor:10

#The marks scored will be converted to 60 Marks.

Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for a period of a maximum of two months. For those students who extend the project work for two months, Viva Voce will be carried out and results will be declared separately. If the project report is not submitted even beyond the extended time, then students are not eligible to appear for Project Viva Voce Examination.

V SEMESTER

AIE5110 –INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Programme Name : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Course Code : AIE5110
Semester : V SEMESTER
Course Title : INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Course Type : THEORY

L	T	P	C
3	0	0	3

TEACHINGANDSCHEMEOFEXAMINATION

No.ofweekspersemester:15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Autonomous Examination	Total	
INTRODUCTION TO ARTIFICIAL INTELLIGENCE	3	45	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time(Hrs)
I	Introduction to Artificial Intelligence (AI)	9
II	Problem Solving Algorithms	9
III	Knowledge Representation and Reasoning	9
IV	Machine Learning Fundamentals	8
V	Natural Language Processing (NLP)	10
TOTAL HOURS		**45**

COURSEDESCRIPTION

AI is one of the newest fields in science and engineering. AI currently encompasses a huge variety of subfields, ranging from the general (learning and perception) to the specific, such as playing chess, proving mathematical theorems, writing poetry, driving a car on a crowded street, and diagnosing diseases. AI is relevant to any intellectual task; it is truly a universal field.

COURSEOBJECTIVES

The objective of this course is to enable the student to

- The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches.
- Develop a basic understanding of the building blocks of AI as presented in terms problem, problem space: Search, Knowledge representation, inference, logic, and learning.

COURSEOUTCOMES

On successful completion of this course, the student will be able to	
E5110.1	Understand basic principles of AI in solutions that require problem solving, inference, knowledge representation and learning.
E5110.2	Understand knowledge representation using logic and rules.
E4110.3	Analyze various AI techniques in expert systems, artificial neural networks and other machine learning models.
E5110.4	Apply Min-Max Search procedures, iterative deepening, and learning in game playing.
E5110.5	Analyze the main approaches to natural language processing and expert systems.

Pre-requisites:

- Good Programming knowledge.
- Familiarity in various mathematical concepts such as probability, statistics, algebra, matrix, calculus, etc.
- Strong Analytical skills like ability to think critically, analyze data, decision making capability as well as solve complex problems.
- Ability to understand complex algorithms like Classification algorithms, Regression algorithms, clustering algorithms.

CO-Pos & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5110.1	3	3	2	3	2	2	2	3	3	3
E5110.2	3	3	2	3	3	2	2	3	3	3
E5110.3	3	3	2	3	3	2	2	3	3	3
E5110.4	3	3	2	3	3	2	2	3	3	3
E5110.5	3	3	2	3	3	2	2	3	3	3
Total	**15**	**15**	**10**	**15**	**15**	**10**	**10**	**15**	**15**	**15**
Correlation level	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- UnderstandingLearningObjectives:UnderstandthefundamentalsofAI,including machine learning algorithms, neural networks, natural language processing.
- Incorporate case studies, examples, and real-world applications to illustrate theoretical concepts.
- Deliver traditional lectures to introduce key concepts and theories.
- Quizzes and Exams: Assess understanding of theoretical concepts through traditional tests.
- Assignments: Evaluate problem-solving abilities by assigning tasks such as algorithm design, model implementation, or analysis of AI systems.
- Presentations: Have students present research papers, case studies, or project findings to develop communication skills and deepen understanding.

Assessment Methodology

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Written test (Unit-1 & II)	Written test (Unit-III & IV)	Written test (Unit- V)	Written Examination (Entire Syllabus)
Duration	2 Periods	2 Periods	1 Period	2 hours
Exam Marks	30	30	20	60
Converted to	15	15	10	(No Conversion)
Marks	40			60
Tentative Schedule	6th Week	12th Week	13-14th Week	

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	30 Marks
20	1	20	5	2	10	
➢ 10 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit and one question from either unit. ➢ All questions are compulsory			

CONTINUOUS ASSESSMENT – 3 (CA3)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	20 Marks
10	1	10	5	2	10	
➢ 10 questions from the unit ➢ All questions are compulsory			➢ 5 questions from the unit. ➢ All questions are compulsory			

END EXAMINATION

PART - A			PART - B			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			Long Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	60 Marks
20	1	20	5	2	10	3	10	30	
➢ 4 questions from each unit ➢ All questions are compulsory			➢ Questions from the entire unit. ➢ Out of 8 questions, 5 questions to be answered			➢ 1 questions from each unit. ➢ Out of 5 questions, 3 questions to be answered			

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

- Answer all questions under Part-A. Each question carries 1 mark.
- Answer any 5 questions under Part-B. Each question carries 2 marks.
- Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

<table>
<tr><th rowspan="2">Revised Bloom's Taxonomy Level</th><th>Lower order thinking skills (LOTs)</th><th>Higher Order Thinking Skills (HOTs)</th></tr>
<tr><td>R-Remember, U-Understand, AP-Apply</td><td>An- Analyse, E-Evaluate, C-Create</td></tr>
<tr><td>% to be included</td><td>90 %</td><td>10 %</td></tr>
</table>

AIE5110 – INTRODUCTION TO ARTIFICIAL INTELLIGENCE

AIE5110	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L	T	P	C
THEORY		3	0	0	3

Unit I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE (AI)	[9 Hrs]
Definition and history of AI,		[1Hr]
Impact and Applications of AI in various domains: Speech recognition,		[1 Hr]
Machine Learning, Machine Translation,		[1 Hr]
Robotics, Game Playing,		[1 Hr]
Autonomous planning and scheduling.		[1 Hr]
Agents and Environments		[1 Hr]
Rationality		[1 Hr]
Nature of Environments		[1 Hr]
Structure of Agents.		[1 Hr]
Unit II	**PROBLEM SOLVING ALGORITHMS**	**[9 Hrs]**
Problem solving by searching: Problem solving agents,		[1 Hr]
Uninformed search(blind search): Breadth-first search, Depth-first search,		[2 Hrs]
Informed search (Heuristic search) techniques: Greedy best-first search, A* search,		[2 Hrs]
Adversarial search: Games, Mini max Algorithm, Alpha-Beta pruning.		[2 Hrs]
Constraint Satisfaction Problem: Backtracking search for CSP.		[2 Hrs]
Unit III	**KNOWLEDGE REPRESENTATION AND REASONING**	**[9 Hrs]**
Knowledge Representation: Logic, Propositional logic,		[2 Hrs]
First Order Predicate Logic		[1 Hr]
Unification–Forward Chaining		[1Hr]
Backward Chaining–Ontological Engineering		[2 Hr]
Categories and Objects–Events–Mental Events and Mental Objects		[1 Hr]
Reasoning Systems for Categories		[1 Hr]
Reasoning with Default Information.		[1 Hr]
Unit IV	**MACHINE LEARNING FUNDAMENTALS**	**[8 Hrs]**
Introduction to Learning, Supervised learning,		[2 Hrs]
Regression and Classification with linear Models,		[2 Hrs]
Artificial Neural Network: Neural network structures,		[1 Hr]
Single-layer feed-forward neural networks,		[1 Hr]
Multi layer feed-forward neural networks, Support vector machine.		[2 Hrs]

Unit V	NATURAL LANGUAGE PROCESSING (NLP)	[10 Hrs]
Language Models, Text classification		[1 Hr]
Information Retrieval, Information extraction,		[1 Hr]
Natural Language for Communication: Machine translation, Speech Recognition.		[1 Hr]
Perception: Image Formation,		[1 Hr]
Early Image-Processing Operations: Edge detection, Texture, Optical flow,		[1 Hr]
Segmentation of images,		[1 Hr]
Object Recognition by Appearance: Complex appearance and pattern elements,		[1 Hr]
Pedestrian detection with HOG features,		[1 Hr]
Robotics: Robot Hardware		[1 Hr]
Robot Perception.		[1 Hr]
TOTAL HOURS		**45 Hrs**

Suggested List of Students Activity

- Task students with implementing AI algorithms discussed in class, such as linear regression, decision trees, or neural networks.
- Provide case studies show casing real-world applications of AI, such as self-driving cars, recommender systems, or medical diagnosis.
- Divide students into groups and assign each group a dilemma to research and debate, considering various perspectives and proposing solutions.
- Assign a semester-long project where students design and implement an AI system to solve a specific problem.

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHERWITH EDITION
1.	Artificial Intelligence– A Modern Approach	Stuart Russell and Peter Norvig	Fourth Edition, Pearson Education, 2021.
2.	Introduction to AI and ES	Dan W.Patterson	Pearson Education
3.	Basics of Artificial Intelligence & Machine Learning	Dheeraj Mehrotra	Notion Press,2019
4.	Artificial Intelligence and Machine Learning	Venu Gopal C.K	Pacific Books International, 2019

Web-based/Online Resources

S.NO	WEBSITES
1.	https://www.coursera.org/learn/introduction-to-ai
2.	https://nptel.ac.in/courses/106102220
3.	https://www.udemy.com/topic/artificial-intelligence

MODEL QUESTION PAPER

AIE5110 – INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Time: [2 Hrs]. **Max. Marks:60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**Who is considered the father of AI?** A) Alan Turing B) John McCarthy C) Marvin Minsky D) Claude Shannon
2.	**AI was officially founded as a discipline in the year:** A) 1945 B) 1956 C) 1965 D) 1970
3.	**Robotics in AI involves:** A) Creating software agents B) Building intelligent physical machines C) Data mining D) Internet security
4.	**The four types of environments are:** A) Static, Dynamic, Discrete, Continuous B) Open, Closed, Real, Virtual C) Simple, Complex, Easy, Hard D) Hardware, Software, User, System
5.	**Which of the following is NOT a property of an environment?** A) Observable B) Deterministic C) Rational D) Episodic
6.	**Uninformed search is also called:** A) Blind search B) Heuristic search C) Best-first search D) A* search
7.	**Backtracking search for CSP:** A) Assigns values to variables incrementally and backtracks on conflict B) Tries all solutions simultaneously
8.	**Which search algorithm can use heuristic information?** A) Breadth-first search B) Depth-first search C) Greedy best-first search D) Backtracking
9.	**The goal of adversarial search is to:** A) Maximize win chances considering an opponent’s moves B) Find shortest path C) Sort game states D) Randomly pick moves
10.	**The difference between BFS and DFS is mainly:** A) BFS uses queue, DFS uses stack B) BFS uses stack, DFS uses queue C) BFS uses recursion, DFS does not D) DFS finds shortest path always
11.	**Knowledge representation in AI primarily helps in:** A) Storing and manipulating knowledge B) Sorting numbers C) Training models D) Writing code faster

12.	**In logic, a predicate represents:** A) A property or relation that can be true or false B) A constant number C) A function only D) A variable type
13.	**Categories in ontological engineering represent:** A) Classes or types of objects B) Individual objects only C) Actions D) Events only
14.	**Mental objects represent:** A) Ideas, beliefs, or knowledge constructs B) Physical objects only C) Data files D) Sensors
15.	**Quantifiers in first-order logic include:** A) Universal (∀) and existential (∃) B) Addition and subtraction C) Greater than and less than D) None of the above
16.	**What type of learning uses labeled data?** a) Unsupervised learning b) Supervised learning c) Reinforcement learning d) None of the above
17.	**.What is the primary function of an activation function in a neural network?** a) To add bias b) To introduce non-linearity c) To connect neurons d) To initialize weights
18.	**What does SVM stand for?** a) Standard Vector Machine b) Support Vector Machine c) Supervised Vector Model d) Statistical Vector Machine
19.	**Which of the following is NOT an activation function?** a) ReLU b) Sigmoid c) Softmax d) Euclidean distance
20.	**Which of the following is true for a linear classifier?** a) It can only separate linearly separable data b) It can separate any data c) It uses clusters to classify data d) It is non-parametric

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following

21. Define Artificial Intelligence (AI).
22. What is an intelligent agent and what are its key components?
23. What is Machine Learning?
24. How is default information used in reasoning?
25. What is a neural network structure?
26. What is a Python tuple? How is it created?
27. What is a single-layer feed-forward neural network?
28. Mention two ethical concerns associated with the increasing adoption of AI and Robotics.

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Explain the main idea behind Breadth-First Search (BFS).
30. Explain the difference between single-layer and multi-layer feed-forward neural networks.
31. Explain about the key hardware components of a robot work together to enable movement, sensing, decision-making, and task execution.
32. Discuss about the ethical concerns related to bias in AI and robotics
33. What is the difference between linear regression and non-linear regression?

QUESTIONPAPERSETTING

Theteachinglearningprocessandassessmentarebeingcarriedoutinaccordancewiththerevised BloomsTaxonomy.Thequestionpapershouldconsistof90%questionsbased on Lower Order Thinking (LOTs)and the remaining 10% based on Higher Order Thinking(HOTs)as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
%to be included	90 %	10 %

AIE5211 – ESSENTIALS OF SOFTWARE ENGINEERING

Programme Name : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Course Code : AIE5211
Semester : V SEMESTER
Course Title : ESSENTIALS OF SOFTWARE ENGINEERING
Course Type : THEORY

L	T	P	C
2	0	2	3

TEACHINGANDSCHEMEOFEXAMINATION

No.ofweekspersemester:15 weeks

Course	Instructions		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
ESSENTIALS OF SOFTWARE ENGINEERING	4	60	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICSANDALLOCATION OFHOURS

Unit	Topics	Time (Hrs)
I	Introduction to Software Engineering	12
II	Software Design and Planning	12
III	Software Maintenance and Risk Management	11
IV	Software Testing	15
V	Software Reliability and Quality Assurance	10
TOTAL HOURS		**60**

COURSEDESCRIPTION

Software Engineering deals with reliability and quality assurance of the software under development. It provides framework for development of quality software product. The course enables the students to write specifications for software system understand the importance of good software, design and develop test plans from design specifications. The course also covers other important aspects of software Engineering such as software lifecycle, requirement analysis and documentation, characteristics of good design, design techniques, testing, software implementation and maintenance etc.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To learn software project management process.
- To gain knowledge of software quality metrics.
- To understand the concept of testing and maintenance.
- To comprehend the basics of design and planning and its importance in reliability.
- To recognize the importance of risk management.

COURSE OUTCOMES

On successful completion of this course, the student will be able to	
E5211.1	Identify the key activities in managing software project and compare different process models.
E5211.2	Concepts of requirements engineering and Analysis Modeling.
E5211.3	Apply systematic procedure for software design and deployment.
E5211.4	Compare and contrast the various testing and maintenance.
E5211.5	Manage project schedule, estimate project cost and effort required.

Pre-requisites: NIL

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5211.1	3	3	3	3	2	3	2	3	3	2
E5211.2	3	3	3	3	2	3	2	3	3	2
E5211.3	3	3	3	3	2	3	2	3	3	2
E5211.4	3	3	3	3	2	3	2	3	3	2
E5211.5	3	3	3	3	2	3	2	3	3	2
Total	**15**	**15**	**15**	**15**	**10**	**15**	**10**	**15**	**15**	**10**
Correlation Level	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory- demonstrate- practice- activity strategy throughout the course to ensure outcome-driven learning and employability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Written test (Unit-1 & II)	Written test (Unit-III & IV)	Written test (Unit- V)	Written Examination (Entire Syllabus)
Duration	2 Periods	2 Periods	1Period	2 hours
Exam Marks	30	30	20	60
Converted to	15	15	10	(No Conversion)
Marks	40			60
Tentative Schedule	6th Week	12th Week	13-14th Week	

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	
20	1	20	5	2	10	30 Marks
➢ 10 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit and one question from either unit. ➢ All questions are compulsory			

CONTINUOUS ASSESSMENT – 3 (CA3)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	20 Marks
10	1	10	5	2	10	
➢ 10 questions from the unit ➢ All questions are compulsory			➢ 5 questions from the unit. ➢ All questions are compulsory			

END EXAMINATION

PART - A			PART - B			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			Long Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	60 Marks
20	1	20	5	2	10	3	10	30	
➢ 4 questions from each unit ➢ All questions are compulsory			➢ Questions from the entire unit. ➢ Out of 8 questions, 5 questions to be answered			➢ 1 questions from each unit. ➢ Out of 5 questions, 3 questions to be answered			

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 5 questions under Part-B. Each question carries 2 marks.
3. Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	Lower order thinking skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE5211– ESSENTIALS OF SOFTWARE ENGINEERING

AIE5211	ESSENTIALS OF SOFTWARE ENGINEERING	L	T	P	C
THEORY		2	0	2	3

Unit I	INTRODUCTION TO SOFTWARE ENGINEERING	[12 Hrs]
Basics of Software Engineering: Need for Software Engineering		[1 Hr]
Definition – Software Characteristics–Software Myths		[1 Hr]
Program versus Software Products.		[1 Hr]
Software Development Life Cycle Models: Introduction –Waterfall Model–		[1 Hr]
Spiral Model–Iterative Enhancement model		[1 Hr]
Agile model –Object Oriented Model– Advantages and Disadvantages of above models.		[2 Hrs]
Software Requirement Analysis (SRS):Value of good SRS–		[1 Hr]
Developing SRS from Business Requirements –		[1 Hr]
Requirement Process – Requirement Specification –		[1 Hr]
Desirable Characteristics of an SRS		[1 Hr]
Components of an SRS.		[1 Hr]
Unit II	**SOFTWARE DESIGN AND PLANNING**	**[12 Hrs]**
Software Design: Definition of software design– Objectives of software design		[1 Hr]
Process of software design– Architectural design–Modular design–Structure chart		[2 Hrs]
Coupling and Cohesion		[2 Hrs]
Different types–Interface design –Design of Human Computer Interface.		[2 Hrs]
Software Planning: Software metrics –Definition – Types of metrics		
Product and product metrics		[1 Hrs]
Relevant metrics in agile – Function point and feature point metrics		[1 Hrs]
Software project estimation – Steps for estimation		[1 Hrs]
Reason for poor and inaccurate estimation		[1 Hrs]
Project estimation guidelines–Models for estimation		[1 Hrs]
COCOMO Model–Automated tools for estimation–Sprint planning in agile.		
Unit III	**SOFTWARE MAINTENANCE AND RISK MANAGEMENT**	**[11 Hrs]**
Software Maintenance: Software as an evolution entity		[1 Hr]
Software configuration management activities – Change control process		[2 Hrs]
Software version control – Software configuration management		[2 Hrs]
Need for maintenance – Categories of maintenance – Maintenance cost		[2 Hrs]
Factors affecting the effort. Risk management: Definition of risk –		[2 Hrs]
Basics for different types of software risks		
Monitoring of risks–Risk management–Risk avoidance–Risk detection–Risk control		[1 Hr]
Risk recovery–Sources of risks– Types of risks.		[1 Hr]
Unit IV	**SOFTWARE TESTING**	**[15 Hrs]**

Software Testing: Introduction to testing– Testing principles	[1 Hr]
Testing objectives – Basic terms used in testing – Fault –Error– Failure –Test cases	[2 Hrs]
Black box and white box testing–Advantages and disadvantages of above testing	[2 Hrs]
Methods for Block box testing strategies–Methods for white box testing strategies	[2 Hrs]
Testing activities–Test plan–Tracking defects.	[1 Hr]
Levels of testing: Integration tests – System testing .	[1 Hr]
Types Software Testing strategies: Static testing strategies – Formal technical reviews	[1 Hr]
Code walkthrough–Code inspection–Debugging–Definition–Characteristics of bugs	[1Hr]
Life cycle of a Debugging task – Debugging approaches. Software Testing Tools:	[1 Hr]
Need for tools – Classification of tools-Functional/Regression Testing tools Performance/Load Testing Tools	[2 Hrs]
Testing process management Tools – Benefits of tools	[1 Hr]
Unit V **SOFTWARE RELIABILITY AND QUALITY ASSURANCE**	**[10 Hrs]**
Software Quality Assurance: Verification and validation –SQA–Objectives and Goals –	[1 Hr]
SQA plan – Definition of software quality –	[1 Hr]
Classification of software qualities–Software quality attributes	[1 Hr]
Important qualities of software products	[1 Hr]
Importance of software quality –SEI –CMM–	[1 Hr]
Five levels –ISO9000 –Need forISOCertification–BenefitsofISO9000certification	[1 Hr]
LimitationofISO9000 certification.	[1 Hr]
Software Reliability: Definition – Reliability terminologies – Classification of failures Reliability metrics	[2 Hrs]
Reliability growth modeling–Reliability measurement process	[1 Hr]
TOTAL HOURS	**60 Hrs**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Programming assignments.
- P class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHERWITH EDITION
1.	Software Engineering– A practitioner's Approach	Roger S.Pressman	Sixth Edition, McGraw- Hill International Edition,2005.
2.	Software engineering	Ian Sommerville	Seventh Edition, Pearson Education Asia, 2007.
3.	Fundamentals of Software Engineering	Rajib Mall	Third Edition, PHI Learning Private Limited, 2009.
4.	Software Engineering, A Precise Approach,	Pankaj Jalote	WileyIndia,2010.

Web-based/Online Resources

S.NO	WEBSI
1.	Nptel course: https://onlinecourses.nptel.ac.in/noc20_cs68/preview

MODEL QUESTION PAPER

AIE5211- ESSENTIALS OF SOFTWARE ENGINEERING

Time: [2 Hrs]. **Max. Marks:60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	Which of the following is NOT a characteristic of software? A. Software doesn't wear out B. Software is tangible C. Software is developed, not manufactured D. Software is reusable
2.	Which model is most suitable for small, well-defined projects? A. Spiral B. Waterfall C. Agile D. RAD
3.	What is SRS? A. Software Requirement Study B. Software Running System C. Software Requirement Specification D. Structured Report Sheet
4.	Which type of requirement specifies system behaviour? A. Non-functional B. Legal C. Functional D. Regulatory
5.	Which one is a type of software design? A. Black-box B. Modular C. Top-down D. Flow-chart
6.	Poor estimation can lead to: A. Better performance B. Budget savings C. Project delays and failures D. More documentation
7.	Which one is NOT a COCOMO model? A. Basic B. Intermediate C. Detailed D. Agile
8.	Software Configuration Management (SCM) deals with: A. Coding standards B. Project planning C. Controlling changes in software D. UI design
9.	Which of the following is NOT a category of maintenance? A. Corrective B. Adaptive C. Preventive D. Defensive
10.	What is risk detection? A. Adding more developers B. Finding and identifying potential risks C. Avoiding testing D. Speeding up coding
11.	Risk exposure is calculated by: A. Probability + Impact B. Probability × Impact C. Impact / Cost D. Probability – Cost

12.	**Which of the following is a black box testing strategy?** a) Statement coverage b) Decision coverage c) Equivalence partitioning d) Path testing
13.	**Static testing strategies include:** a) Executing the code b) Formal technical reviews c) Performance testing d) Load testing
14.	**Boundary value analysis is a technique under:** a) White box testing b) Black box testing c) Debugging d) Load testing
15.	**Code walkthrough is:** a) Formal review b) Informal review c) Automated test d) Performance test
16.	**SEI stands for:** a) Software Engineering Initiative b) Software Engineering Institute c) Software Enhancement Interface d) Standard Engineering Institution
17.	**One of the benefits of ISO 9000 certification is:** a) Reduced maintenance b) Increased process standardization c) Decreased documentation d) Fewer test cases
18.	**Which is NOT a reliability metric?** a) MTTF b) MTTR c) MTTD d) LOC
19.	**In software reliability, a permanent failure is:** a) Reoccurring under all conditions b) Occurs only once c) Occurs randomly d) Cannot be classified
20.	**What does SQA stand for?** a) Software Quality Automation b) Software Quality Assurance c) Software Query Analysis d) Software Quality Association

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following21. Define Software Engineering

22. What is the main focus of the Spiral Model?

23. State two principles of Human-Computer Interface (HCI) Design

25. What is a Structure Chart and what does it represent?

26. Define Software Configuration Management (SCM).

27. What are the three basic terms in testing: Fault, Error, and Failure?

28 What does SEI CMM stand for, and briefly describe its highest level?

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Why is Software Engineering necessary in modern development?
30. Define software metrics and explain their importance, providing examples of different types of
    metrics.
31. Define Software Maintenance.
32. Explain about Software Testing Tools
33. Explain about some key reliability metrics

QUESTIONPAPERSETTING

The teaching learning process and assessment are being carriedout in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs)and the remaining 10% based on Higher Order Thinking(HOTs)as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills(HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**-Analyse, **E**-Evaluate, **C**-Create
%to be included	90 %	10 %

AIE5212 – DEEP LEARNING

Programme Name : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Course Code: AIE5212
Semester : V SEMESTER
Course Title : DEEP LEARNING
Course Type :THEORY

L	T	P	C
2	0	2	3

TEACHING AND SCHEME OF EXAMINATION

No.ofweekspersemester:15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Autonomous Examination	Total	
DEEP LEARNING	4	60	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICSANDALLOCATION OFHOURS

Unit	Topics	Time(Hrs)
I	Neural Networks	11
II	Convolutional Neural Networks (CNN)	15
III	Recurrent Neural Network(RNN)	11
IV	Deep Reinforcement Learning	12
V	Deep Generative Models	11
TOTAL HOURS		**60**

COURSEDESCRIPTION

Deep learning is a subset of artificial intelligence (AI) and machine learning that mimics the workings of the human brain in processing data and creating patterns for use in decision- making. Deep learning is distinguished from traditional machine learning algorithms through its ability to automatically discover intricate patterns and representations of data, without requiring explicit programming of feature extraction. Deep learning models autonomously extract features from raw data, enabling them to perform tasks like image recognition, natural language processing, and speech recognition with remarkable accuracy and provides solutions to real world problems.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- Understand the fundamental concepts of deep learning.
- Explore the basics of feed forward neural networks, activation functions and learning parameters.
- Learn the working of convolution neural networks and their applications.
- Explain different types of recurrent neural networks and their applications.
- Summarize the concepts of deep reinforcement learning and deep generative models.

COURSEOUTCOMES

On successful completion of this course, the student will be able to	
E5212.1	Define the processes in data science.
E5212.2	Use the Python Libraries for handling data and manipulating them.
E5212.3	Apply visualization Libraries in Python to interpret and explore data.
E5212.4	Explore graph and its hidden properties in real time applications.
E5212.5	Understand the basics of Natural Language Processing and Text Analytics.

Pre-requisites: Fundamentals of Data Science

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5212.1	3	3	3	2	2	3	2	3	3	3
E5212.2	3	3	3	2	2	3	2	3	3	3
E5212.3	3	3	3	2	2	3	2	3	3	3
E5212.4	3	3	3	2	2	3	2	3	3	3
E5212.5	3	3	3	2	2	3	2	3	3	3
Total	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**15**	**15**
Correlation Level	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**3**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy

- Provide instructional content (lectures, videos, PPTs) for students to review and learn.
- Present students with real-world problems that require critical thinking and problem- solving skills.
- Incorporate a variety of instructional modalities, such as visualizations, simulations, and demonstrations.

Assessment Methodology

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Written test (Unit-1 & II)	Written test (Unit-III & IV)	Written test (Unit- V)	Written Examination (Entire Syllabus)
Duration	2 Periods	2 Periods	1Period	2 hours
Exam Marks	30	30	20	60
Converted to	15	15	10	(No Conversion)
Marks	40			60
Tentative Schedule	6^{th} Week	12^{th} Week	13-14^{th} Week	

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	**Marks for Each Question**	**Total Marks**	**No. of Questions**	**Marks for Each Question**	**Total Marks**	**30 Marks**
20	1	20	5	2	10	
➢ 10 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit and one question from either unit. ➢ All questions are compulsory			

CONTINUOUS ASSESSMENT – 3 (CA3)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	20 Marks
10	1	10	5	2	10	
➢ 10 questions from the unit ➢ All questions are compulsory			➢ 5 questions from the unit. ➢ All questions are compulsory			

END EXAMINATION

PART - A			PART - B			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			Long Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	60 Marks
20	1	20	5	2	10	3	10	30	
➢ 4 questions from each unit ➢ All questions are compulsory			➢ Questions from the entire unit. ➢ Out of 8 questions, 5 questions to be answered			➢ 1 questions from each unit. ➢ Out of 5 questions, 3 questions to be answered			

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

- Answer all questions under Part-A. Each question carries 1 mark.
- Answer any 5 questions under Part-B. Each question carries 2 marks.
- Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	Lower order thinking skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE5212–DEEP LEARNING

AIE5212	DEEP LEARNING	L	T	P	C
THEORY		2	0	2	3

Unit I	NEURAL NETWORKS	[11 Hrs]
	Building Intelligent Machines–The Limits of Traditional Computer Programs	[1 Hr]
	The Mechanics of Machine Learning.	[1 Hr]
	The Neuron–Expressing Linear Perceptrons as Neurons–Feed-Forward Neural Networks	[2 Hrs]
	Linear Neurons and Their Limitations–Sigmoid, Tanh and ReLU Neurons–Softmax Output Layers.	[1 Hr]
	Training Feed–Forward Neural Networks–Gradient Descent	[1 Hr]
	The Delta Rule and Learning Rates–The Back propagation Algorithm.	[1 Hr]
	Test Sets, Validation Sets, and Overfitting	[2 Hrs]
	Preventing Overfitting in DeepNeural Networks.	[1 Hr]
		[1 Hr]
Unit II	**CONVOLUTIONAL NEURAL NETWORKS (CNN)**	**[15 Hrs]**
	Introduction–Historical Perspective and Biological Inspiration.	[1 Hr]
	The Basic Structure of a Convolutional Network–Padding–Strides	[1 Hr]
	Typical Settings– Use of Bias–The ReLU Layer	[1 Hr]
	Pooling–Fully Connected Layers	[1 Hr]
	The Interleaving Between Layers–LeNet-5.	[1 Hr]
	Case Studies of Convolutional Architectures	[2 Hrs]
	Alex Net–VGG	[2 Hrs]
	GoogleNet– ResNet.	[1 Hr]
	Applications of Convolutional Networks–Content-Based Image Retrieval	[1 Hr]
	Object Localization–Object Detection–	[2 Hrs]
	Natural Language and Sequence Learning–Video Classification	[2 Hrs]
Unit III	**RECURRENT NEURAL NETWORK(RNN)**	**[11 Hrs]**
	The Architecture of Recurrent Neural Networks–	[2Hrs]
	Bidirectional RNNs.	[2 Hrs]
	Encoder-Decoder Sequence-to-Sequence Architectures–Deep RecurrentNetworks	[2 Hrs]
	Recursive Neural Networks– Long Short- Term Memory(LSTM).	[2 Hrs]
	Applications of Recurrent Neural Networks– Automatic Image Captioning	[1 Hr]
	Question-Answering Systems–Sentence-Level Classification	[1 Hr]
	End-to-End Speech Recognition–Handwriting Recognition.	[1 Hr]

Unit IV	DEEP REINFORCEMENT LEARNING	[12 Hrs]
	Reinforcement Learning – Markov Decision Processes (MDP) – Policy	[2 Hrs]
	Future Return – Discounted Future Return – Explore Versus Exploit	[2 Hrs]
	Policy Versus Value Learning – Policy Learning via Policy Gradients	[2 Hrs]
	Q-Learning and Deep Q-Networks – The Bellman Equation Issues with Value Iteration	[2 Hrs]
	Approximating the Q-Function – Deep Q-Network (DQN) – Training DQN –	[2 Hrs]
	Learning Stability – Target Q-Network – Experience Replay.	[2 Hrs]

Unit V	DEEP GENERATIVE MODELS	[11 Hrs]
	Boltzmann Machines	[1 Hr]
	Restricted Boltzmann Machines	[1 Hr]
	Deep Belief Networks	[1 Hr]
	Deep Boltzmann Machines(only architecture).	[2 Hrs]
	Directed Generative Nets – Sigmoid Belief Nets	[1 Hr]
	Differentiable Generator Nets – Variational Auto encoders	[1 Hr]
	Generative Adversarial Networks–Generative Moment Matching Networks	[2 Hrs]
	Convolutionl Generative Networks – Auto- Regressive Networks	[1Hr]
	Linear Auto - Regressive Networks Neural Auto Regressive Networks.	[1 Hr]
	TOTAL HOURS	**60 Hrs**

Suggested List of Students Activity

- Implement simple neural network architecture using python programming.
- Project based learning for image classification and object detection using convolutional neural network.
- Problem based learning on text processing application using recurrent neural network.
- Incorporate group discussions, case studies and collaborative problem-solving activities.

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Fundamentals of Deep Learning: Designing Next Generation Machine Intelligence Algorithms	Nikhil Buduma, Nicholas Locascio,	O'Reilly Media, 2017
2.	Neural Networks and Deep Learning: A Textbook	Charu C. Aggarwal	Springer International Publishing, 1st Edition, 2018.
3.	Deep Learning	Ian Good fellow, Yoshua Bengio, Aaron Courville	MIT Press, 2017.

Web-based/Online Resources

S.NO	WEBSITES
1.	https://www.coursera.org/specializations/deep-learning
2.	https://nptel.ac.in/courses/106106184
3.	https://www.udemy.com/course/basics-of-deep-learning/

MODELQUESTIONPAPER

AIE5212– DEEP LEARNING

Time: [2 Hrs]. **Max. Marks:60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**The basic unit of a neural network is called a:** a) Node b) Matrix c) Neuron d) Signal
2.	**The output range of the Tanh function is:** a) 0 to 1 b) -1 to 1 c) 0 to ∞ d) -∞ to ∞
3.	**A model with good generalization:** a) Performs poorly on new data b) Memorizes training data c) Performs well on unseen data d) Avoids all learning
4.	**Over fitting occurs when a model:** a) Is too simple b) Performs well on training data but poorly on unseen data c) Has very few parameters d) Is not trained enough
5.	**Dropout is a technique used to:** a) Remove training data b) Randomly ignore neurons during training c) Increase neuron activation d) Normalize weights
6.	**Use of bias in CNN layers allows:** a) Ignoring features b) Faster computation c) Learning constant offset d) Preventing over fitting
7.	**VGGNet is known for:** a) Inception modules b) Very deep networks with 3x3 convolutions c) Shortcut connections d) Using transformers
8.	**One of the CNN applications in NLP is:** a) Sorting emails b) Sentiment analysis c) Video segmentation d) Web scraping
9.	**Max pooling selects:** a) Minimum value in a window b) Maximum value in a window c) Average value in a window d) Sum of all pixels
10.	**CNNs are applied to NLP tasks by:** a) Ignoring sequence b) Converting text into pixel data c) Using word embeddings and 1D convolutions d) Using only soft max
11.	**Deep RNNs refer to:** a) Shallow networks b) RNNs with no layers c) RNNs with multiple hidden layers d) RNNs with fewer neurons
12.	**LSTM stands for:** a) Long Short-Term Memor b) Large Scale Temporal Memory c) Low Scale Transfer Mechanism d) Long Sequence Temporal Mapping
13.	**RNN stands for:** a) Repeating Neural Network b) Recursive Neural Network c) Recurrent Neural Network d) Reconfigurable Neural Network

14.	**Encoder-Decoder architecture is mainly used in:** a) Image compression b) Sequence-to-sequence tasks c) Object detection d) Clustering
15.	**The output gate in an LSTM:** a) Decides how much information to store b) Controls output to the next time step c) Deletes the hidden state d) Replaces input
16.	**What are the key components of a Deep Reinforcement Learning environment?** A. Agent, Environment, State, Action, Reward B. Inputs, Outputs, Weights, Bias C. Episodes, Batches, Epochs, Labels D. Nodes, Layers, Clusters, Features
17.	**What is the primary purpose of "Experience Replay" in a Deep Q-Network (DQN)?** A. To speed up the inference time of the neural network B. To reduce the correlation between consecutive training samples C. To increase the randomness of the agent's actions D. To store the optimal policy permanently
18.	**What does the discount factor \(\gamma \) (gamma) represent in the Bellman Equation?** A. The learning rate of the deep neural network B. The probability of taking an incorrect action C. The importance of future rewards compared to immediate ones D. The total duration of a single episode
19.	**What issue does the "Target Network" solve in Deep Q-Networks?** A. The agent getting stuck in local minima B. The instability of continuously shifting targets during Q-learning updates C. The inability to explore unknown states D. The computational overhead of deep networks
20.	**Which of the following is considered an "off-policy" deep reinforcement learning algorithm?** A. SARSA B. Deep Q-Network (DQN) C. Advantage Actor-Critic (A3C) D. Proximal Policy Optimization (PPO)

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following

21 What is the primary limitation of traditional computer programs in building intelligent machines?
22: Why are linear neurons limited in deep learning?
23. What is the role of the Stride parameter in a Convolution Neural Network?
24. Briefly describe the function of Pooling layers in a CNN.
25. How did Google Net address the challenges of network depth and computational efficiency?
26. What are Bidirectional RNNs (BRNNs) and what is their advantage?
27. Differentiate between Model-Based and Model-Free RL.
28. How does a Deep Q-Network (DQN) work?

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Describe the structure and function of a biological neuron and its analogy in neural networks.
30. Describe the basic structure of a Convolution Neural Network.
31. Discuss the stability challenges in DQN. How do "Experience Replay" and "Target Networks" resolve these issues?
32. Explain about Automatic Image Captioning with example.
33. Explain about Deep Generative Models

QUESTIONPAPERSETTING

TheteachinglearningprocessandassessmentarebeingcarriedoutinaccordancewiththerevisedBloomsTaxonomy.Thequestionpapershouldconsistof90%questionsbased on Lower Order Thinking (LOTs)and the remaining 10% based on Higher Order Thinking(HOTs)as detailed below.

Revised Bloom's Taxonomy Level	Lower order thinking skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, **U**-Understand, **AP**-Apply	**An**-Analyse, **E**-Evaluate, **C**-Create
%to be included	90 %	10 %

AIE5213– DATA SCIENCE AND BIG DATA

Programme Name : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Course Code : AIE5213
Semester : V SEMESTER
Course Title : DATA SCIENCE AND BIG DATA
Course Type : THEORY

L	T	P	C
2	0	2	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester:15 weeks

Course	Instructions		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
DATA SCIENCE AND BIG DATA	4	60	40	100*	100	[3 Hrs]

***Examinations will be conducted for100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time(Hrs)
I	Introduction to Data Science	12
II	Fundamentals of Data Modeling	12
III	Fundamentals of Big Data	12
IV	Big Data Storage	12
V	Big Data Processing	12
TOTAL HOURS		**60**

COURSEDESCRIPTION

This course provides a comprehensive understanding of data science and data modeling. The foundation on data science is laid to understand the core concepts and the techniques that underlie today's big data computing technologies. This course helps the students in identifying and applying appropriate techniques and tools to solve problems in managing huge quantities of data.

COURSEOBJECTIVES

The objective of this course is to enable the student to

- Understand the fundamentals of Data Science, including its subfields, common problems with data, and the basics of Python arrays and data frames.
- Apply regression models, such as simple and multiple regression, to analyze relationships among attributes and make predictions.
- Recognize the characteristics of Big Data and its handling techniques, including data identification, acquisition, filtering, extraction, validation, cleansing, aggregation, representation and analysis.
- Describe the components and features of the Hadoop ecosystem, including its core components, distributed file system (HDFS), and tools for data processing.
- Explain the concepts of distributed data processing and the Hadoop framework, including batch processing with Map Reduce and real-time processing, and their application in handling large-scale datasets.

COURSE OUTCOMES

On successful completion of this course, the student will be able to	
E5213.1	Gain an understanding of fundamental concepts in Data Science, including its subfields, basic programming languages, and common data problems.
E5213.2	Develop proficiency in regression analysis techniques, such as simple and multiple regression, to analyze and interpret relationships among attributes.
E5213.3	Acquire knowledge of Big Data characteristics, handling techniques, and challenges, enabling effective data management and analysis in large-scale environments.
E5213.4	Demonstrate comprehension of the Hadoop ecosystem, its core components, and tools for distributed data processing, facilitating efficient handling of massive datasets.
E5213.5	Attain competency in distributed data processing concepts and the Hadoop framework, enabling efficient batch and real-time processing of large datasets for actionable insights.

Pre-requisites: Database Management System

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5213.1	3	3	2	3	2	2	3	3	3	3
E5213.2	3	3	2	3	2	2	3	3	3	3
E5213.3	3	3	2	3	2	2	3	3	3	3
E5213.4	3	3	2	3	2	2	3	3	3	3
E5213.5	3	3	2	3	2	2	3	3	3	3
Total	**15**	**15**	**10**	**15**	**10**	**10**	**15**	**15**	**15**	**15**
Correlation level	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- Massive Open On-line Courses(MOOCs) may be used to teach various topics/subtopics.
- Different types of teaching methods such as flipped classroom, tutorials, peer to peer learning and self learning may be employed by teachers to develop the outcomes.

Assessment Methodology

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Written test (Unit-1 & II)	Written test (Unit-III & IV)	Written test (Unit- V)	Written Examination (Entire Syllabus)
Duration	2 Periods	2 Periods	1 Period	2 hours
Exam Marks	30	30	20	60
Converted to	15	15	10	(No Conversion)
Marks	40			60
Tentative Schedule	6^{th} Week	12^{th} Week	$13\text{-}14^{th}$ Week	

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			Short Answer Questions (Apply, Analyze, Evaluate and Create levels)			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	30 Marks
20	1	20	5	2	10	
➢ 10 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit and one question from either unit. ➢ All questions are compulsory			

CONTINUOUS ASSESSMENT – 3 (CA3)

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks
(Understand, Apply levels)</th><th colspan="3">Short Answer Questions
(Apply, Analyze, Evaluate and Create levels)</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="3">20 Marks</td></tr>
<tr><td>10</td><td>1</td><td>10</td><td>5</td><td>2</td><td>10</td></tr>
<tr><td colspan="3">➢ 10 questions from the unit
➢ All questions are compulsory</td><td colspan="3">➢ 5 questions from the unit.
➢ All questions are compulsory</td></tr>
</table>

END EXAMINATION

<table>
<tr><th colspan="3">PART - A</th><th colspan="3">PART - B</th><th colspan="3">PART - B</th><th rowspan="2">TOTAL MARKS</th></tr>
<tr><th colspan="3">MCQ Questions Marks
(Understand, Apply levels)</th><th colspan="3">Short Answer Questions
(Apply, Analyze, Evaluate and Create levels)</th><th colspan="3">Long Answer Questions
(Apply, Analyze, Evaluate and Create levels)</th></tr>
<tr><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><th>No. of Questions</th><th>Marks for Each Question</th><th>Total Marks</th><td rowspan="3">60 Marks</td></tr>
<tr><td>20</td><td>1</td><td>20</td><td>5</td><td>2</td><td>10</td><td>3</td><td>10</td><td>30</td></tr>
<tr><td colspan="3">➢ 4 questions from each unit
➢ All questions are compulsory</td><td colspan="3">➢ Questions from the entire unit.
➢ Out of 8 questions, 5 questions to be answered</td><td colspan="3">➢ 1 questions from each unit.
➢ Out of 5 questions, 3 questions to be answered</td></tr>
</table>

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

- Answer all questions under Part-A. Each question carries 1 mark.
- Answer any 5 questions under Part-B. Each question carries 2 marks.
- Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

<table>
<tr><th rowspan="2">Revised Bloom's Taxonomy Level</th><th>Lower order thinking skills (LOTs)</th><th>Higher Order Thinking Skills (HOTs)</th></tr>
<tr><td>R-Remember, U-Understand, AP-Apply</td><td>An- Analyse, E-Evaluate, C-Create</td></tr>
<tr><td>% to be included</td><td>90 %</td><td>10 %</td></tr>
</table>

AIE5213– DATA SCIENCE AND BIG DATA

AIE5213	DATA SCIENCE AND BIG DATA	L	T	P	C
THEORY		2	0	2	3

Unit I	**INTRODUCTION TO DATA SCIENCE**	**[12 Hrs]**
Subfields of Data Science – Data Science Road Map		[1 Hr]
Programming languages for Data Science – Problems with Data		[1 Hr]
Formatting issues – Python Arrays and Data Frames.		[1 Hr]
Data Quality – Consistency and accuracy (Integrity), Noise: Outliers,		[1 Hr]
Missing and Duplicate values –		[1 Hr]
Data Preprocessing using Cleaning, Enrichment, Editing, Reduction, Data Formats		[2 Hrs]
Loading and Saving files Loading data –		[1Hr]
Statistical functions – Text Functions –		[1 Hr]
Lookup Functions – Sorting – Filtering –		[1 Hr]
Data Analysis: Correlation, covariance, Descriptive statistics, Regression.		[2 Hrs]
Unit II	**FUNDAMENTALS OF DATA MODELING**	**[12 Hrs]**
Classification of attributes		[1 Hr]
Concept of Rank		[1 Hr]
Identify the relationship among attributes, Regression Models		[2Hrs]
Linear regression – Simple and Multiple		[2Hrs]
Regression – Correlation – Mean squared Error		[2Hrs]
Testing goodness of fit – Model		[1 Hr]
Equation, Two class – Multi class classification		[2 Hrs]
Separability – Performance measures		[1 Hr]
Nearest Neighbors.		
Unit III	**FUNDAMENTALS OF BIG DATA**	**[12 Hrs]**
Web Data		[1 Hr]
Classification of Data		[1 Hr]
Big Data – Characteristics – Volume, Velocity, Variety, Veracity, Value		[2Hrs]
Big Data Types and classifications		[1 Hr]
Sources of Big Data		[1 Hr]
Big Data handling techniques		[1 Hr]
Challenges. Business Case		[1 Hr]
Evaluation, Data Identification, Data Acquisition & Filtering, Data Extraction,		[2 Hrs]
Data Validation & Cleansing, Data Aggregation & Representation.		[2 Hrs]
Unit IV	**BIG DATA STORAGE**	**[12 Hrs]**

Introduction – Hadoop and its Ecosystem: Hadoop core components	[2 Hrs]
Features of Hadoop	[2 Hrs]
Hadoop Ecosystem components	[2 Hrs]
Hadoop streaming	[1Hr]
Hadoop pipes	[1 Hr]
Hadoop distributed File system	[1 Hr]
HDFS data storage	[1 Hr]
Hadoop Ecosystem tools.	[2 Hrs]
Unit V **BIG DATA PROCESSING**	**[12 Hrs]**
Distributed data processing	[1 Hr]
Hadoop Framework	[1 Hr]
Processing workloads	[1 Hr]
cluster for processing	[1 Hr]
Batch processing with Map Reduce	[2 Hrs]
Map and Reduce	[1 Hr]
Tasks – Map Reduce algorithms	[2 Hrs]
Processing in Real time mode	[1 Hr]
Real time processing and Map Reduce.	[2 Hrs]
TOTAL HOURS	**60 Hrs**

Suggested List of Students Activity

- Give seminar on relevant topics.
- Undertake MOOC on-line course Python for Data Science - Course(nptel.ac.in)
- Conduct quiz, role play, group discussion, etc.,

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHERWITH EDITION
1.	Python Data Science Handbook- Essential tools for working with data	Jake Vander Plas,	O'REILLY, 2017
2.	Introducing Data Science	Davy Cielen, Arno D. B. Meysman, Mohamed Ali	manning publications, 2016
3.	"Big Data Analytics- Introduction to Hadoop, Spark and Machine Learning	Raj kamal, Preeti Saxena	McGraw Hill Education(India) Pvt Ltd., 2019.

Web-based/Online Resources

S.NO	WEBSITES
1.	Python for Data Science: https://www.w3schools.com/datascience/ds_python.asp

MODEL QUESTION PAPER

AIE5213 -DATA SCIENCE AND BIG DATA

Time: [2 Hrs]. **Max. Marks:60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**What is the primary goal of Data Science?** A) Web Designing B) Extracting knowledge and insights from data C) Data Storage only D) Hardware configuration
2.	**Which of the following data types is considered strictly structured?** A) Audio files B) Video streams C) Images D) Excel spreadsheets
3.	**What does the acronym CSV stand for?** A) Column Separated Values B) Comma Separated Values C) Character Sorted Values D) All the above
4.	**Which Python library is primarily used for data manipulation and analysis?** A) Matplotlib B) Seaborn C) Pandas D) NumPy
5.	**6. Which type of data visualization is best for displaying the distribution of a single numeric variable?** A) Line plot B) Histogram C) Bar chart D) Scatter Plot
6.	**Which of the following best describes the primary purpose of a conceptual data model?** A) To define the technical implementation and storage details B) To provide a high-level business view of what data is needed and how it is organized C) To design exact tables and foreign keys D) To create queries for data retrieval

7.	**What symbol represents a weak entity set in an Entity-Relationship (ER) diagram?** A) Dotted rectangle B) Diamond C) Doubly outlined rectangle D) Oval
8.	**In a database, properties that describe the characteristics of an entity are called:** A) Relationships B) Identifiers C) Instances D) Attributes
9.	**What is the fundamental goal of database normalization?** A) To increase the speed of complex queries B) To eliminate redundant data and avoid data anomalies C) To add more tables to the database D) To securely encrypt user passwords
10.	**In a logical data model, what generally happens to an attribute from the conceptual ER model?** A) It becomes a database schema B) It becomes a primary key C) It becomes a column in a table D) It becomes a relationship set
11.	**What does the term "Big Data" primarily refer to?** a) Any dataset that takes more than an hour to download b) A large relational database used by banks c) High-volume data that is simple to organize d) Extremely large and complex datasets requiring specialized tools for processing
12.	**What is the default block size in Hadoop HDFS?** a) 64 MB b) 128 MB c) 256 MB d) 512 MB
13.	**Why is Apache Spark generally faster than Hadoop MapReduce?** a) It requires less disk storage b) It performs processing in-memory (RAM) c) It is written entirely in Java d) It does not require a cluster
14.	**Which component in the Hadoop Distributed File System (HDFS) stores the actual file data?** A) NameNode B) Secondary NameNode C) DataNode D) ResourceManager

15.	**Which of the following NoSQL databases is a classic example of a Column-Family Store?** A) MongoDB B) Apache Cassandra C) Redis D) Neo4j
16.	**Which file format is highly optimized for complex analytics in Big Data ecosystems and supports column-level compression?** A) CSVB) XMLC) JSOND) Apache Parquet
17.	**What is the fundamental, low-level data structure of Apache Spark?** a) DataFrame b) RDD (Resilient Distributed Dataset) c) Relational Table d) Dataset
18.	**Why is Apache Spark significantly faster than traditional Hadoop MapReduce? [1]** a) It requires less disk storage. b) It performs computations entirely in memory (RAM). c) It uses a single-node architecture. d) Apache Parquet
19.	**Why is Apache Spark significantly faster than traditional Hadoop MapReduce? [1]** a) It requires less disk storage. b) It performs computations entirely in memory (RAM). c) It uses a single-node architecture. d) It does not require a cluster manager
20.	**Which of the following data processing models is best suited for continuous, real-time data ingestion?** a) Batch Processing b) Stream Processing c) MapReduce d) Iterative Processing

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following

21. List the 5 V's of Big Data.
22 Differentiate between Structured, Semi-Structured, and Unstructured Data.
23. What is an "anonymous function" in Python, and what keyword is used to define it?
24. What is the full form of HDFS? What is its default block size?
25. What is Stream Processing?.
26. What is MapReduce?
27. What is the role of the Mapper and Reducer?
28. What is a NameNode and DataNode?

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Explain distributed data processing and its advantages in Big Data environments.
30. Describe the Hadoop Framework architecture with a neat diagram.
31. Explain the components and working of the Hadoop Framework.
32. Explain Batch Processing in Hadoop using the MapReduce framework.
33. Discuss the working principle of Map and Reduce tasks with an example.

QUESTIONPAPERSETTING

Theteachinglearningprocessandassessmentarebeingcarriedoutinaccordancewiththerevised BloomsTaxonomy.Thequestionpapershouldconsistof90%questionsbased on Lower Order Thinking (LOTs)and the remaining 10% based on Higher Order Thinking(HOTs)as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**-Analyse, **E**-Evaluate, **C**-Create
%to be included	90 %	10 %

AIE5320 – ARTIFICIAL INTELLIGENCE LABORATORY

Programme Name : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Course Code : AIE5320
Semester : V SEMESTER
Course Title : ARTIFICIAL INTELLIGENCE LABORATORY
Course Type : PRACTICAL

L	T	P	C
0	0	6	3

TEACHING AND SCHEME OF EXAMINATION

No.ofweekspersemester:15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Autonomous Examination	Total	
ARTIFICIAL INTELLIGENCE LABORATORY	6	90	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICSANDALLOCATION OFHOURS

Unit	Topics	Time (Hrs)
PART-A	PRACTICAL EXERCISES	42
PART-B	CONTINUOUS ASSESSMENT – 1 (PRACTICAL)	48
TOTAL HOURS		**90**

COURSE DESCRIPTION

The Artificial Intelligence Laboratory is designed to provide hands-on experience and practical understanding of various concepts and techniques in artificial intelligence (AI). Through a series of 15 experiments, students will explore fundamental algorithms, methods, and tools used in AI applications. The laboratory exercises will cover areas such as machine learning, natural language processing, computer vision, and robotics.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To familiarize students with essential AI concepts and techniques.
- To design and implement search strategies and game playing techniques.
- To provide practical experience in implementing AI algorithms and models.
- To develop problem- solving skills in the context of AI applications.
- To encourage critical thinking and experimentation in AI research and development.

COURSE OUTCOMES

On successful completion of this course, the student will be able to	
E5320.1	Understand the principles and theories underlying artificial intelligence.
E5320.2	Implement and analyze various AI algorithms and models.
E5320.3	Apply AI techniques to solve real-world problems in different domains.
E5320.4	Evaluate the performance of AI systems and make informed decisions
E5320.5	Work effectively in teams to develop AI-based solutions.

Pre-requisites:

- Basic programming skills (preferably in Python).
- Understanding of data structures and algorithms.
- Familiarity with linear algebra and probability theory.

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5320.1	3	3	3	2	2	3	3	3	3	3
E5320.2	3	3	3	2	2	3	3	3	3	3
E5320.3	3	3	3	2	2	3	3	3	3	3
E5320.4	3	3	3	2	2	3	3	3	3	3
E5320.5	3	3	3	2	2	3	3	3	3	3
Total	**15**	**15**	**15**	**10**	**10**	**15**	**15**	**15**	**15**	**15**
Correlation level	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy

- The laboratory sessions will be conducted in a computer lab equipped with necessary software and tools.
- Each experiment will consist of a theoretical introduction followed by practical implementation and analysis.
- Students will work individually or in small groups to complete the experiments.
- Instructors will provide guidance and support as needed, fostering an environment of active learning and collaboration.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Practical Document	Practical Test	Practical Examination
Portion	Part A Exercises	Part B Exercises	All Exercises	All Exercises	All Exercises
Duration	2Periods	2Periods	Regularly	3Hours	3Hours
Exam Marks	50	50	Each Practical 10Marks	100	100
Converted to	10	10	10	10	60
Internal Marks	40				60
Tentative Schedule	7^{th}Week	14^{th}Week	15^{th}Week	16^{th} week	

Note:

- **CA1 and CA2:** All the exercises/experiments as per the portions mentioned above should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below.

  The marks awarded will be converted to 10 Marks for each assessment test.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim & Circuit diagram	35
B	Execution and Result	15
TOTAL		**50**

- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.
- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded should be converted to 10 Marks for the internal assessment

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

PART	DESCRIPTION	MARKS
1	Aim (05), Circuit diagram for the experiment from Part-A (30)	35
2	Aim (05), Circuit diagram for the experiment from Part-B (30)	35
3	Execution of any one experiment from Part-A OR Part-B	25
4	Viva Voce	05
TOTAL		**100**

AIE5320	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
PRACTICAL		0	0	6	3

PART–A		
S.No	**PRACTICAL EXERCISES**	**Time (Hrs)**
1.	Construct a Python script for Breadth First Search and Depth First Search Algorithm.	6
2.	Implement a Python program to solve the 8-Puzzle Problem using Breadth-First Search (BFS).	6
3.	Write a Python program to solve the 8-Queens's problem using Backtracking.	6
4.	Formulate a Python program to find the shortest path in a graph between a given start node and a goal node using the A * Heuristic search Algorithm.	6
5.	Execute a Python Program to find the shortest path in a graph between a given start node and end node using the Memory Bounded A*(MA*)algorithm.	6
6.	Implement a Python program for tic-tac-toe game playing using Minimax decision-making algorithm.	6
7.	Develop a Python program to solve Alpha-Beta Pruning optimization technique.	6
PART–B		
CONTINUOUS ASSESSMENT–1 (PRACTICAL)		
8.	Create a Python Program to solve a Sudoku Puzzle using Constraint Satisfaction Problem(CSP)and backtracking	6
9.	Construct a Python script to solve the Water-Jug Problem using Breadth-First Search.	6
10.	Implement Python Program to solve Monkey Banana Problem usingDynamic programming.	6
11.	Execute a Python Program to Construct knowledge base for any use case and apply inferences in First Order Logic.	6
12.	Implement a Python Program to solve Naïve Bayes classification Models.	6
13.	Write a Python Program to implement Forward Chaining Algorithm.	6
14.	Execute a Python Program to Implement Natural Language Processing: Text pre-processing and sentiment analysis.	6
15.	Write a Python program to implement Genetic Algorithm for solving OneMax problem.	6
TOTAL HOURS		**90**

Suggested List of Students Activity

- **Python Programming Practice**: Students can engage in coding exercises to reinforce their Python skills, focusing on syntax, data structures, and basic algorithms.
- **Search Algorithms Implementation**: Students work on implementing various search algorithms such as depth-first search and breadth-first search to solve maze navigation problems.
- **Text Preprocessing and Sentiment Analysis**: Students preprocess text data by tokenization and stemming, and then implement sentiment analysis algorithms to classify the sentiment of movie reviews or social media posts.
- **Clustering Techniques Experiment**: Students apply clustering algorithms like K-means to segment datasets into clusters, such as grouping customers based on purchasing behavior.
- **Q-learning Algorithm Implementation**: Students develop a simple game environment and implement Q-learning to train an agent to navigate and collect rewards efficiently.
- **Image Processing and Feature Extraction**: Students apply image processing techniques to preprocess images and extract features for further analysis or classification tasks.
- **Convolutional Neural Network (CNN) Implementation**: Students build CNN models to classify images from datasets like CIFAR-10 or ImageNet into different categories.
- **Recurrent Neural Network (RNN) Experiment**: Students use RNNs to generate text or predict the next word in a sequence based on a given input.

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson Education, 2021.
2.	Natural Language Processing with Python	Steven Bird, Ewan Klein, and Edward Loper,	O'Reilly Media, 2009
3.	Bayesian Reasoning and Machine Learning	David Barber	Cambridge University Press, 2012.

Web-based/Online Resources

S.NO	WEBSITES/ LINK
1.	https://www.jupyter.org.
2.	https://www.coursera.org.
3.	https://www.edx.org. 119
4.	https://www.udacity.org.

Equipment / Facilities required to conduct the Practical Portion

Software Requirement:

S.NO.	SOFTWARE
1.	Install necessary software tools and libraries for AI development and experimentation, including programming environments **(e.g., Python)**, AI frameworks **(e.g., TensorFlow, PyTorch, OpenAI Gym library), and development tools (e.g.,Jupyter Notebook, Anaconda, PyCharm IDEs).**
2.	**High-Speed Internet Access**: Ensure reliable internet connectivity in the lab to download datasets, access online resources, and facilitate collaborative learning activities.

Hardware Requirement:

S.NO.	HARDWARE
1.	Desktop Computers / Laptop

AIE5320- ARTIFICIAL INTELLIHENCE LABORATORY

MODELQUESTIONPAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAMEOFTHEEXPERIMENTS	CO	PO
	PART - A		
1	Construct a Python script for Breadth First Search and Depth First Search Algorithm.	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Implement a Python program to solve the 8-Puzzle Problem using Breadth-First Search (BFS).	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Write a Python program to solve the 8-Queens's problem using Backtracking.	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Formulate a Python program to find the shortest path in a graph between a given start node and a goal node using the A * Heuristic search Algorithm.	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Execute a Python Program to find the shortest path in a graph between a given start node and end node using the Memory Bounded A*(MA*)algorithm.	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
6	Implement a Python program for tic-tac-toe game playing using Minimax decision-making algorithm.	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
7	Develop a Python program to solve Alpha-Beta Pruning optimization technique.	E5320.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
PART - B			
8	Create a Python Program to solve a Sudoku Puzzle using Constraint Satisfaction Problem(CSP)and backtracking	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Construct a Python script to solve the Water-Jug Problem using Breadth-First Search.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Implement Python Program to solve Monkey Banana Problem usingDynamic programming.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
11	Execute a Python Program to Construct knowledge base for any use case and apply inferences in First Order Logic.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
12	Implement a Python Program to solve Naïve Bayes classification Models.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
13	Write a Python Program to implement Forward Chaining Algorithm.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7

14	Execute a Python Program to Implement Natural Language Processing: Text pre-processing and sentiment analysis.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
15	Write a Python program to implement Genetic Algorithm for solving OneMax problem.	E5320.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7

SCHEME OF EVALUATION

End Semester Examination–Practical Exam

PART	DESCRIPTION	MARKS
1	Aim(05),Algorithm and Program from Part-A(30)	35
2	Aim(05),Algorithm and Program from Part-B(30)	35
3	Execution of any one experiment from Part-A OR Part-B	25
4	Viva voce	05
TOTAL		**100**

AIE5440 –FUNDAMENTALS OF MACHINE LEARNING

Programme Name : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
CourseCode : AIE5440
Semester : V SEMESTER
CourseTitle :FUNDAMENTALS OF MACHINE LEARNING
CourseType :PRACTICUM

L	T	P	C
2	0	2	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester:15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Autonomous Examination	Total	
FUNDAMENTALS OF MACHINE LEARNING	4	60	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	PARADIGMS OF MACHINE LEARNING	10
II	SUPERVISED LEARNING – REGRESSION	08
III	SUPERVISED LEARNING – CLASSIFICATION I	14
IV	SUPERVISED LEARNING – CLASSIFICATION II	18
V	UNSUPERVISED LEARNING – CLUSTERING	10
TOTAL HOURS		**60**

COURSE DESCRIPTION

Machine Learning (ML) is basically that field of computer science with the help of which computer systems can provide sense to data in much the same way as human beings do. In simple words, ML is a type of artificial intelligence that extract patterns out of raw data by using an algorithm or method. The key focus of ML is to allow computer systems to learn from experience without being explicitly programmed or human intervention. This subject introduces the basics concepts of machine learning and different algorithms used in machine learning. It covers how to do exploratory data analysis before model building. Several Visualization techniques and applying machine learning algorithms in different applications is covered in this course.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To understand the basic theory under lying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

COURSE OUTCOMES

On successful completion of this course, the student will be able to	
E5440.1	Understand a very broad collection of machine learning algorithms and problems.
E5440.2	Develop an appreciation for what is involved in learning from data.
E5440.3	Apply structured thinking to unstructured problems.
E5440.4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.
E5440.5	Appreciate the importance of visualization in the data analytics solution.

Pre-requisites: A basic course in linear algebra/probability/programming/algorithms is sufficient.

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5440.1	3	3	3	3	2	2	2	2	3	3
E5440.2	3	3	3	3	2	2	2	2	3	3
E5440.3	3	3	3	3	2	2	2	2	3	3
E5440.4	3	3	3	3	2	2	2	2	3	3
E5440.5	3	3	3	3	2	2	2	2	3	3
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**15**
Correlation Level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**3**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy

- **Engage and Motivate:** Instructors should actively engage students to boost their learning confidence.
- **Real-World Relevance:** Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- **Interactive Learning:** Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- **Application-Based Learning:** Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- **Encourage Critical Analysis:** Foster an environment where students can honestly assess experiment outcomes and analyse potential sources of error in case of discrepancies.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3Hours	3Hours
Exam Marks	60	60	100	100	100
Converted o	10	10	10	10	60
Marks	40				60
Tentative Schedule	7thWeek	14thWeek	15thWeek	16th week	

Note:

- **CA1andCA2:** All the exercises/experiments should be completed as per theportions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10Marksforeachassessment test.
- Practical document should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10Marksfor the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program fromPart– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(PartA or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE5440	FUNDAMENTALS OF MACHINE LEARNING	L	T	P	C
PRACTICUM		**2**	**0**	**2**	**3**

UNIT I	**PARADIGMS OF MACHINE LEARNING**	**[10 Hrs]**
THEORY		
Machine learning: Types of Machine Learning		[1 Hr]
Supervised Learning – Unsupervised Learning		[1 Hr]
Reinforcement Learning. Machine Learning Lifecycle		[1 Hr]
Gathering data–Data Preparation		[1 Hr]
Data Preprocessing–Analyze data		[1 Hr]
Train the model – Test the model – Deployment.		[1 Hr]
PRACTICAL		
Exercise 1: Write a python program to import and export data using Pandas library functions.		[2 Hrs]
Exercise 2: Demonstrate various data pre-processing techniques for a given dataset.		[2 Hrs]
UNIT II	**SUPERVISED LEARNING – REGRESSION**	**[8 Hrs]**
THEORY		
Linear methods		[3 Hrs]
Linear regression, Lasso and Ridge Regression.		[3 Hrs]
PRACTICAL		
Exercise 3: Write a program for house rent prediction using linear regression (can use any other prediction other than house rent)		[2 Hrs]
UNITIII	**SUPERVISED LEARNING – CLASSIFICATION I**	**[14 Hrs]**
THEORY		
K- Nearest Neighbor (KNN),		[3 Hrs]
Decision Tree, Naïve Bayes.		[3 Hrs]
PRACTICAL		
Exercise 4: Write a program to implement K – Nearest Neighbor algorithm to classify the given data set. Print both correct and wrong predictions.		[2 Hrs]
Exercise 5: Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.		[2 Hrs]
Exercise6: Implement Naïve Bayes Classification in Python.		[4 Hrs]
UNITIV	**SUPERVISED LEARNING – CLASSIFICATION II**	**[18 Hrs]**
THEORY		
Logistic Regression–Perceptron		[2 Hrs]
Support Vector Machines		[2 Hrs]
Ensemble Methods		[2 Hrs]

PRACTICAL **Exercise7:** Develop Logistic Regression Model for a given dataset. **Exercise 8:** Write a program to construct a Support Vector Machine considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set. **Exercise 9:** a) Implement Random Forest ensemble method on a given dataset. b) Implement Boosting ensemble method on a given dataset.	[4 Hrs] [4 Hrs] [4 Hrs]
UNITV **UNSUPERVISEDL EARNING – CLUSTERING**	**[10 Hrs]**
THEORY K–means Clustering, Principal Component Analysis (PCA)	[3 Hrs] [3 Hrs]
PRACTICAL **Exercise10:** a) Write a python program to implement K-Means clustering Algorithm. b) Implement Dimensionality reduction using Principle Component Analysis (PCA) method.	[2 Hrs] [2 Hrs]
TOTAL HOURS	**60**

Suggested List of Students Activity

- Students shall work in team on any socially relevant problem that needs a machine learning based solution, and evaluate the model performance.

Text Books for Reference: :

S.No	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Introduction to Machine Learning	Ethem Alpaydin	Second Edition, The MIT Press,2009.
2.	Mathematics for Machine Learning	Marc Peter Deisenroth,A. AldoFaisal, Cheng Soon Ong	Cambridge University Press, 2020.

Web-based/Online Resources

S.NO	WEBSITES/ LINKS
1.	IntroductiontoMachineLearning(Tamil):https://nptel.ac.in/courses/106106236
2.	Datasets: https://archive.ics.uci.edu/

Equipment / Facilities required to conduct the Practical Portion

Software Requirement:

S.NO.	SOFTWARE
1.	Operating System: Any Operating System which supports Python or R
2.	Software: Python or R.

Hardware Requirement:

S.NO.	HARDWARE
1.	Desktop Computers / Laptop
2.	Laser Printer

MODEL QUESTION PAPER

AIE5440– FUNDAMENTALS OF MACHINE LEARNIG

Time: [3 Hrs]. **Max. Marks:100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Write a python program to import and export data using Pandas library functions	E5440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	Demonstrate various data pre-processing techniques for a given dataset.	E5440.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Write a program for house rent prediction using linear regression (can use any other prediction other than house rent)	E5440.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	Write a program to implement K – Nearest Neighbor algorithm to classify the given data set. Print both correct and wrong predictions.	E5440.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.	E5440.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
	PART – B		
6	Implement Naïve Bayes Classification in Python.	E5440.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Develop Logistic Regression Model for a given dataset.	E5440.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Write a program to construct a Support Vector Machine considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set.	E5440.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	a) Implement Random Forest ensemble method on a given dataset. b) Implement Boosting ensemble method on a given dataset.	E5440.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	a) Write a python program to implement K-Means clustering Algorithm. b) Implement Dimensionality reduction using Principle Component Analysis (PCA) method.	E5440.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

SCHEME OF VALUATION		
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	Total	100

AIE5541- WEB ANALYTICS

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE5541
Semester : V SEMESTER
Course Title : WEB ANALYTICS
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
WEB ANALYTICS	5	75	40	100	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time (Hrs)
I	Introduction to Web Analytics	15
II	Data Collection and Setup	15
III	Analyzing Web Site Traffic	15
IV	Advanced Analytics Techniques	15
V	Application and Optimization	15
TOTAL HOURS		**75**

COURSE DESCRIPTION

Web analytics is the practice of collecting, analyzing, and interpreting data related to website user activity. It provides insights into user behavior, traffic sources, and key performance metrics, enabling informed decision-making for website optimization. By leveraging tools like Google Analytics, businesses can understand their online audience, track conversions, and enhance the overall user experience. Web analytics plays a crucial role in shaping digital strategies, improving marketing effectiveness, and maximizing online performance. In essence, it transforms raw data into action able in sights for optimizing websites and achieving organizational goals.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To equip students with the knowledge and skills necessary to effectively use web analytics tools, analyze data, and derive actionable insights to enhance the performance of websites and online platforms.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E5541.1	Understand the Web analytics
E5541.2	Identify Different Data Collection and Web Analytics Strategies
E5541.3	Apply Different Web Analytics Tools
E5541.4	Summarize Various Google Analytics and testing
E5541.5	Develop the knowledge and skills required to measure, monitor and optimize digital marketing activity.

Pre-requisites:

- Basic understanding of websites and online platforms
- Familiarity with basic internet concepts

CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5541.1	3	3	2	3	3	3	2	3	3	3
E5541.2	3	3	2	3	3	3	2	3	3	3
E5541.3	3	3	2	3	3	3	2	3	3	3
E5541.4	3	3	2	3	3	3	2	3	3	3
E5541.5	3	3	2	3	3	3	2	3	3	3
Total	**15**	**15**	**10**	**15**	**15**	**15**	**10**	**15**	**15**	**15**
Correlation level	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy

Foundational Concepts:

- **Lectures:** Begin with interactive lectures to introduce foundational concepts of web analytics, emphasizing its significance in digital strategies.
- **Demonstrations:** Conduct live demonstrations on setting up basic analytics tools, such as Google Analytics, to give students hands-on experience.

Hands-On Practice:

- **Lab Sessions:** Organize regular lab sessions where students can practice using web analytics tools, analyze sample data, and navigate dashboards.
- **Practical Assignments:** Assign small projects or exercises that require students to apply analytics techniques to real-world scenarios.

Case Studies and Application:

- **Real- World Cases:** Present case studies illustrating how organizations have used web analytics to make informed decisions and optimize their online presence.
- **Application Exercises:** Develop exercises where students apply analytics to solve specific business challenges, fostering critical thinking.

Assessment Methodology:

	Continuous Assessment (40marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th}Week	14^{th}Week	15^{th}Week	16^{th} week	

Note:

- **CA1and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.

- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents (As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:**All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE5541- WEB ANALYTICS

AIE5541	WEB ANALYTICS	L	T	P	C
PRACTICUM		1	0	4	3

Unit I INTRODUCTION TO WEB ANALYTICS	**[15 Hrs]**
THEORY	
Overview of Web Analytics–Importance of Data	[1Hr]
Driven Decision Making	[1Hr]
Key Metrics and Terminology	[1Hr]
Evolution of Web Analytics	[1Hr]
Commonly Used Analytics Tools.	[1Hr]
PRACTICAL	
Exercise1: Conduct Stop word elimination & Stemming Preprocessing text document using NLTK of Python.	[5 Hrs]
Exercise 2: Conduct Lemmatization, POS tagging & Lexical analysis Preprocessing text document using NLTK of Python.	[5 Hrs]
Unit II DATA COLLECTION AND SETUP	**[15 Hrs]**
THEORY	
Basics of Data Collection Techniques	[1Hr]
Introduction to Google Analytics	[1Hr]
Setting Up Google Analytics Account and Properties	[1Hr]
Configuring Views, Filters, and Goals	[1Hr]
Integrating Tracking Codes on Websites.	[1Hr]
PRACTICAL	
Exercise3: Setting Up and Configuring Web Analytics Tools.	[5 Hrs]
Exercise4: Conduct Sentiment analysis on customer review on products.	[5 Hrs]
Unit III ANALYZING WEB SITE TRAFFIC	**[15 Hrs]**
THEORY	
Understanding Website Traffic Metrics (Page views, Sessions, Users)	[1Hr]
Analyzing User Behavior (Bounce Rate, Time on Page, Exit Rate)	[1Hr]
Conversion Metrics and Goal Tracking	[1Hr]
Traffic Sources and Attribution Modeling	[1Hr]
Real-time Analytics.	[1Hr]
PRACTICAL	
Exercise 5: Conduct Web analytics on Web usage data (web server log data, click stream analysis)	[5 Hrs]
Exercise 6: Conduct Web analytics on Hyperlink data.	[5 Hrs]

Unit IV	ADVANCED ANALYTICS TECHNIQUES	[15 Hrs]
THEORY Segmenting Users for Deeper Insights Cohort Analysis and User Retention Event Tracking and Custom Dimensions Enhanced E-commerce Tracking A/B Testing.		 [1Hr] [1Hr] [1Hr] [1Hr] [1Hr]
PRACTICAL **Exercise 7:** Use Google analytics tools to implement the Conversion Statistics. **Exercise 8:** Use Google analytics tools to implement the Visitor Profiles.		 [5 Hrs] [5 Hrs]
UNIT V	**APPLICATION AND OPTIMIZATION**	**[15 Hrs]**
THEORY Practical Applications of Analytics Insights User Experience Optimization Mobile Analytics and Responsive Design Privacy Considerations and Ethical Practices Emerging Trends in Web Analytics.		 [1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 9 :** Use Google analytics tools to implement the Traffic Sources. **Exercise 10 :** Use Google analytics tools to implement Real-Time Data Analysis.		 [5 Hrs] [5 Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

1. **Traffic Source Analysis:**
   Objective: Analyze the traffic sources of a given website using Google Analytics.
   Activity: Students will identify and report on the proportion of traffic coming from organic search, direct, referral, and paid sources. They can explore how different traffic sources impact key metrics.

2. **A/B Testing Simulation:**
   Objective: Simulate an A/B testing scenario for a web page element.
   Activity: Students will create two variations of a webpage element (e.g., CTA button), implement A/B testing using tools like Google Optimize, and analyze the results. This hands-on exercise helps them understand the impact of changes on user behavior.

3. **Real-world Analytics Project:**
   Objective: Conduct a comprehensive web analytics project for a chosen website.
   Activity: Students will choose a real website and go through the entire process, from setting up analytics and data collection to analyzing the data and providing action able recommendations.Thisactivitymimicsareal-worldscenarioandenhancespractical skills.

4. **Interactive Dashboard Creation:**
   Objective: Create an interactive analytics dashboard using visualization tools.
   Activity: Students will use tools like Google Data Studio or Table auto create a dashboard that visualizes key metrics from a dataset. This activity enhances their data visualization skills and prepares them for presenting insights in a clear and engaging manner.

Text book for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Practical web analytics for user experience: How Analytics can help you understand your users.	Beasley, M.	Morgan Kaufmann Publishers. 2013
2.	Web analytics 2.0: The art of online accountability & science of customer centricity,	Avinash Kaushik.	1st Edition, John Wiley & Sons, Inc., 2009
3.	Web Analytics: An Hour a Day	Avinash Kaushik	1st Edition, Publisher Indianapolis, Ind. :Sybex, 2007

Web-based/Online Resources:

S.NO	WEBSITES / LINKS
1.	https://www.hotjar.com/web-analytics/tools/
2.	https://www.ietf.org/policies/web-analytics/

Equipment / Facilities required to conduct the Practical Portion
Hardware Requirement

S.NO	HARDWARE
1.	Desktop / Laptop Computers with internet connection
2.	Printer

AIE5541- WEB ANALYTICS

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Conduct Stop word elimination & Stemming Preprocessing text document using NLTK of Python.	E5541.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Conduct Lemmatization, POS tagging & Lexical analysis Preprocessing text document using NLTK of Python.	E5541.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Setting Up and Configuring Web Analytics Tools.	E5541.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Conduct Sentiment analysis on customer review on products.	E5541.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Conduct Web analytics on Web usage data (web server log data, click stream analysis)	E5541.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
PART - B			
6	Conduct Web analytics on Hyperlink data.	E5541.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
7	Use Google analytics tools to implement the Conversion Statistics.	E5541.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Use Google analytics tools to implement the Visitor Profiles.	E5541.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Use Google analytics tools to implement the Traffic Sources.	E5541.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Use Google analytics tools to implement Real-Time Data Analysis	E5541.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

	SCHEME OF VALUATION	
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE5542- CLOUD COMPUTING & IOT

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE5542
Semester : V SEMESTER
Course Title : CLOUD COMPUTING & IOT
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
CLOUD COMPUTING & IOT	5	75	40	100	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time(Hrs)
I	Cloud Computing	3
II	Virtualization	4
III	Web Services and cloud Service Providers	4
IV	Security in the Cloud	34
V	Internet of Things (IoT)	30
TOTAL HOURS		**75**

COURSE DESCRIPTION

This course will introduce the emerging technology cloud computing and Internet of Things. The advantages of cloud services and IOT will give the students the much- needed exposure to the current trend and also a hands- on experience to the students in working with different cloud platform, also enables students in designing and developing Internet of Things applications and models.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- Introduce the concept of virtualization.
- Outline the concepts of cloud computing.
- Summarize the different types of web services and cloud service providers.
- Elaborate the security issues in cloud.
- Present the cloud applications.
- Enable the students to understand the basic concepts of Internet of Things

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E5542.1	Interpret the concept of virtualization.
E5542.2	Differentiate various cloud services.
E5542.3	Work with the different cloud service providers.
E5542.4	Describe the security issues with cloud and security policies.
E5542.5	Interface sensors with micro controllers.

Pre-requisites:

- The student should have taken up Computer Networks and Security.
- The student should have the basic Knowledge about network protocols.

CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5542.1	3	2	2	3	3	3	3	3	3	2
E5542.2	3	2	2	3	3	3	3	3	3	2
E5542.3	3	2	2	3	3	3	3	3	3	2
E5542.4	3	2	2	3	3	3	3	3	3	2
E5542.5	3	2	2	3	3	3	3	3	3	2
Total	**15**	**10**	**10**	**15**	**15**	**15**	**15**	**15**	**15**	**10**
Correlation level	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy:

- The teacher can use experiential learning as an instructional strategy both in and outside the classroom.
- It may be necessary for the teacher to pre-teach the skills and processes necessary to achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entire class can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform a teacher guided image into several others of their own creation.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7thWeek	14thWeek	15thWeek	16th week	

Note:

- **CA1andCA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10Marksforeachassessment test.
- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10Marksfor the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents(As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE5542- CLOUD COMPUTING &IOT

AIE5542	CLOUD COMPUTING & IOT	L	T	P	C
PRACTICUM		1	0	4	3

UNIT I	**CLOUD COMPUTING**	**[3 Hrs]**
Characteristics of Cloud – Benefits – limitations– Cloud Deployment Models		[1 Hr]
Cloud service models – Infrastructure as a service (IaaS), Platform as a Service (PaaS) ,Software as a Service (SaaS),Anything as a Service (XaaS)–SPIVs.		[1 Hr]
Traditional IT Models–Cloud Data Centers.		[1 Hr]
UNIT II	**VIRTUALIZATION**	**[4Hrs]**
Virtualization, Hypervisors, Types of hypervisors.		[1 Hr]
Virtualization techniques– para virtualization– full virtualization		[2 Hrs]
Hardware assisted virtualization –hybrid virtualization.		[1 Hr]
UNIT III	**WEB SERVICES AND CLOUD SERVICE PROVIDERS**	**[4 Hrs]**
Web Services and its types, Google compute engine, Google App Engine, Amazon–		[2 Hrs]
Amazon Elastic Compute Cloud–Amazon Simple DB–		[1 Hr]
Amazon Simple Storage Service (S3) – Amazon Cloud Front.		[1 Hr]
UNIT IV	**SECURITY IN THE CLOUD**	**[4 Hrs]**
Storage Location and Tenancy–Cloud Security Challenges		[1 Hr]
CSA Reference Model–Security Policies and Implementation		[2 Hrs]
Virtualization Security Management.		[1 Hr]

Exercise	Name of Experiment (PART–A)	[30 Hrs]
1	Create a professional portfolio using Google Slides.	[5 Hrs]
2	Use Google Drive as Storage as a Service to Store, Organize, Share and Collaborate.	[5 Hrs]
3	Install Virtual box/ VM ware Workstation with different flavours of Linux or windows OS on top of existing OS.	[5 Hrs]
4	Install a PaaS Engine (Google App Engine/ AWS/ Azure or any One PaaS Engine) and creates simple web applications using python/java.	[5 Hrs]
5	Protect Google Sheets and Range with various access permissions.	[5 Hrs]

6	Create/Launch an instance in AWS/Open Stack and add a Security group for the created instance and connect/ access the created instance from local computer using SSH.	[5 Hrs]
UNITV	**INTERNET OF THINGS (IOT)**	**[6Hrs]**
Internet of Things–Sensors–Actuators–Micro Controllers Introduction to Arduino Board and Arduino IDE–Arduino Programming.		[3 Hrs] [3 Hrs]
Exercise	**Name of Experiment (PART–B)**	**[24Hrs]**
1	Write an Arduino program to display "Hello World" in LCD16×2 Display	[6 Hrs]
2	Write an Arduino program to create different led patterns and controlling them using push button switches.	[6 Hrs]
3	Write an Arduino program to control servo motor.	[6 Hrs]
4	Write an Arduino program to calculate the distance to an objectWith the help of an ultrasonic sensor and display it on an LCD.	[6 Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

- Presentation / Seminars by students on any recent technological developments based on the course.
- Micro project that shall be an extension of any practical lab exercise to real-world application.

Text book for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Cloud Computing: Implementation, Management and Security	John W Ritting house and James F. Ransome	CRC Press, 2017.
2.	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, S.ThamaraiSelvi	Tata McGrawHill,2013.
3.	Internet of Things - A Hands-On Approach	ArsheepBahga, Vijay Madisetti	Universities Press, First Edition, 2015.
4.	Internet of Things	Raj Kamal	McGraw Hill Education; First edition, 2017.

Web-based/Online Resources:

S.NO	WEBSITES
1.	https://www.virtualbox.org/
2.	https://cloud.google.com/appengine/
3.	https://www.seanmcilvenna.com/2018/03/26/setting-up-a-java-development-vm-with-virtualbox/
4.	Arduino IDE: https://www.arduino.cc/en/IoT/HomePage
5.	Wokwi Simulator: https://wokwi.com/

Equipment / Facilities required to conduct the Practical Portion
Hardware Requirement

S.NO	HARDWARE
1.	Work station with Intel – Core i5 Processor, 16 GB RAM, 500 GB SSD – 30 Numbers
2.	Internet connectivity (100Mbpsormore) for all 30systems
3.	Arduino kit–10 Numbers
4.	LED Lights–10 Numbers
5.	330 K Resistor–10 Numbers
6.	Push Button–10 Number
7.	ServoMotor5VDC–10 Numbers
8.	Joystick–10 Numbers
9.	Ultrasonic Sensor –10 Numbers
10.	16×2 LCD Display–10 Numbers
11.	PIR Sensor–10 Numbers
12.	Buzzer–10 Numbers
13.	IRSensor–10 Numbers
14.	LDR–10 Numbers
15.	LM35 Temperature Sensor–10 Numbers
16.	5V DC Relay–10 Numbers
17.	Mini Bread Board–10 Numbers
18.	Jumper Wires
19.	DataCables–10 Numbers

Software Requirement

S.NO	SOFTWARE
1.	Virtual Box/VM Ware player
2.	Arduino IDE
3.	Wokwi Simulator

SCHEME OF VALUATION		
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Execution of the experiment from Part–A or Part–B	25
4	Viva Voce	5
TOTAL MARKS		**100**

AIE5542-CLOUD COMPUTING & IOT

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Create a professional portfolio using Google Slides.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Use Google Drive as Storage as a Service to Store, Organize, Share and Collaborate.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Install Virtual box/ VM ware Workstation with different flavours of Linux or windows OS on top of existing OS.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Install a PaaS Engine (Google App Engine/ AWS/ Azure or any One PaaS Engine) and creates simple web applications using python/java.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Protect Google Sheets and Range with various access permissions.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
6	Create/Launch an instance in AWS/Open Stack and add a Security group for the created instance and connect/ access the created instance from local computer using SSH.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
	PART - B		
7	Write an Arduino program to display “Hello World” in LCD16×2Display	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Write an Arduino program to create different led patterns and controlling them using push button switches.	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Write an Arduino program to control servo motor.	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Write an Arduino program to calculate the distance to an object With the help of an ultrasonic sensor and display it on an LCD.	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

	SCHEME OF VALUATION	
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE5544 - MULTIMEDIA SYSTEMS

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE5544
Semester : V SEMESTER
Course Title : MULTIMEDIA SYSTEMS
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
MULTIMEDIA SYSTEMS	5	75	40	100	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time (Hrs)
I	INTRODUCTION TO MULTIMEDIA	3
II	TEXT	9
III	IMAGES	21
IV	SOUND	15
V	VIDEO & ANIMATION	27
	TOTAL HOURS	**75**

COURSEDESCRIPTION

Multimedia application is the combined use of text, images, graphics, animation and video which can be used for business, education and entertainment. This practicum course prepares students to use digital multimedia for communication, creativity, collaboration and critical thinking. It also enables the students to implement their creativity to produce variety of multimedia objects using different multimedia software tools.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- Understand the basic concepts of multimedia systems.
- Introduce various aspects of multimedia components like Images, audio, video, graphics and animation.
- Gain knowledge on Image, audio and video editing software tools.
- Provide hands-on experience through a series of practical skill building tasks and exercises.
- Develop multimedia applications using various tools.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E5544.1	Analyze the key components of multimedia systems.
E5544.2	Design an image and edit images using image editing tools.
E5544.3	Apply audio and video editing using different editing tools
E5544.4	Create an animation using animation tools.
E5544.5	Apply acquired knowledge in the relevant field for the good cause.

Pre-requisites: NIL
CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5544.1	3	3	3	3	3	3	2	3	3	3
E5544.2	3	3	3	3	3	3	2	3	3	3
E5544.3	3	3	3	3	3	3	2	3	3	3
E5544.4	3	3	3	3	3	3	2	3	3	3
E5544.5	3	3	3	3	3	3	2	3	3	3
Total	**15**	**15**	**15**	**15**	**15**	**15**	**10**	**15**	**15**	**15**
Correlation level	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- In addition to traditional lecture method, different types of teaching methods and media are to be employed to develop the outcome.
- Guide students to create multimedia objects and applying it in relevant application.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th}Week	14^{th}Week	15^{th}Week	16^{th} week	

Note:

- **CA1andCA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10Marksforeachassessment test.
- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10Marksfor the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents(As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:**All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE5544- MULTIMEDIA SYSTEMS

AIE5544 PRACTICUM	MULTIMEDIA SYSTEMS	L	T	P	C
		1	0	4	3

UNIT I	**INTRODUCTION TO MULTIMEDIA**	**[3 Hrs]**
Definition of Multimedia, Multimedia applications, Multimedia elements,		[1 Hr]
Transition from conventional media to digital media		[1 Hr]
Delivering of Multimedia product, copy rights		[1 Hr]
UNIT II	**TEXT**	**[9 Hrs]**
THEORY		
Usage of text in multimedia, Fonts and Faces		[1 Hr]
Hypermedia documents and Hypertext, Hypermedia Structures		[1Hr]
Hypertext Tools, Text Editing and Word Processing Tools, OCR Software		[1 Hr]
PRACTICAL		
Exercise 1: Design a poster with different text effects using suitable software		[6 Hrs]
UNIT III	**IMAGES**	**[21 Hrs]**
THEORY:		
Introduction to image, Making Still Images, Image editing tools,		[1Hr]
Color: Understanding Natural Light and Color, Color models, Color Palettes, Dithering, 2Dgraphics,		[1 Hr]
Image compression and file formats: GIF, JPEG, JPG, PNG, TIFF, EXIF,PS,PDF.		[1 Hr]
PRACTICAL		
Exercise 2: Convert the given image into pencil sketch using suitable photo editing software.		[6 Hrs]
Exercise 3: Create a two or more partial scanned images of large poster/photo. Create a panoramic view of multiple photos by stitching together them using any panorama software.		[6 Hrs]
Exercise 4: Using photo editor software and/or GIF creator software create an animation such as a flying balloon		[6 Hrs]
UNIT IV	**SOUND**	**[15Hrs]**
THEORY:		
PRACTICAL		
Exercise 5: Use suitable software to (a) compress / decompress audio files. (b) convert audio to different formats (c) split, join, rip audio.		[6 Hrs]

Exercise 6: Use an audio processing software and perform the audio editing tasks – Import audio, select and edit the sound, create fade-in fade-out effects, label audio segments, use noise remove filter, mix audio, change stereo to mono tracks, export audio to different format and save.	[6 Hrs]
UNIT V **VIDEO & ANIMATION**	**[27 Hrs]**
THEORY: Video basics – How video works, Analog Video, Digital Video, Video file formats, Shooting and Editing Video. Principle of animations, animation techniques, animation file formats. Basics of multimedia authoring.	 [1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 7:** Use a video processing software to perform – Trim video clips, crop video, rotate video, join video, add subtitles, edit video dimension, bit rate, frame rate, sample rate, channel, and video/audio quality tasks on a video. **Exercise 8:** Create a movie from video clips to demonstrate audio-video mixing, music, video effects, video transitions and titles. **Exercise 9:** Sketching of cartoon characters using suitable software. **Exercise 10:** Create a 2D animation of an aeroplane take off using suitable Software.	 [6 Hrs] [6 Hrs] [6 Hrs] [6 Hrs]
TOTAL HOURS	**75 Hrs**

Suggested List of Students Activity

- Presentation / Seminars by students on any recent technological developments based on the course.
- Periodic class quizzes conducted on a weekly/fortnightly based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text book for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Fundamental of Multimedia,	Multimedia: Making It Work	Second Edition, Pearson Education, 2014.
2.	Multimedia: Making It Work	Tay Vaughan	Ninth Edition, Tata-McGrawHill, 2014.

Web-based/Online Resources:

S.NO	WEBSITES
1.	https://helpx.adobe.com/in/photoshop/using/tools.html

Equipment / Facilities required to conduct the Practical Portion
Hardware Requirement

S.NO	HARDWARE
1.	Desktop Computers
2.	Printer

Software Requirement

S.NO	SOFTWARE
1.	Windows / Linux Operating System
2.	**Software tools:** open-source software or commercial software. The following list is a suggestive list of open-source software and their commercial replacement. Experiments may be done using either opens-source or commercial software. open-source software is preferred.
3.	**List of Softwares** **1. 2D Graphics and Animation** a) Open-Source: OpenToonz, Pencil2D, Blender, Powtoon b) Commercial software: Adobe Flash **2. Audio Players** a) Open-Source: CoolPlayer, MPC-HC, Zing 4g Mp3 Player b) Commercial software: Windows Media Player **3. Audio Recorders and Editors** a) Open-Source: Audacity, Traverso, Qtractor,Frinika b) Commercial: Sonar X1, ACID music studio, Adobe Audition **4. Multimedia Players** a) Open-Source: VLC Media Player, Kodi, Mplayer, MediaPortal b) Commercial: Windows Media Player **5. Video Editing** a) Open-Source: OpenShot,Shotcut, Lightworks, Cinelerra, Kdenlive b) Commercial: Adobe Premiere Pro CS6

	6. Video File Conversion a) Open-Source: DVDStyler, DVD Flick, HandBrake, ffdshow b) Commercial: Movavi Video Converter, Zamzar, Windows Movie Maker

SCHEME OF VALUATION		
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Execution of the experiment from Part–A or Part–B	25
4	Viva Voce	5
TOTAL MARKS		**100**

AIE5544- MULTIMEDIA SYSTEMS

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Design a poster with different text effects using suitable software	E5542.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Convert the given image into pencil sketch using suitable photo editing software.	E5542.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Create a two or more partial scanned images of large poster/photo. Create a panoramic view of multiple photos by stitching together them using any panorama software.	E5542.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Using photo editor software and/or GIF creator software create an animation such as a flying balloon.	E5542.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Use suitable software to (a) compress / decompress audio files. (b)	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
6	Use an audio processing software and perform the audio editing tasks – Import audio, select and edit the sound, create fade-in fade-out effects, label audio segments, use noise remove filter, mix audio, change stereoto mono tracks, export audio to different format and save.	E5542.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
	PART - B		
7	Use a video processing software to perform – Trim video clips, crop video, rotate video, join video, add subtitles, edit video dimension, bit rate, frame rate, sample rate, channel, and video/audio quality tasks on a video	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Create a movie from video clips to demonstrate audio-video mixing, music, video effects, video transitions and titles.	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Sketching of cartoon characters using suitable software.	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Create a 2D animation of an aeroplane take off using suitable software.	E5542.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

	SCHEME OF VALUATION	
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE5546 - ROBOTIC PROCESS AUTOMATION

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE5546
Semester : V SEMESTER
Course Title : ROBOTIC PROCESS AUTOMATION
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
ROBOTIC PROCESS AUTOMATION	5	75	40	100	100	3 Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time (Hrs)
I	RPA TOOL INTRODUCTION	15
II	BASIC PROGRAMMING CONCEPTS	15
III	ADVANCED AUTOMATION CONCEPTS & TECHNIQUES	21
IV	HANDLING USER EVENTS & EXCEPTION HANDLING	09
V	DEPLOYING AND MANAGING THE BOT	15
TOTAL HOURS		**75**

COURSE DESCRIPTION

In today's digital landscape, businesses are employing automation more and more to increase productivity, streamline operations and reduce cost. This technology revolution is being led by Remote Process Automation, or RPA, which offers powerful tools and techniques to automate repetitive tasks and workflows across various industries. This syllabus is designed to provide students with hands – on experience and comprehensive understanding of Remote Process Automation.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- Understand the fundamentals of RPA tools, including their features and user interface.
- Master the concept of variables in UiPath, covering various variable types.
- Gain proficiency in basic programming concepts such as control flow, including if – else statements, loops, and advanced control flow structures, through hands-on experience in UiPath Studio.
- Develop skills in advanced automation techniques including recording, table extraction, selectors, and automation of Excel and PDF files using UiPath.
- Learn how to build and manipulate data tables both statically and dynamically using UiPath, including techniques such as data scraping for dynamic table creation.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E5546.1	Download, install, and activate UiPath Studio, and gain proficiency in using the tool to develop RPA solutions.
E5546.2	Demonstrate a deep understanding of variables in UiPath, including their types and management best practices, allowing them to handle data effectively within automation workflows
E5546.3	Identify and apply Image, Text, and Data Tables Automation.
E5546.4	Handle User Events and various types of Exceptions effectively.
E5546.5	Deploy and maintain Robots efficiently.

Pre-requisites: NIL

CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5546.1	3	3	3	3	3	3	3	2	3	3
E5546.2	3	3	3	3	3	3	3	2	3	3
E5546.3	3	3	3	3	3	3	3	2	3	3
E5546.4	3	3	3	3	3	3	3	2	3	3
E5546.5	3	3	3	3	3	3	3	2	3	3
Total	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**10**	**15**	**15**
Correlation level	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Instructional Strategy:

- Understanding RPA Concepts: Begin by introducing learners to the basic concepts of RPA, including its definition, benefits, and common use cases across different industries. Explain the difference between attended and unattended automation and introduce key RPA tools and platforms.
- Interactive Learning: Utilize interactive learning methods such as quizzes, polls, and group discussions to reinforce learning and promote engagement.
- Real-world Examples: Incorporate real-world examples and case studies to illustrate how RPA tools are used in various industries and scenarios. Showcasing practical applications will enhance understanding and highlight the relevance of RPA skills in the job market.
- Peer Learning: Encourage participants to exchange ideas, review each other's work, and provide constructive feedback.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7thWeek	14thWeek	15thWeek	16th week	

Note:

- **CA1andCA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10Marksforeachassessment test.
- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10Marksfor the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents(As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:**All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE5546 -ROBOTIC PROCESS AUTOMATION

AIE5546	ROBOTIC PROCESS AUTOMATION	L	T	P	C
PRACTICUM		1	0	4	3
UNIT I	**RPA TOOL INTRODUCTION**				**[15 Hrs]**
THEORY:					
Introduction to RPA Tools and User Interface – Overview of popular RPA tools and their features – Understanding the user interface of RPA tools.					[1Hr]
Variables: Types – Generic Value Variables – Text Variables – True or False Variables					[1 Hr]
Number Variables – Array Variables – Date and Time Variables – Data Table Variables Naming Best Practices and Management.					[1Hr]
PRACTICAL:					
Exercise 1: Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA (Variables, arguments and Control flow etc.)					[6Hrs]
Exercise 2: Write a program to empty the trash folder in Gmail.					[6Hrs]
UNIT II	**BASIC PROGRAMMING CONCEPTS**				**[15 Hrs]**
THEORY					
Control flow concepts – If Else Statements – Loops – Advanced Control Flow					[1 Hr]
Sequences – Flowcharts – Control Flow Activities – The Assign Activity					[1Hr]
The Delay Activity – The Do While Activity					[1 Hr]
The If Activity – The Switch Activity –					[1 Hr]
The While Activity – The For Each Activity – The Break Activity.					[1 Hr]
PRACTICAL					
Exercise 3: Write a program in UI Path that utilizes the If activity and Switch activity to find the smallest and largest numbers in an array.					[5Hrs]
Exercise 4: Write a program in UI Path that utilizes the While activity, Do-While activity, and For-Each activity to increment an integer variable from 5 to 50 in increments of 5.					[5 Hrs]
UNIT III	**ADVANCED AUTOMATION CONCEPTS & TECHNIQUES**				**[21 Hrs]**
THEORY					
Recording Introduction – App / Web Recording – Table Extraction – Selectors					[1Hr]
Excel Automation: Basics, Information Retrieval in Data Tables					[1 Hr]

Data Manipulation in excel – PDF Automation: Extracting Data from PDF Extracting a single piece of data – Anchors – Using anchors in PDF		[1 Hr]
PRACTICAL **Exercise 5:** Write a program to (i) build a data table(static) (ii) build a data table using data scraping (Dynamically). **Exercise 6:** Write a program to read an Excel file and creating a data table by using data from the Excel file. **Exercise 7:** Write a program to demonstrate the concept of dynamic elements in UIPath selectors.		[6 Hrs] [6 Hrs] [6 Hrs]
UNIT IV	**HANDLING USER EVENTS & EXCEPTION HANDLING**	**[9 Hrs]**
THEORY: Triggers: Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - An example of monitoring email. Exception Handling - Strategies for handling errors and exceptions Implementing error - catching mechanisms in RPA workflows.		[1 Hr] [1 Hr] [1 Hr]
PRACTICAL **Exercise 8:** Write a program to demonstrate email automation. (Note: use triggers and exception handling)		[6 Hrs]
UNIT V	**DEPLOYING AND MANAGING THE BOT**	**[15 Hrs]**
THEORY: Orchestrator overview for Automation Developers –Working with Orchestrator Resources. Managing packages – Uploading packages – Deleting packages.		[1 Hr] [2Hrs]
PRACTICAL **Exercise 9:** Create an automation project in UiPath studio and publish and control the same using uipath orchestrator. **Exercise 10:** Write a program to demonstrate manage package, upload package and deleting package for a reusable component.		[6 Hrs] [6 Hrs]
TOTAL HOURS		**75 Hrs**

Suggested List of Students Activity

- Presentation / Seminars by students on any recent technological developments based on the course.
- Periodic class quizzes conducted on a weekly/fortnightly based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text book for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Learning Robotic Process Automation	Alok Mani Tripath	Packt Publishing, 2018.
2.	Introduction to Robotic Process Automation: a Primer	Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston,	Institute of Robotic Process Automation, First Edition 2015.
3.	Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”	Richard Murdoch,	Independently Published, First Edition 2018.

Web-based/Online Resources:

S.NO	WEBSITES
1.	https://www.uipath.com/rpa/robotic-process-automation
2.	https://www.academy.uipath.com

Equipment / Facilities required to conduct the Practical Portion
Hardware Requirement

S.NO	HARDWARE
1.	Desktop Computers

S.NO	SOFTWARE
1.	UIPath Studio.

AIE5546 -ROBOTIC PROCESS AUTOMATION

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA (Variables, arguments and Control flow etc.)	E5546.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Write a program to empty the trash folder in Gmail.	E5546.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Write a program in UI Path that utilizes the If activity and Switch activity to find the smallest and largest numbers in an array.	E5546.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Write a program in UI Path that utilizes the While activity, Do-While activity, and For-Each activity to increment an integer variable from 5 to 50 in increments of 5.	E5546.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Write a program to (i) build a data table(static) (ii) build a data table using data scraping (Dynamically).	E5546.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
6	Write a program to read an Excel file and creating a data table by using data from the Excel file.	E5546.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
	PART - B		
7	Write a program to demonstrate the concept of dynamic elements in UIPath selectors.	E5546.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Write a program to demonstrate email automation. (Note: use triggers and exception handling)	E5546.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Create an automation project in UiPath studio and publish and control the same using uipath orchestrator.	E5546.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Write a program to demonstrate manage package, upload package and deleting package for a reusable component.	E5546.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

	SCHEME OF VALUATION	
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE5654 - INNOVATION AND STARTUP

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE5654
Semester : V SEMESTER
Course Title : INNOVATION AND STARTUP
Course Type : PRACTICUM

L	T	P	C
1	0	2	2

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
INNOVATION AND STARTUP	3	45	40	100*	100	3Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

Unit	Topics	Time (Hrs)
I	INTRODUCTION TO INNOVATION	6
II	INCUBATION CLUBS, IPR, PATENTS AND COPYRIGHTS	6
III	GOVERNMENT AND NON-GOVERNMENT FUNDING SCHEMES FOR START-UPS	6
IV	SEMINAR	9
V	EXPOSURE TO INDUSTRY	18
TOTAL HOURS		**45**

COURSEDESCRIPTION

The integration of Innovation and Start-ups concept within the syllabus is testament to the forward thinking nature of educational institutions. By introducing this concept, students are provided with a solid foundation upon which they can build their skills in Innovation and Start-ups. This course can bridge the gap between theory and practice. It allows students to apply the knowledge they have acquired in a real world context, thereby enhancing their understanding and retention of the above concept. This experimental learning approach not only fosters a deeper level of engagement but also trains student with practical skills necessary to navigate the complexities of the business world. This also empowers students to become an Innovator or Entrepreneur. With necessary tools and knowledge, educational institutions are preparing the next generation of entrepreneurs to tackle the challenges and opportunities that lie ahead. This syllabus will explore the different facets of innovation, including its importance, types and strategies for fostering a culture of innovation within organizations.

COURSE OBJECTIVES

The objective of this course is to enable the student to

- To understand the concept of Innovation and Start-ups.
- To acquire knowledge of Prototype development, IPR, Patents and Copyrights.
- To have the practical experience in preparing Business plan for Start-ups.
- To visit the existing nearby industry to prepare project report about the present challenges of that industry.
- To know the different funding supports available from Government and Non Government schemes for Start-ups.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E5654.1	Differentiate between Innovation and Start-ups.
E5654.2	Explain the importance of IPR, Patents and Copyrights.
E5654.3	Describe the methodology to be adopted for preparing the Business Plan.
E5654.4	Gain practical experience by Industrial training and visiting the nearby industry.
E5654.5	Explore and identify various funding facilities available from Government and Non-Government Schemes for Start-ups.

Pre-requisites: There are no specific prerequisites for this course, although a basic understanding of business and technology concepts would be beneficial.

CO-POs & PSOs Mapping matrix:

CO/POs & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5654.1	3	2	2	3	3	2	3	3	3	2
E5654.2	3	2	2	3	3	2	3	3	3	2
E5654.3	3	2	2	3	3	2	3	3	3	2
E5654.4	3	2	2	3	3	2	3	3	3	2
E5654.5	3	2	2	3	3	2	3	3	3	2
Total	**15**	**10**	**10**	**15**	**15**	**10**	**15**	**15**	**15**	**10**
Correlation level	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Class Assessment (Unit I,II & Unit III)	Seminar Presentations (Unit IV)	Submission of Industry Visit Project Report (Unit V)	Practical Examination (Project)
Duration	2 hours	-	-	3 hours
Exam Marks	50	20	30	100
Converted to	10	10	20	60
Marks	10	10	20	60

Continuous Assessment - 40 marks

S. No	Description	Marks
CA1 i) ii)	**Class Assessment (50 marks) - Unit – I, II & III** Written Examination - Theory Questions 10 questions out of 15 questions (10 x 3 marks :30 marks) 4 questions out of 6 questions (4 x 5 marks : 20 marks)	10 marks
CA 2	**Seminar Presentations (20 marks- each topic carries 10 marks) - Unit IV** Students should present any two topics with PPTs	10 marks
CA 3	Submission of Industry Visit Project Report - **(30 marks) - Unit V**	20 marks
	Total	**40 marks**

End Semester Examination –Project Exam

Students should be assessed for 100 Marks both by the internal examiner and externalexaminer appointed by the Chairperson Autonomous of Examinations.

Detailed Allocation of Marks

S. No	Description	Marks
Part A i) ii)	Written Examination – Unit –I,II & IIITheory Questions 10 questions out of 15 questions (10 x 3 marks = 30 marks) 3 questions either or pattern (3 x 5 marks = 15 marks)	45
Part B i)	Presentation of Industry Visit Project Report	25
ii)	Interaction and Evaluation	30
TOTAL		**100**

AIE5654 – INNOVATION AND STARTUP

AIE5654	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2
Unit I	**INTRODUCTION TO INNOVATION**	**[6 Hrs]**			
An Introduction to Innovation and Creativity- Innovation in current Environment – Types of Innovation – Challenges of Innovation - Steps of Innovation Management- Divergent v/s Convergent thinking – Design thinking and Entrepreneurship		[1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr]			
Unit II	**INCUBATION CLUBS, IPR, PATENTS AND COPYRIGHTS**	**[6 Hrs]**			
Idea Generation - Incubation Clubs – Prototype Development - Marketing of Innovation – Management of Innovation – Creation of IPR -Types of IPR – Patents and Copyrights - Patents in India – Technological and Non-Technological Innovation Process.		[1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr]			
Unit III	**GOVERNMENT AND NON-GOVERNMENT FUNDING SCHEMES FORSTART-UPS**	**[6 Hrs]**			
An introduction to Start-up – Start-ups in India – Procedure for registration of Start- ups – Business Model- Business Plan – Case Studies - Opportunities and Challenges – Funding supports from Government Schemes – MUDRA, TANSEED, NEEDS, PMEGP, UYEGP – Non-Government Schemes - CSR Fund - Angel Investors - Venture Capitalist		[1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr] [1 Hr]			
Unit IV	**SEMINAR**	**[9 Hrs]**			
All the students have to select a minimum of 2 topics from the list given below. They are expected to collect the resources with the help of faculty assigned to them to prepare PPTs for presentation 1. Idea Generation 2. Innovation Management 3. Product Development 4. Business Model Innovation 5. Organizational Culture and Change Management		[9 Hrs]			

<table>
<tr><td colspan="2">6. Leadership and Innovation.
7. Barriers to Innovation.
8. Innovation Marketing.
9. E-Commerce success stories (any one)
10. Role of Start-ups in Higher Education.
11. Professional Networking in Building Brands
How to start a start-up in India</td><td></td></tr>
<tr><td>Unit V</td><td>EXPOSURE TO INDUSTRY</td><td>[18 Hrs]</td></tr>
<tr><td colspan="2">All the students should visit and study the nearby industries, incubation centres, start-ups etc., and select any one to prepare a project report which covers the Name of the Industry/Organization, Introduction of the Industry, Type of the Industry, Scope of the Industry, Plant Layout and Location, Details of Plant and Machineries, Process flow chart, Manufacturing Methods, Process of Manufacturing, Product Manufacturing, Quality Control, Marketing, Product selling - Conclusion</td><td>[18 Hrs]</td></tr>
<tr><td colspan="2">TOTAL HOURS</td><td>45 Hrs</td></tr>
</table>

AIE5773 – INDUSTRIAL TRAINING

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE5773
Semester : V SEMESTER
Course Title : INDUSTRIAL TRAINING
Course Type : PROJECT

SUMMER VACATION	C
	2

COURSE DESCRIPTION

Industrial training is a crucial component of the diploma engineering curriculum, designed to bridge the gap between theoretical knowledge and practical application. Typically conducted during vacation periods, this two-week training program provides students with hands-on experience in their respective engineering fields. The primary objectives are to enhance practical skills, familiarize students with industry standards, and prepare them for future employment.

Two-week industrial training during vacation periods is an invaluable part of diploma engineering education. It not only equips students with practical skills but also provides a comprehensive understanding of the industry, preparing them for successful engineering careers.

COURSE OBJECTIVES

1. Practical Exposure: Students gain direct exposure to real-world engineering practices, tools, and technologies.
2. Skill Enhancement: The training helps in developing technical and soft skills that are essential for professional growth.
3. Industry Insight: Students learn about the working environment, operational procedures, and challenges faced by industries.
4. Professional Networking: The training offers opportunities to interact with industry professionals, which can be beneficial for career prospects.
5. Application of Knowledge: It allows students to apply classroom knowledge to solve practical problems, enhancing their understanding and retention of engineering concepts.

Structure of the Training Program

- Orientation: Introduction to the company, its operations, and safety protocols.
- Project Assignment: Students are assigned specific projects or tasks relevant to their field of study.
- Supervision and Mentorship: Industry professionals guide and mentor students throughout the training.
- Skill Development Workshops: Sessions on technical skills, software tools, and industry best practices.
- Assessment and Feedback: Performance evaluations and constructive feedback to help students improve.

Benefits for Students

- Enhanced Employability: Practical experience makes students more attractive topotential employers.
- Confidence Building: Working in a real-world setting boosts confidence and professional demeanor.
- Clarified Career Goals: Exposure to various roles and responsibilities helps students define their career paths.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to	
E5773.1	Demonstrate proficiency in using industrial machinery, tools, and software.
E5773.2	Able to identify, analyze, and solve engineering problems using industry-standard methods and practices.
E5773.3	Gain a comprehensive understanding of industrial manufacturing processes,quality control, and safety practices.
E5773.4	Exhibit improved communication, teamwork, and professional behavior in an industrial setting.
E5773.5	Apply theoretical concepts learned in their coursework to practical engineering tasks and projects.

CO- POs & PSOs MAPPING MATRIX:

CO/ PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E5773.1	3	3	3	3	2	2	3	2	3	2
E5773.2	3	3	3	3	2	2	3	2	3	2
E5773.3	3	3	3	3	2	2	3	2	3	2
E5773.4	3	3	3	3	2	2	3	2	3	2
E5773.5	3	3	3	3	2	2	3	2	3	2
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**2**

Correlation level 1 – Slight (low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (high)

Duties Responsibilities of the Faculty Mentor.

One faculty mentor should be assigned for every 30 students by the HOD / Principal. Faculty mentors shall play a crucial role in overseeing and guiding students during their industrial training program in Diploma engineering.

Pre-Training Responsibilities:

1. Orientation and Preparation:
   - Conduct orientation sessions to familiarize students with the objectives, expectations, and guidelines of the industrial training program.
   - Assist students in understanding the importance of industrial training in their academic and professional development.
2. Placement Coordination:
   - Collaborate with the placement cell or industry liaison office to secure suitable training placements for students that align with their academic specialization and career interests.
   - Facilitate communication between the institution and host organizations to ensure smooth coordination of training arrangements.
3. Training Plan Development:
   - Help students develop a detailed training plan outlining learning objectives, tasks, and expected outcomes for the training period.
   - Guide students in setting SMART (Specific, Measurable, Achievable, Relevant,Time-bound) goals for their training experience.

During Training Responsibilities:

4. Monitoring and Support:
   - Regularly monitor the progress of students during their industrial training. Maintain communication with both students and industry supervisors to trackperformance and address any issues that may arise.
   - Provide ongoing support and guidance to students, offering advice on technical challenges, professional conduct, and workplace etiquette.
5. Technical Guidance:
   - Offer technical guidance and mentorship related to the specific engineering discipline or specialization of the students. Help them apply theoretical knowledge to practical situations encountered in the industry.
6. Problem-Solving Assistance:
   - Assist students in overcoming obstacles or challenges encountered during their training. Encourage them to develop problem-solving skills and resilience in real-world engineering scenarios.
7. Feedback and Evaluation:
   - Provide constructive feedback on students' performance based on reports, assessments, and observations gathered from industry supervisors.
   - Evaluate students' achievements in relation to their training objectives and competencies developed during the program.

Post-Training Responsibilities:

8. Reflection and Debriefing:
   - Conduct debriefing sessions with students to reflect on their training experiences, discuss lessons learned, and identify areas for further improvement.
   - Help students articulate their learning outcomes and how these experiences contribute to their professional growth.
9. Documentation and Reporting:
   - Ensure comprehensive documentation of students' training activities, achievements, and feedback received from industry supervisors.
   - Prepare reports summarizing students' performance and submit these to relevant departments or committees for review and assessment.
10. Career Counseling:
    - Provide career guidance and counseling to students based on their industrial training experiences. Assist them in leveraging these experiences for future job applications or further academic pursuits.
11. Continuous Improvement:
    - Collaborate with industry partners to continuously improve the quality and relevance of the industrial training program.
    - Incorporate feedback from students and industry supervisors to enhance the effectiveness of future training placements.

By fulfilling these duties and responsibilities, faculty mentors contribute significantly to the overall educational experience and professional development of Diploma engineering students during their industrial training program.

Instructions to the students

Before Starting Industrial Training:

1. **Orientation and Preparation:**
   - Attend orientation sessions conducted by the institution or faculty mentors to understand the objectives, expectations, and guidelines of the industrial training program.
   - Familiarize yourself with the specific policies, procedures, and safety regulations of the host organization where you will be undergoing training.
2. **Setting Goals:**
   - Set clear and specific goals for your industrial training period. Define what skills, knowledge, and experiences you aim to gain during this time.
   - Discuss your goals with your faculty mentor and seek their guidance indeveloping a training plan that aligns with your career aspirations.

3. **Professional Attire and Conduct:**
    - Dress appropriately and professionally according to the standards of the industry and host organization.
    - Maintain a positive attitude, demonstrate punctuality, and adhere to workplace etiquette and norms.

During Industrial Training:

4. Learning and Engagement:
    - Actively engage in all assigned tasks and projects. Seek opportunities to learnnew skills and technologies relevant to your field of study.
    - Take initiative in asking questions, seeking clarification, and participating in discussions with supervisors and colleagues.
5. Adaptability and Flexibility:
    - Adapt to the work environment and demonstrate flexibility in handling various responsibilities and challenges that arise during your training.
    - Be open to different roles and tasks assigned to you, as this will broaden your experience and skill set.
6. Professionalism and Communication:
    - Communicate effectively with supervisors, colleagues, and clients as required. Practice clear and concise verbal and written communication.
    - Demonstrate professionalism in all interactions, respecting confidentiality, and adhering to company policies and procedures.
7. Safety and Compliance:
    - Prioritize safety at all times. Familiarize yourself with safety protocols, procedures, and emergency exits in the workplace.
    - Follow all safety guidelines and regulations to ensure your well-being and that of others around you.

After Completing Industrial Training:

8. Reflection and Documentation:
    - Reflect on your training experience. Evaluate what you have learned, the challenges you faced, and how you have grown professionally.
    - Maintain a journal or log documenting your daily activities, achievements, and lessons learned during the training period.
9. Feedback and Evaluation:
    - Seek feedback from your industry supervisor and faculty mentor on your performance and areas for improvement.
    - Use constructive feedback to enhance your skills and competencies for futurecareer opportunities.

10. Career Planning:

   - Use your industrial training experience to inform your career planning and decision-making process.
   - Discuss your career goals and aspirations with your faculty mentor or career counselor for guidance on next steps after completing your diploma.

By following these instructions, Diploma engineering students can make the most of their industrial training experience, gain valuable insights into their chosen field, and preparethemselves effectively for future professional endeavors.

Attendance Certification

Every student has to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution faculty mentor.

Training Reports

The students have to prepare reports: The report in the form of a diary to be submitted to the concerned faculty mentor of the institution. This will be reviewed while awarding Internal assessment.

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such arecord is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor isto periodically check these progress reports.

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant / product / process / construction along with intensive in-depth studyon any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Anydata, drawings etc. should be incorporated with the consent of the Organisation.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 40 Marks by industry supervisor and polytechnic faculty mentor for the Internal Assessment.

Sl. No.	**Description**	**Marks**
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Self expression / communication skills. Interpersonal skills / Human Relation.	10
D	Report and Presentation.	10
Total		**50**

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairperson Autonomous of Examinations after the completion of industrial training. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	**Description**	**Marks**
A	Daily Activity Report and Attendance certificate.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		**100**

VI SEMESTER

AIE6110 ARTIFICIAL INTELLIGENCE AND ROBOTICS

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6110
Semester : VI SEMESTER
Course Title : ARTIFICIAL INTELLIGENCE AND ROBOTICS
Course Type : THEORY

L	T	P	C
4	0	0	4

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
ARTIFICIAL INTELLIGENCE AND ROBOTICS	3	45	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 mark s and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	Introduction to Artificial Intelligence	**12**
II	Machine learning	**12**
III	Natural Language Processing	**12**
IV	Robotics fundamentals and control	**12**
V	Advanced Topics in AI and Robotics	**12**
TOTAL		**60**

COURSE DESCRIPTION

The course "Artificial Intelligence and Robotics" is designed to introduce students to the fundamental concepts, techniques, and tools that enable machines to perform tasks that require human intelligence and physical capabilities. This course covers both theoretical and practical aspects of artificial intelligence (AI) and robotics, including machine learning, computer vision, natural language processing, robot kinematics, dynamics, control, and planning.

COURSE OBJECTIVES

By the end of this course, students will be able to:

- Understand the key concepts and methodologies in artifice al intelligence and their applications in robotics.
- Develop and implement algorithms for machine learning ,computer vision, and natural language processing.
- Analyze and design robotic systems, including the kinematics dynamics, and control.
- Integrate AI techniques with robotic hard ware to solve re al- world problems.
- Evaluate the performance of AI and robotic systems and refine them for optimal performance.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E6110.1	Demonstrate knowledge of AI principles and apply them to robotic systems.
E6110.2	Implement machine learning algorithms for perception and decision-making in robots.
E6110.3	Design and control robotic manipulators and mobile robots.
E6110.4	Apply computer vision techniques to enable robots to understand and interact with their environment.
E6110.5	Use natural language processing to enable human-robot interaction.
E6110.6	Develop and execute comprehensive projects that integrate AI and robotics concepts.

Pre-requisites : Knowledge of basic Artificial Intelligence

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6110.1	3	3	3	3	3	2	3	3	3	2
E6110.2	3	3	3	3	3	2	3	3	3	2
E6110.3	3	3	3	3	3	2	3	3	3	2
E6110.4	3	3	3	3	3	2	3	3	3	2
E6110.5	3	3	3	3	3	2	3	3	3	2
Total	**15**	**15**	**15**	**15**	**15**	**10**	**15**	**15**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Massive open online courses (MOOCs) may be used to teach various topics/subtopics.
- Guide student(s)in undertaking micro-projects.
- Different types of teaching methods such as flipped classroom, tutorials, peer-peer learning may be employed by teachers to develop the outcomes. About 10-15% of the topics/sub-topicswhicharerelativelysimplerordescriptiveinnatureistobegiventothe students for self-learning, but to be assessed using different assessment methods

Assessment Methodology

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Written test (Unit-1 & II)	Written test (Unit-III & IV)	Written test (Unit- V)	Written Examination (Entire Syllabus)
Duration	2 Periods	2 Periods	1Period	2 hours
Exam Marks	30	30	20	60
Converted to	15	15	10	(No Conversion)
Marks	40			60
Tentative Schedule	6th Week	12th Week	13-14th Week	

Note

CONTINUOUS ASSESSMENT – 1 & 2 (CA1 & CA2)

PART - A			**PART - B**			**TOTAL MARKS**
MCQ Questions Marks (Understand, Apply levels)			**Short Answer Questions (Apply, Analyze, Evaluate and Create levels)**			
No. of Questions	**Marks for Each Question**	**Total Marks**	**No. of Questions**	**Marks for Each Question**	**Total Marks**	**30 Marks**
20	1	20	5	2	10	
➢ 10 questions from each unit ➢ All questions are compulsory			➢ 2 questions from each unit and one question from either unit. ➢ All questions are compulsory			

CONTINUOUS ASSESSMENT – 3 (CA3)

PART - A			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			**Short Answer Questions (Apply, Analyze, Evaluate and Create levels)**			
No. of Questions	**Marks for Each Question**	**Total Marks**	**No. of Questions**	**Marks for Each Question**	**Total Marks**	**20 Marks**
10	1	10	5	2	10	
➢ 10 questions from the unit ➢ All questions are compulsory			➢ 5 questions from the unit. ➢ All questions are compulsory			

END EXAMINATION

PART - A			PART - B			PART - B			TOTAL MARKS
MCQ Questions Marks (Understand, Apply levels)			**Short Answer Questions (Apply, Analyze, Evaluate and Create levels)**			**Long Answer Questions (Apply, Analyze, Evaluate and Create levels)**			
No. of Questions	**Marks for Each Question**	**Total Marks**	**No. of Questions**	**Marks for Each Question**	**Total Marks**	**No. of Questions**	**Marks for Each Question**	**Total Marks**	**60 Marks**
20	1	20	5	2	10	3	10	30	
➢ 4 questions from each unit ➢ All questions are compulsory			➢ Questions from the entire unit. ➢ Out of 8 questions, 5 questions to be answered			➢ 1 questions from each unit. ➢ Out of 5 questions, 3 questions to be answered			

QUESTION PATTERN - END SEMESTER EXAMINATION (THEORY)

1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 5 questions under Part-B. Each question carries 2 marks.
3. Answer any 3 questions under Part-C. Each question carries 10 marks.

QUESTION PAPER SETTING:

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
% to be included	90 %	10 %

AIE6110 - ARTIFICIAL INTELLIGENCE AND ROBOTICS

AIE6110	ARTIFICIAL INTELLIGENCE AND ROBOTICS	L	T	P	C
THEORY		4	0	0	4

Unit I	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**	**[12 Hrs]**
	Definition and scope of artificial intelligence	[3 Hrs]
	History and evolution of AI	[2 Hrs]
	Problem solving techniques : search algorithms	[3 Hrs]
	Heuristic methods	[2 Hrs]
	Intelligent agent architecture.	[2 Hrs]
Unit II	**MACHINE LEARNING**	**[12 Hrs]**
	Introduction to machine learning	[2 Hrs]
	Supervised learning :regression	[2 Hrs]
	classification, Un supervised learning	[2 Hrs]
	clustering, dimensionality reduction	[2 Hrs]
	Reinforcement learning	[2 Hrs]
	Markov decision processes ,Q-learning	[2 Hrs]
Unit III	**NATURAL LANGUAGE PROCESSING**	**[12 Hrs]**
	Introduction to NLP,	[2 Hrs]
	Text preprocessing and feature extraction	[2 Hrs]
	Language models and sequence modeling	[2 Hrs]
	Applications of NLP in robotics : speech recognition	[2 Hrs]
	language understanding	[2 Hrs]
	dialogue systems	[2 Hrs]
Unit IV	**ROBOTICS FUNDAMENTALS AND CONTROL**	**[12 Hrs]**
	Introduction to robotics: history, components, and types of robots	[2 Hrs]
	Robot kinematics: forward and inverse kinematics Robot dynamics: equations of motion	[2 Hrs]
	Motion planning and trajectory generation	[2 Hrs]
	Control theory basics : PID control ,state-space representation	[2 Hrs]
	Advanced control techniques: adaptive control	[2 Hrs]
	Robust control, and optimal control, Implementation of control algorithms in robotic systems	[2 Hrs]
Unit V	**ADVANCED TOPICSIN AI AND ROBOTICS**	**[12 Hrs]**
	Autonomous navigation and path planning	[3 Hrs]
	multi-robot systems and swarm robotics	[3 Hrs]
	Reinforcement learning for robotic control	[3 Hrs]
	Ethical and societal impacts of AI and robotics	[3 Hrs]
	TOTAL HOURS	**60 Hrs**

Suggested List of Students Activity

- Assignment preparation from web sources.
- ICT tools for conducting assessments

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig,	Pearson Education,2021
2.	Introduction to Robotics: Mechanics and Control	John J. Craig	Pearson,4th Edition, 2017
3.	Robot Modeling and Control"	Mark W. Spong, Seth Hutchinson, and M. Vidyasagar	Wiley, 2nd Edition, 2020

Web-based/Online Resources:

S.NO	WEBSITES/ LINKS
1.	**Udemy – Introduction to Robotics and Artificial Intelligence** https://www.udemy.com/course/introduction-to-robotics-artificial- intelligence/
2.	https://gaoyichao.com/Xiaotu/resource/refs/PR.MIT.en.pdf
3.	https://www.changjiangcai.com/files/text-books/Introduction-to-Robotics-3rd-edition.pdf

MODEL QUESTION PAPER

AIE6110- ARTIFICIAL INTELLIGENCE AND ROBOTICS

Time: [2 Hrs]. **Max. Marks:60**

PART-A (20 X 1 Marks = 20 Marks)

Note : Answer all the question

PART – A (25X1=25 Marks)	
Note: Answer all questions under Part-A. Each question carries 1 mark.	
1.	**What is Artificial Intelligence?** A) Study of databases B) Study of intelligent machines C) Study of networks D) Study of operating systems
2.	**Who is known as the father of Artificial Intelligence?** A) Alan Turing B) Charles Babbage C) John McCarthy D) Bill Gates
3.	**A heuristic function is represented by:** A) g(n) B) h(n) C) f(n) D) p(n)
4.	**Which of the following is NOT a component of an intelligent agent?** A) Sensors B) Actuators C) Knowledge Base D) Keyboard Driver
5.	**Machine Learning is a subset of:** A) Database Management B) Artificial Intelligence C) Computer Networks D) Operating Systems
6.	**Supervised learning uses:** A) Labeled data B) Unlabeled data C) Random data D) Hidden data
7.	**Unsupervised learning works with:** A) Labeled data B) Unlabeled data C) Structured data only D) Target values
8.	**Clustering is used to:** A) Predict labels B) Group similar data points C) Reduce dimensions only D) Find rewards
9.	**NLP stands for:** A) Natural Learning Process B) Neural Language Processing C) Natural Language Processing D) Network Language Program
10.	**Text preprocessing is performed to:** A) Increase noise in data B) Prepare text for analysis C) Store data only D) Reduce storage devices
11.	**A language model predicts:** A) Images B) Next word in a sequence C) Clusters D) Database entries

12.	**A dialogue system is designed to:** A) Communicate with users in natural language B) Compress files C) Create databases D) Design hardware
13.	**Robotics is a branch of:** A) Civil Engineering B) Mechanical Engineering only C) AI and Engineering D) Biology
14.	**The word "robot" was first introduced by:** A) Isaac Asimov B) Karel Čapek C) Alan Turing D) John McCarthy
15.	**Kinematics deals with:** A) Forces causing motion B) Motion without considering forces C) Electricity D) Programming only
16.	**Adaptive control means:** A) Fixed control B) Control that adjusts automatically C) Random control D) No control
17.	**Autonomous navigation in robots means:** A) Human-controlled movement B) Self-guided movement without human intervention C) Random movement D) Manual programming only
18.	**SLAM stands for:** A) Simple Linear Algorithm Model B) Simultaneous Localization and Mapping C) System Level Automation Method D) Sensor Learning and Mapping
19.	**Multi-robot systems involve:** A) One robot B) Multiple robots working together C) No robots D) Virtual systems only
20.	**One major ethical concern in robotics is:** A) Battery size B) Job displacement C) Screen size D) Cable length

PART-B (5 X 2 Marks = 10 Marks)

Note : Answer any FIVE of the following

21. Define intelligent agent?
22. What is a search algorithm?
23. What are the main types of Machine Learning?
24. What is an agent in reinforcement learning?
25. What is Natural Language Processing (NLP)?
26. Mention two applications of dialogue systems.
27. What are the main components of a robot?
28. What is autonomous navigation?

PART-C (3 X 10 Marks = 30 Marks)

Note : Answer any THREE of the following

29. Explain the History and Evolution of Artificial Intelligence.
30. Explain Unsupervised Learning and Clustering Techniques.
31. Explain Speech Recognition in NLP and Robotics.
32. Explain the history, components, and types of robots.
33. Explain Reinforcement Learning for Robotic Control.

QUESTIONPAPERSETTING

The teaching learning process and assessment are being carried out in accordance with the revised Blooms Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Revised Bloom's Taxonomy Level	**Lower order thinking skills (LOTs)**	**Higher Order Thinking Skills (HOTs)**
	R-Remember, **U**-Understand, **AP**-Apply	**An**- Analyse, **E**-Evaluate, **C**-Create
%to be included	90 %	10 %

AIE6241 GAME DEVELOPMENT

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6241
Semester : VI SEMESTER
Course Title : GAME DEVELOPMENT
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Autonomous Examination	Total	
GAME DEVELOPMENT	3	45	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	Introduction to Game	**15**
II	Game Design Principles	**15**
III	Game Engine Design	**15**
IV	Over view of gaming plat forms and frame works	**15**
V	Game Development using PYGAME	**15**
TOTAL		**75**

COURSE DESCRIPTION

Creating and developing interactive experiences, usually in the form of games, is what it means to be a game designer. The rules, mechanics, and general structure of a game are created by game designers, who also have the responsibility of influencing the player's experience and involvement. This course is designed to introduce students to the elements and structure of game design and development. The areas of major emphasis in the course are game methodology, programming, game genres, game theory and 2D interactive experiences, and immersive environments. Students will apply both creative and technical skills to design and refine in addition to implementing the adventure. The appropriate use of technology is an integral part of this course.

COURSE OBJECTIVES

- To know the basics of 2Dand 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Py game environment.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E6241.1	Explain the concepts of 2D and 3D Graphics
E6241.2	Design game design documents
E6241.3	Implementation of gaming engines.
E6241.4	Survey gaming environments and frame works.
E6241.5	Implement a simple game in Pygame

Pre-requisites Basics of Computer Engineering

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6241.1	3	3	3	3	3	3	3	3	3	2
E6241.2	3	3	3	3	3	3	3	3	3	2
E6241.3	3	3	3	3	3	3	3	3	3	2
E6241.4	3	3	3	3	3	3	3	3	3	2
E6241.5	3	3	3	3	3	3	3	3	3	2
Total	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Massive open online courses (MOOCs)may be used to be ach various topics/subtopics.
- Guide student(s)in under taking micro-projects.
- Different types of teaching methods such as flipped classroom, tutorials, peer-peer learning may be employed by teachers to develop the outcomes.
- About 10 – 15% of the topics/sub-topics which are relatively simpler or descriptive in nature is to be given to the students for self-learning, but to be assessed using different assessment methods.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th}Week	14^{th}Week	15^{th}Week	16^{th} week	

Note:

- **CA1and CA2:** All the exercises/experiments should be completed as per theportions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.

- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents(As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:**All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE6241 GAME DEVELOPMENT

AIE6241	GAME DEVELOPMENT	L	T	P	C
PRACTICUM		1	0	4	3

Unit I	INTRODUCTION TO GAME	[15 Hrs]
THEORY		
Genres of Games,		[1 Hr]
Basics 2D and 3D Graphics for Game Avatar		[1 Hr]
Game Components		[1 Hr]
2D and 3D Transformations – Projections		[1 Hr]
Color Models – Illumination and Shader Models		[1 Hr]
Animation – Controller Based Animation		[1 Hr]
PRACTICAL		
Exercise 1: Explore various games(any5)and identify component so be each game		[5 Hrs]
Exercise 2: Installation of a game engine ,e g., Unity, Unreal Engine, familiarization of the GUI. Conceptualize the theme for a 2D game.		[4 Hrs]
Unit II	**GAME DESIGN PRINCIPLES**	**[15 Hrs]**
THEORY		
Character Development, Storyboard Development for Gaming		[1 Hr]
Script Design		[1 Hr]
Script Narration		[1 Hr]
Game Balancing, Core Mechanics, Principles of Level Design		[1 Hr]
Proposals – Writing for Preproduction		[1 Hr]
Production and Post – Production.		[1 Hr]
PRACTICAL		
Exercise 3: Character design, sprites, movement and character control.		[5 Hrs]
Exercise 4: Level design: design of the world in the form of tiles along with interactive and collectible objects.		[4 Hrs]
Unit III	**GAME ENGINE DESIGN**	**[15 Hrs]**
THEORY		
Rendering Concept–Software Rendering		[1 Hr]
Hardware Rendering–Spatial Sorting Algorithms		[1 Hr]
Algorithms for Game Engine		[1 Hr]
Collision Detection		[1 Hr]
Game Logic – Game AI		[1 Hr]
Path finding.		[1 Hr]
PRACTICAL		
Exercise 5: Design of interaction between the player and the world, optionally using the physics engine.		[5 Hrs]
Exercise 6: Study game development by exploring major genres, player dynamics, platform considerations, game concepts, and the role of storyboards in shaping narratives		[4 Hrs]

Unit IV	OVERVIEW OF GAMING PLAT FORMS AND FRAMEWORKS	[15 Hrs]
THEORY		
Pygame Game development		[2 Hrs]
Unity–Unity Scripts		[1 Hr]
Mobile Gaming, Game Studio		[1 Hr]
Unity Single player Multi-Player games		[2 Hrs]
PRACTICAL		
Exercise 7: Set-up of Unity development environment and basic introduction to tools, navigation and interface.		[3 Hrs]
Exercise 8: Develop a game scene which contains multiple game objects, apply transform on them and do lights and camera settings.		[3 Hrs]
Exercise 9 : Developing a 2D interactive using Pygame		[3 Hrs]
UNITV	**GAME DEVELOPMENT USING PYGAME**	**[15 Hrs]**
THEORY		
Developing 2D and 3D interactive games using Pygame		[1 Hr]
Avatar Creation – 2D and 3D Graphics Programming		[1 Hr]
Incorporating music and sound – Asset Creations		[1 Hr]
Game Physics algorithms Development		[1 Hr]
Device Handling in Pygame		[1 Hr]
Overview of Isometric and Tile Based arcade Games – Puzzle Games		[1 Hr]
PRACTICAL		
Exercise 10 : Develop a 2D game project in Unity that incorporates essential elements like scenes, game objects, lights, camera, basic 2D physics – Collider, and Rigid body.		[3 Hrs]
Exercise 11 : Develop any 2D game by using various features of Unity game engine.		[3 Hrs]
Exercise 12 : Developing a 3D Game using Unreal.		[3 Hrs]
TOTAL HOURS		**75**

Suggested List of Students Activity

- Undertake micro-projects in teams.
- https://code.org/, an hour of code may be organized and students are encouraged to participate
- Students are encouraged to register themselves in various MOOCs such as: Swayam, edx, Coursera, Udemy etc. to further enhance their learning.
- List the applications which are developed using Unity IDE and other Game developing IDE Tool.
- Encourage students to participate in different coding competitions like hackathon, online competitions on code chef etc.
- Encourage students t*o* form a coding club at institute level and can help the slow learners.

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Game Programming Algorithms and Techniques: A Platform Agnostic Approach	Sanjay Madhav	Addison Wesley,2013.
2.	Beginning Game Development with Python and Pygame: From Novice to Professional",	Will McGugan,	Apress,2007.
3.	3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics	David H. Eberly	Second Edition, CRC Press,2006

Web-based/Online Resources:

S.NO	WEBSITES/LINKS
1.	https://docs.unity3d.com/Manual/UnityManual.html
2.	https://www.udemy.com/course/game-design-fundamentals/
3.	https://www.udemy.com/course/unitycourse2/

Equipment / Facilities required to conduct the Practical Portion
Hardware Requirement

S.NO	HARDWARE
1.	Desktop / Laptop Computers with internet connection
2.	Printer

S.NO	SOFTWARE
1.	Windows7orhigherVer.,/LinuxOperatingSystemwith4GBorhigherRAM
2.	Unity IDE

MODEL QUESTION PAPER

AIE6241- GAME DEVELOPMENT

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
PART - A			
1	Explore various games(any5)and identify component so be each game.	E6241.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Installation of a game engine ,e g., Unity, Unreal Engine, familiarization of the GUI. Conceptualize the theme for a 2D game.	E6241.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Character design, sprites, movement and character control.	E6241.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Level design: design of the world in the form of tiles along with interactive and collectible objects.	E6241.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Design of interaction between the player and the world, optionally using the physics engine.	E6241.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
6	Study game development by exploring major genres, player dynamics, platform considerations, game concepts, and the role of storyboards in shaping narratives	E6241.3	
PART - B			
7	Set-up of Unity development environment and basic introduction to tools, navigation and interface.	E6241.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Develop a game scene which contains multiple game objects, apply transform on them and do lights and camera settings.	E6241.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Developing a 2D interactive using Pygame	E6241.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Develop a 2D game project in Unity that incorporates essential elements like scenes, game objects, lights, camera, basic 2D physics – Collider, and Rigid body.	E6241.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
11	Develop any 2D game by using various features of Unity game engine.	E6241.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
12	Developing a 3D Game using Unreal.	E6241.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

SCHEME OF VALUATION		
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE6242 - APPLIED ARTIFICIAL INTELLIGENCE

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6242
Semester : VI SEMESTER
Course Title : APPLIED ARTIFICIAL INTELLIGENCE
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
APPLIED ARTIFICIAL INTELLIGENCE	3	45	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	Foundations Of Applied AI	**15**
II	AI in Healthcare, Business and Finance	**15**
III	AI in transportation and smart cities	**15**
IV	AI In Industry	**18**
V	Emerging trends and future directions	**12**
TOTAL		**75**

COURSE DESCRIPTION

This course serves as the gate way to the exciting world of Applied Artificial Intelligence (AI). In this course, we will embark on a journey to explore the foundational concepts, theories, and practical applications that under in the field of AI and Machine Learning(ML).Understanding AI and its practical applications is not only crucial for staying relevant in today's job market but also for contributing to the advancement of society through innovative solutions.

COURSE OBJECTIVES

The primary objective of this course is to provide students with a comprehensive understandingofAppliedAIanditsintegrationwithMachineLearningtechniques.Bytheend of this course, students will:

- Gain insight in to the fundamental principles and concepts of Artificial Intelligence.
- Develop proficiency in programming languages commonly used in AI and ML applications, such as Python.
- Acquire hands-on experience in implementing AI algorithms and models using popular libraries and frameworks.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E6242.1	Demonstrate a comprehensive understanding of the foundational concepts, principles, and techniques of Artificial Intelligence (AI) and its subfields, including Machine Learning (ML), Neural Networks, and Deep Learning.
E6242.2	Develop proficiency in programming languages commonly used in AI and ML applications, particularly Python, and will be able to apply programming skills to implement AI algorithms and models.
E6242.3	Apply a variety of AI techniques, including supervised and unsupervised learning, neural networks, and deep learning, to solve real-world problems across diverse domains such as healthcare, finance, and cyber security.
E6242.4	Develop an awareness of the ethical, social, and legal implications of AI technologies

Pre-requisites : Basics of Computer Engineering ,Artificial Intelligence

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6242.1	3	3	3	2	2	3	3	3	3	2
E6242.2	3	3	3	2	2	3	3	3	3	2
E6242.3	3	3	3	2	2	3	3	3	3	2
E6242.4	3	3	3	2	2	3	3	3	3	2
E6242.5	3	3	3	2	2	3	3	3	3	2
Total	**15**	**15**	**15**	**10**	**10**	**15**	**15**	**15**	**15**	**10**
Correlation level	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

Throughout this course, a variety of instructional strategies will be employed to cater to different learning styles and preferences. These may include:

- Lectures: To provide theoretical foundations and conceptual understanding.
- Hands-on Coding Works hops :Tore in force learning through practical implementation of AI algorithms and models.
- Case Studies and Real-world Applications: To showcase how AI is being used to solve real-world problems across various industries.
- Group Discussions and Collaborative Projects: To foster collaboration and peer learning.
- Guest Lectures and Industry Insights: To expose students to the latest trends and developments in the field of AI from industry experts.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th}Week	14^{th}Week	15^{th}Week	16^{th} week	

Note:

- **CA1and CA2:** All the exercises/experiments should be completed as per theportions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents(As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE6242 - APPLIED ARTIFICIAL INTELLIGENCE

AIE6242 PRACTICUM	APPLIED ARTIFICIAL INTELLIGENCE	L	T	P	C
		1	0	4	3

Unit I FOUNDATIONS OF APPLIED AI	**[15 Hrs]**
THEORY	
1.1 Introduction to Applied AI: Definition of applied AI and its significance in various domains and Overview of course objectives and structure for the session	[2 Hrs]
1.2 Fundamentals of Machine Learning: Explanation of machine learning concepts: Examples of machine learning applications in real-world scenarios.	[2 Hrs]
1.3 Introduction to Deep Learning: Definition and Scope of Deep Learning, Deep Learning vs. Traditional Machine Learning, Basic Neural Network Components.	[2 Hrs]
PRACTICAL	
Exercise 1: Write a program to implement DFS and BFS using Python.	[5 Hrs]
Exercise 2: Data cleaning process using filters in Python.	[4 Hrs]
Unit II AI IN HEALTH CARE, BUSINESS AND FINANCE	**[15 Hrs]**
THEORY	
2.1 AI in Health care: Medical Imaging and Diagnostics, Health Monitoring and Predictive Analytics.	[2 Hrs]
2.2 AI in Finance: Fraud Detection and Risk Management, Algorithmic Trading and Portfolio Management, Credit Scoring and Loan Approval Systems.	[2 Hrs]
2.3 AI in Business Operations: Supply Chain Optimization and Demand Forecasting, Predictive Maintenance and Quality Control.	[2 Hrs]
PRACTICAL	
Exercise 3: K-Means cluster Algorithm - application and usage in Python.	[5 Hrs]
Exercise 4: Image pre-processing techniques using python image libraries.	[4 Hrs]
Unit III AI IN TRANSPORTATION AND SMART CITIES	**[15 Hrs]**
THEORY	
3.1 AI in Transportation: Autonomous Vehicles and Self-Driving Technology, Traffic Management and route Optimization & scheduling, Predictive Maintenance for Vehicles and Infrastructure.	[3 Hrs]
3.2 AI in Smart Cities: AI in managing utilities, Smart buildings and energy efficiency, Environmental Monitoring and management, Public Safety and Emergency Response Systems.	[3 Hrs]
PRACTICAL	
Exercise 5: Image noise removal and Quality improvement using Python.	[5 Hrs]
Exercise 6: Develop a program for feature selection and feature extraction in Python.	[4 Hrs]
Unit IV OVERVIEW OF GAMING PLAT FORMS AND FRAMEWORKS	**[15 Hrs]**

THEORY **4.1 Manufacturing**: Fundamentals of Manufacturing Processes, AI Applications in Predictive Maintenance, AI for Quality Control and Inspection, Supply Chain Management. **4.2 Agriculture**: Introduction to AI in Agriculture, Fundamentals of Agricultural Systems, Crop Monitoring and Management, Disease Detection and Pest Management, Irrigation Management. **4.3 Retail**: Fundamentals of Retail Operations, Personalized Marketing and Customer Insights, Price Optimization and Dynamic Pricing, Customer Service and Chat bots.		[2 Hrs] [2 Hrs] [2 Hrs]
PRACTICAL **Exercise 7:** Write a program for developing linear regression model using Python. **Exercise 8:** Develop a program for logistics regression model using Python. **Exercise 9 :** Write a Program to find the solution for travelling salesman problem using Python.		[3 Hrs] [3 Hrs] [3 Hrs]
UNIT V	**GAME DEVELOPMENT USING PYGAME**	**[15 Hrs]**
THEORY **5.1 Advances in AI Research and Development:** Advances Research and Development in AI, Current AI Research Challenges and Directions. **5.2 Edge AI and Internet of Things (IoT):** Introduction to IoT and Edge Computing, Edge AI Architectures and Frameworks, Real-world Applications of Edge AI and IoT. **5.3 AI Ethics and Responsible AI Development:** Introduction to AI Ethics, Ethical Issues in AI, Ethical Decision Making in AI, Accountability and Responsibility.		[2 Hrs] [2 Hrs] [2 Hrs]
PRACTICAL **Exercise 10 :** Develop ANN/CNN framework for an application using Python.		[6 Hrs]
TOTAL HOURS		**75**

Suggested List of Students Activity

- Presentation/Seminarsbystudentsonanyrecenttechnologicaldevelopments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore there cent trends and developments in the field.
- Micro project that shall be extension of any practical lab exercise to real world application.
- Conduct of Idea thon to generate innovative solutions to real life problems

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Applied Machine Learning and AI for Engineers: Solve Business problems that can 't be solved Algorithmically(Gray scale Indian edition)	Jeff Prosise	First Edition, shroff/O' reilly, 2022.
2.	Artificial Intelligence (Concepts and Applications).	Lavika Goel	-
3.	Applied Edge AI,	Pethuru Ray & G Nagarajan	Auer Bach Publications, 2022.

Web-based/Online Resources:

S.NO	WEBSITES / LINKS
1.	https://chatgpt.com/
2.	https://www.tandfonline.com/toc/uaai20/38/1?nav=tocList
3.	https://www.geeksforgeeks.org/introduction-to-applied-ai/

Equipment / Facilities required to conduct the Practical Portion
Hardware Requirement

S.NO	HARDWARE
1.	Desktop / Laptop Computers with internet connection
2.	Laser Printer

S.NO	SOFTWARE
1.	Windows7orhigherVer.,/LinuxOperatingSystemwith4GBorhigherRAM
2.	Python Programming

AIE6242 - APPLIED ARTIFICIAL INTELLIGENCE

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
	PART - A		
1	Write a program to implement DFS and BFS using Python.	E6242.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Data cleaning process using filters in Python.	E6242.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	K-Means cluster Algorithm - application and usage in Python.	E6242.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Image pre-processing techniques using python image libraries.	E6242.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Image noise removal and Quality improvement using Python.	E6242.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
	PART - B		
6	Develop a program for feature selection and feature extraction in Python.	E6242.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
7	Write a program for developing linear regression model using Python.	E6242.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Develop a program for logistics regression model using Python	E6242.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Write a Program to find the solution for travelling salesman problem using Python.	E6242.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Develop ANN/CNN framework for an application using Python.	E6242.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

	SCHEME OF VALUATION	
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE6245 - MOBILE APPLICATION DEVELOPMENT

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6245
Semester : VI SEMESTER
Course Title : MOBILE APPLICATION DEVELOPMENT
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
MOBILE APPLICATION DEVELOPMENT	3	45	40	100*	100	[3 Hrs]

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	Introduction to mobile application development	**15**
II	Introduction to Android	**15**
III	Android User Inter Face Design	**15**
IV	Testing and Managing Android applications	**15**
V	Android APIs and Deploying Android application	**15**
TOTAL		**75**

COURSE DESCRIPTION

This course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques. Students will work at all stages of the of ware development life-cycle from inception through to implementation and testing.

COURSE OBJECTIVES

The objective of this course is to

- To facilitate students to understand android SDK.
- To help students to gain a basic understanding of Android application development.
- To inculcate working knowledge of Android Studio development tool.
- To test Android applications.
- To deploy Android applications.

COURSE OUTCOMES

After successful completion of this course, the students should be able to	
E6245.1	Identify various concepts of mobile programming that make it unique from programming for other platform
E6245.2	Critique mobile applications on the and cons.
E6245.3	Utilize to typing techniques to design and develop sophisticated mobile interfaces.
E6245.4	Test Android applications.
E6245.5	Deploy applications to the Android market place for distribution.

Pre-requisites : NIL

CO-POs & PSOs Mapping matrix

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6245.1	3	3	3	3	3	3	2	3	3	3
E6245.2	3	3	3	3	3	3	2	3	3	3
E6245.3	3	3	3	3	3	3	2	3	3	3
E6245.4	3	3	3	3	3	3	2	3	3	3
E6245.5	3	3	3	3	3	3	2	3	3	3
Total	**15**	**15**	**15**	**15**	**15**	**15**	**10**	**15**	**15**	**15**
Correlation level	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real- world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate -practice-activity strategy may be used to ensure that learning is outcome and employ ability-based.
- Do not let students work on an activity or an experiment with the expected out come, rather allow students to be honest about what ever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 Hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7^{th}Week	14^{th}Week	15^{th}Week	16^{th} week	

Note:

- **CA1and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.

- Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEMEOFEVALUATION

PART	DESCRIPTION	MARKS
A	Aim(05), Program(30)	35
B	Execution and Output	15
TOTAL		**50**
C	Practical Documents(As per the portions)	10
TOTAL		**60**

- **CA 3:** Written Test for complete theory portions should be conducted for 100Marks as per the question pattern below. The marks scored will be converted to 10Marksfor internal assessment.

Question pattern–Written Test Theory

Description		Marks	
Part –A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part –B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			**100 Marks**

- **CA4:**All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination – Practical Exam

PART	DESCRIPTION	MARKS
A	Aim(05),Program from Part– A(30)	35
B	Aim(05),Program from Part–B(30)	35
C	Executing any one program(Part A or Part–B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE6245 – MOBILE APPLICATION DEVELOPMENT

AIE6245	**MOBILE APPLICATION DEVELOPMENT**	**L**	**T**	**P**	**C**
PRACTICUM		**1**	**0**	**4**	**3**

Unit I	**INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT**	**[15 Hrs]**
THEORY		
Introduction to Android: The Android Platform, Android SDK		[1 Hr]
Eclipse Installation, Android Installation,		[1 Hr]
Building First Android application.		[1 Hr]
PRACTICAL		
Exercise 1: Implement “Hello World” Android example.		[6 Hrs]
Exercise 2 : Develop an application that uses GUI components, Font and Colours.		[6 Hrs]
Unit II	**INTRODUCTION TO ANDRIOD**	**[15 Hrs]**
THEORY		
Android Application Design Essentials: Anatomy of an Android applications		[1 Hr]
Android terminologies, Application Context, Activities, Services, Intents		[1 Hr]
Android Manifest File and its common settings.		[1 Hr]
PRACTICAL		
Exercise 3: Develop an application that uses Layout Managers and event listeners		[6 Hrs]
Exercise 4 : Write an application that draws basic graphical primitives on the screen.		[6 Hrs]
Unit III	**ANDROID USER INTERFACE DESIGN**	**[15 Hrs]**
THEORY		
Android User Interface Design Essentials: User Interface Screen elements,		[2 Hrs]
Designing User Interfaces with Layouts.		[1 Hr]
PRACTICAL		
Exercise 5: Develop an application that makes use of Notification Manager.		[6 Hrs]
Exercise 6 : Implement an application that writes data to the SD card.		[6 Hrs]
Unit IV	**TESTING AND MANAGING ANDROID APPLICATIONS**	**[15 Hrs]**
THEORY		
Testing Android applications		[1 Hr]
Publishing Android application		[1 Hr]
Using Android preferences.		[1 Hr]
PRACTICAL		
Exercise 7: Develop a native application that uses GPS location information.		[6 Hrs]
Exercise 8 : Develop an application for sending & receiving SMS.		[6 Hrs]
UNIT V	**ANDROID APIs AND DEPLOYING ANDROID APPLICATION**	**[15 Hrs]**

THEORY	
Using Common Android APIs: Using Android Data and Storage APIs	[1 Hr]
Managing data using Sqlite, Using Android Networking APIs, Using Android Web and Telephony APIs	[1 Hr]
Deploying Android Application to the World.	[1 Hr]
PRACTICAL	
Exercise 9: Develop an application that makes use of SQLite databases.	[6 Hrs]
Exercise 10 : Write an application that creates alarm clock.	[6 Hrs]
TOTAL HOURS	**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course
- Periodic class quizzes conducted on a weekly/fortnightly based on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application.

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	Head First Android Development: A Brain-Friendly Guide	Dawn Griffiths, David Griffiths,	1st edition, O'Reilly, 2017.
2.	Android Programming for Beginners	John Horton	2nd edition, Packt Publishing, 2018
3.	Android Application Development All-in-One For Dummies	Barry Burd	2nd edition, For Dummies, 2020

Web-based/Online Resources:

S.NO	WEBSITES / LINKS
1.	https://developer.android.com/get-started/overview
2.	https://developer.android.com/courses/

Equipment / Facilities required to conduct the Practical Portion

Software Requirement:

S.NO.	SOFTWARE
1.	Windows / Linux Operating System

Hardware Requirement:

S.NO.	HARDWARE
1.	Desktop Computer/ Laptop
2.	Printer

AIE6245 – MOBILE APPLICATION DEVELOPMENT

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S.NO	NAME OF THE EXPERIMENTS	CO	PO
PART - A			
1	Implement "Hello World" Android example. .	E6245.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
2	Develop an application that uses GUI components, Font and Colours.	E6245.1	PO1, PO2, PO3, PO4,PO5,PO6,PO7
3	Develop an application that uses Layout Managers and event listeners	E6245.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
4	Write an application that draws basic graphical primitives on the screen.	E6245.2	PO1, PO2, PO3, PO4,PO5,PO6,PO7
5	Develop an application that makes use of Notification Manager.	E6245.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
PART - B			
6	Implement an application that writes data to the SD card.	E6245.3	PO1, PO2, PO3, PO4,PO5,PO6,PO7
7	Develop a native application that uses GPS location information.	E6245.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
8	Develop an application for sending & receiving SMS.	E6245.4	PO1, PO2, PO3, PO4,PO5,PO6,PO7
9	Develop an application that makes use of SQLite databases.	E6245.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7
10	Write an application that creates alarm clock.	E6245.5	PO1, PO2, PO3, PO4,PO5,PO6,PO7

SCHEME OF VALUATION		
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE6246–UI AND UX DESIGN

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6246
Semester : VI SEMESTER
Course Title : UI AND UX DESIGN
Course Type : PRACTICUM

L	T	P	C
1	0	4	3

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15weeks

Course	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Autonomous Examination	Total	
UI AND UX DESIGN	5	75	40	100*	100	3Hrs

***Examinations will be conducted for 100 marks and will be converted to 60 marks**

TOPICS AND ALLOCATION OF HOURS

Unit	Topics	Time (Hrs)
I	Introduction to UI and UX Design	15
II	UX Design	15
III	User Research	15
IV	Interaction Design	15
V	Visual Design	15
	TOTAL HOURS	**75**

COURSE DESCRIPTION

User Interface (UI) and User Experience (UX) Design play key roles in the experience users have when interacting with digital products and applications. In this course, student will learn the theory and methodologies behind UI and UX design. Student will learn design their own wireframes and interactive prototypes. Learning UI and UX basics can help to student collaborate better on team projects and create new career opportunities.

COURSE OBJECTIVES

The objective of this course is to

- To learn problem solving skills.
- To gain knowledge of UI and UX Design.
- To understand the concept of functions and their role in UX Design.
- To comprehend the basics of interaction structures and its importance in application development.
- To recognize the importance of visual design.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to	
E6246.1	Demonstrate knowledge on UI and UX design concepts.
E6246.2	Develop and performing a competitive analysis in UX design.
E6246.3	Design user personas using persona UXPressia's online builder tool.
E6246.4	Develop interaction design and functional layout.
E6246.5	Creating web and mobile app applications using visual design tools.

Pre-requisites : Nil

CO- POs & PSOs MAPPING MATRIX:

CO/ PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6246.1	3	3	3	3	2	2	3	2	3	2
E6246.2	3	3	3	3	2	2	3	2	3	2
E6246.3	3	3	3	3	2	2	3	2	3	2
E6246.4	3	3	3	3	2	2	3	2	3	2
E6246.5	3	3	3	3	2	2	3	2	3	2
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Instructional Strategy:

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART-A Exercises	PART-B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 hours	3 hours	3 hours
Exam Marks	60	60	100	100	100
Converted to	10	10	10	10	60
Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test.
- Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.
- **The details of the documents to be prepared as per the instruction below.** The exercise should be completed on the day of practice. The same shall beevaluated for 10 marks on the day or next day of practice before commencementof the next exercise.
- The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
TOTAL		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 10 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim (05) , Program from Part – A (30)	35
B	Aim (05) , Program from Part – B (30)	35
C	Executing any one program (Part A or Part –B)	15
D	Output	10
E	Viva Voce	05
TOTAL		**100**

AIE6246–UI AND UX DESIGN

AIE6246	UI AND UX DESIGN	L	T	P	C
PRACTICUM		1	0	4	3
Unit I	**INTRODUCTION TO UI AND UX DESIGN**	**[15 Hrs]**			
THEORY Introduction to UI and UX Design and the Key Methodologies such as Product Design Life Cycle.		[3 Hrs]			
PRACTICAL **Exercise 1**: Identifying interface connectivity and establishing interface connectivity between two different program modules. **Exercise 2**:Understand front end and backend interfacing and Implementation of both interfacing.		[6 Hrs] [6 Hrs]			
Unit II	**UX DESIGN**	**[15 Hrs]**			
THEORY User Centred Design - Design Thinking – Activity Based Design - Agile Process.		[1 Hr] [2 Hrs]			
PRACTICAL **Exercise 3:** Create and performing a competitive analysis in UX design helps companies identify competitors' strengths and weaknesses relative to their own business, product, and design. **Exercise 4:** Designing a Responsive layout for a societal application		[6 Hrs] [6 Hrs]			
Unit III	**USER RESEARCH**	**[15 Hrs]**			
THEORY Stakeholder & User Interviews - Creating Personas Empathy Mapping - Information Architecture - Building User Journey		[1 Hr] [2 Hrs]			
PRACTICAL **Exercise 5**: Hands on Design Thinking Process for a new product. **Exercise 6:** Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.		[6 Hrs] [6 Hrs]			
Unit IV	**INTERACTION DESIGN**	**[15 Hrs]**			
THEORY Ideation Methods - Interaction & Prototyping Paper & Digital Prototyping - Design a Web / Mobile App.		[1 Hr] [2 Hrs]			
PRACTICAL **Exercise 7**: Identifying interaction design and functional layout. practical implementation of interaction design and functional layout. **Exercise 8**: Exploring various UI Interaction Patterns.		[6 Hrs] [6 Hrs]			

Unit V	VISUAL DESIGN	[15 Hrs]
THEORY Web & Mobile App Design - Grid Systems – Colors Theory and Palette - Understanding Typography.		[1 Hr] [2 Hrs]
PRACTICAL **Exercise 9** : Create Social media advertisement using online tools and applications. **Exercise 10:** Design super market special offer sales poster using online tools and applications.		[6 Hrs] [6 Hrs]
	TOTAL HOURS	**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Programming assignments
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text books for Reference:

S.NO	TITLE	AUTHOR	PUBLISHER WITH EDITION
1.	A Guide to UX Design and Development: Developer's JourneyThrough the UX Process (Design Thinking)	Tom Green, JosephLabrecque	First Edition, APress,2023
2.	Laws of UX: Using Psychology to Design Better Products & Services	Jon Yablonski	First Edition, O'Reilly, 2020
3.	UX for Dummies	Donald Chesnut, Kevin P. Nichols	Frist Edition, Wiley, 2014.

Web-based/Online Resources

S.NO	WEBSITES/LINKS
1.	NPTEL User Interface Design: https://archive.nptel.ac.in/courses/124/107/124107008/
2.	MIT OpenCourseWare: https://ocw.mit.edu/courses/6-831-user-interface-designand-implementation-spring-2011/pages/lecture-notes/

Equipment / Facilities required to conduct the Practical Portion

Software Requirement:

S.NO.	SOFTWARE
1.	Windows / Linux Operating System

Hardware Requirement:

S.NO.	HARDWARE
1.	Desktop Computer/ Laptop
2.	Printer

AIE6246–UI AND UX DESIGN

MODEL QUESTION PAPER

Duration: 3 hrs. **Max. Marks: 100**

S. NO	NAME OF THE EXPERIMENTS	CO	PO
PART - A			
1	Identifying interface connectivity and establishing interface connectivity between two different	E6246.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
2	Understand front end and backend interfacing and Implementation of both interfacing.	E6246.1	PO1, PO2, PO3, PO4, PO5, PO6,PO7
3	Create and performing a competitive analysis in UX design helps companies identify competitors'	E6246.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
4	Designing a Responsive layout for a societal application	E6246.2	PO1, PO2, PO3, PO4, PO5, PO6,PO7
5	Hands on Design Thinking Process for a new product.	E6246.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
PART – B			
6	Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.	E6246.3	PO1, PO2, PO3, PO4, PO5, PO6,PO7
7	Identifying interaction design and functional layout. practical implementation of interaction design and functional layout.	E6246.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
8	Exploring various UI Interaction Patterns.	E6246.4	PO1, PO2, PO3, PO4, PO5, PO6,PO7
9	Create Social media advertisement using onlinetools and applications.	E6246.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7
10	Design super market special offer sales poster using online tools and applications.	E6246.5	PO1, PO2, PO3, PO4, PO5, PO6,PO7

SCHEME OF VALUATION		
S.NO	**ALLOCATION**	**MARKS**
1	Aim(05),Program from Part–A(30)	35
2	Aim(05),Program from Part–B(30)	35
3	Executing any one program (Part–A or Part–B)	15
4	Output	10
5	Viva Voce	5
6	**Total**	**100**

AIE6351 – INTERNSHIP

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code : AIE6351

Semester : VI SEMESTER

Course Title : INTERNSHIP

Course Type : PROJECT

Periods	C
540	12

COURSE DESCRIPTION

Internships in educational institutions are designed to provide students with practical experience in their field of study and to bridge the gap between academic knowledge and professional practice.

COURSE OBJECTIVES

After completing Internship, Interns will be able to,

- Apply the theoretical knowledge and skill during performance of the tasks assignedin internship.
- Demonstrate soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship.
- Document the Use case on the assigned Task.
- Enable interns to apply theoretical knowledge gained in the classroom to real-world practical applications.
- Provide hands-on experience in the industrial practices.
- Develop essential skills such as communication, organization, teamwork, and problem-solving.
- Enhance specific skills related to the intern's area of focus.
- Offer a realistic understanding of the daily operations and responsibilities.
- Provide opportunities to work under the guidance of experienced supervisors and administrators.
- Allow interns to explore different career paths.
- Help interns make informed decisions about their future career goals based on first hand experience.
- Facilitate the establishment of professional relationships with supervisor, Administrators , and other professionals in the field.
- Provide access to a network of contacts that can be beneficial for future job opportunities and professional growth.
- Foster personal growth by challenging interns to step out of their comfort

zones and take on new responsibilities.

- Build confidence and self-efficacy through successful completion of internshiptasks and projects.
- Give insight into the policies, regulations, and administrative practices.
- Allow interns to observe and understand the implementation of standards
- and policies in practice.
- Provide opportunities for constructive feedback from supervisors and mentors, aiding in the intern's professional development.
- Enable self-assessment and reflection on strengths, areas for improvement, andcareer aspirations.
- Encourage sensitivity to the needs and backgrounds of different groups, promoting inclusive and equitable industrial practices.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to	
E6351.1	Demonstrate improved skills
E6351.2	Exhibit increased professional behavior
E6351.3	Apply theoretical knowledge and principles in real-world practices.
E6351.4	Develop and utilize assessment tools to evaluate the learning and practices
E6351.5	Engage in reflective practice to continually improve their learning and professional growth

CO- POs & PSOs MAPPING MATRIX:

CO/ PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6351.1	3	3	3	3	2	2	3	2	3	2
E6351.2	3	3	3	3	2	2	3	2	3	2
E6351.3	3	3	3	3	2	2	3	2	3	2
E6351.4	3	3	3	3	2	2	3	2	3	2
E6351.5	3	3	3	3	2	2	3	2	3	2
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Facilitating the Interns by an Internship Provider.

- Orient intern in the new workplace. Give interns an overview of the organization, Explain the intern's duties and introduce him or her to co-workers.
- Develop an internship job description with clear deliverables and timeline.
- Allow the interns in meetings and provide information, resources, and opportunities for professional development.
- The interns have never done this kind of work before, they want to know that their work is measuring up to organizational expectations, hence provide professional guidance and mentoring to the intern.
- Daily progress report of Intern is to be evaluated by industry supervisor. Examine what the intern has produced and make suggestions. Weekly supervision meetings can help to monitor the intern's work.

Duties Responsibilities of the Faculty Mentor

- To facilitate the placement of students for the internship
- To liaison between the college and the internship provider
- To assist the Industrial Training Supervisor during assessment

Instructions to the Interns

- Students shall report to the internship provider on the 1st day as per the internship schedule.
- Intern is expected to learn about the organization, its structure, product range, market performance, working philosophy etc.
- The interns shall work on live projects assigned by the internship provider.
- The Intern shall record all the activities in the daily log book and get the signature of the concerned training supervisor.
- Intern shall have 100% attendance during internship programme. In case of unavoidable circumstances students may avail leave with prior permission from the concerned training supervisor of the respective internship provider. However, the maximum leave permitted during internship shall be as per company norms where they are working and intern shall report the leave sanctioned details to their college faculty mentor.
- The interns shall abide all the Rules and Regulations of internship provider. Intern shall follow all the safety Regulations of internship provider.
- On completion of the internship, the intern shall report to the college and submit the internship certificate mentioning duration of internship, evaluation of interns by internship provider, Student's Diary and Comprehensive Training Report.

Attendance Certification

Every month students have to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Training Reports

The students have to prepare two types of reports: Weekly report in the form of diaryto be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such a record is called Industrial training Diary. Students have to write this report regularly. All days for theweek should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check theseprogress reports.

Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training.

Any data, drawings etc. should be incorporated with the consent of the Organisation.

SCHEME OF EVALUATION

Internal Assessment

Students should be assessed for 50 Marks by industry supervisor and polytechnic faculty mentor during 3rd Month and 5th Month. The total marks (50 + 50) scored shall be converted to 40 marks for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Ability to solve practical problems. Sense of responsibility	10
D	Self expression / communication skills. Interpersonal skills / Human Relation.	10
E	Report and Presentation.	10
Total		**50**

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairperson Autonomous of Examinations after the completion of internship period (Dec - May). The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		**100**

AIE6353 – FELLOWSHIP

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6353
Semester : VI SEMESTER
Course Title : FELLOWSHIP
Course Type : PROJECT

Periods	C
540	12

COURSE DESCRIPTION

The Fellowship in the Diploma in Engineering program is designed to provide aspiring engineers with a comprehensive educational experience that combines theoretical knowledge with practical skills. This fellowship aims to cultivate a new generation of proficient and innovative engineers who are equipped to meet the challenges of a rapidly evolving technological landscape.

Participants in this fellowship will benefit from a robust curriculum that covers core engineering principles, advanced technical training, and hands-on projects. The program emphasizes interdisciplinary learning, encouraging fellows to explore various branches of engineering, from mechanical and civil to electrical, electronics & communication andcomputer engineering. This approach ensures that graduates possess a versatile skill set, ready to adapt to diverse career opportunities in the engineering sector.

In addition to academics, the fellowship offers numerous opportunities for professional development. Fellows will engage with industry experts through seminars, workshops, and internships, gaining valuable insights into real-world applications of their studies. Collaborative projects and research initiatives foster a culture of innovation, criticalthinking, and problem-solving, essential attributes for any successful engineer.

By offering this fellowship, participants become part of a vibrant community of learners and professionals dedicated to advancing the field of engineering. The program is committed to supporting the growth and development of each fellow, providing them with the tools and resources needed to excel both academically and professionally.

The Fellowship in the Diploma in Engineering is more than just an educational endeavor; it is a transformative journey that equips aspiring engineers with the knowledge, skills, and experiences necessary to make significant contributions to society and the engineering profession.

COURSE OBJECTIVES

After completing students will be able to,

- Provide fellows with a solid foundation in core engineering principles and advancedtechnical knowledge across various engineering disciplines.
- Equip fellows with hands-on experience through laboratory work, projects, and internships, ensuring they can apply theoretical knowledge to real-world scenarios.
- Promote interdisciplinary understanding by encouraging exploration and integrationof different engineering fields, fostering versatility and adaptability in fellows.
- Encourage innovation and creativity through research projects and collaborative initiatives, enabling fellows to develop new solutions to engineering challenges.
- Facilitate professional growth through workshops, seminars, and interactions with industry experts, preparing fellows for successful careers in engineering.
- Develop critical thinking and problem-solving skills, essential for tackling complex engineering problems and making informed decisions.
- Strengthen connections between academia and industry by providing opportunities for internships, industry visits, and guest lectures from professionals.
- Foster leadership qualities and teamwork skills through group projects and collaborative activities, preparing fellows for leadership roles in their future careers.
- Instill a sense of ethical responsibility and awareness of the social impact of engineering practices, encouraging fellows to contribute positively to society.
- Promote a culture of lifelong learning, encouraging fellows to continually update their knowledge and skills in response to technological advancements and industry trends.
- Prepare fellows to work in a global engineering environment by exposing them to international best practices, standards, and cross-cultural experiences.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to	
E6353.1	Demonstrate a strong understanding of core engineering principles and possess the technical skills necessary to design, analyze, and implement engineering solutions across various disciplines.
E6353.2	Apply theoretical knowledge to practical scenarios, effectively solving engineering problems through hands-on projects, laboratory work, and internships.
E6353.3	Exhibit the ability to conduct research, develop innovative solutions, and contribute to advancements in engineering through critical thinking and creative approaches to complex challenges.
E6353.4	Understand and adhere to professional and ethical standards in engineering practice, demonstrating responsibility, integrity, and a commitment to sustainable and socially responsible engineering.
E6353.5	Enhance strong communication skills, both written and verbal, and be capable of working effectively in teams, demonstrating leadership and collaborative abilitiesin diverse and multidisciplinary environments.

CO- POs & PSOs MAPPING MATRIX:

CO/ PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6353.1	3	3	3	3	2	2	3	2	3	2
E6353.2	3	3	3	3	2	2	3	2	3	2
E6353.3	3	3	3	3	2	2	3	2	3	2
E6353.4	3	3	3	3	2	2	3	2	3	2
E6353.5	3	3	3	3	2	2	3	2	3	2
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Important points to consider to select the fellowship project.

Selecting the right fellowship project is crucial for maximizing the educational and professional benefits of a Diploma in Engineering program.

- **Relevance to Future Plans**: Choose a project that aligns with your long-term career aspirations and interests. This alignment will ensure that the skills and knowledge you gain will be directly applicable to your desired career path.
- **Industry Relevance**: Consider the current and future relevance of the project within the industry. Opt for projects that address contemporary challenges or emerging trends in engineering.
- **Access to Facilities**: Ensure that the necessary facilities, equipment, and materials are available to successfully complete the project. Lack of resources can hinder the progress and quality of your work.
- **Mentorship and Guidance**: Select a project that offers strong mentorship and support from experienced faculty members or industry professionals. Effective guidance is crucial for navigating complex problems and achieving project objectives.
- **Project Scope**: Assess the scope of the project to ensure it is neither too broad nor too narrow. A well-defined project scope helps in setting clear objectives and achievable milestones.
- **Feasibility**: Evaluate the feasibility of completing the project within the given timeframe and with the available resources. Consider potential challenges and ensure you have a realistic plan to address them.

- **Technical Skills**: Choose a project that allows you to develop and enhance importanttechnical skills relevant to your field of study. Practical experience in using specific tools, technologies, or methodologies can be highly beneficial.
- **Soft Skills**: Consider projects that also offer opportunities to develop soft skills suchas teamwork, communication, problem-solving, and project management.
- **Innovative Thinking**: Select a project that encourages creativity and innovative problem-solving. Projects that push the boundaries of traditional engineering approaches can be particularly rewarding.
- **Societal Impact**: Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute tosocial good can be highly fulfilling and make a meaningful difference.

Guidelines to select Fellowship

- Ensure the program is accredited by a recognized accrediting body and has a strongreputation for quality education in engineering.
- Ensure it covers core engineering principles that align with your interests and careergoals.
- Investigate the qualifications and experience of the faculty mentor. Look for programs with faculty who have strong academic backgrounds, industry experience,and active involvement in research.
- Check if the program provides adequate hands-on training opportunities, such as laboratory work, workshops, and access to modern engineering facilities and equipment.
- Assess the program's connections with industry. Strong partnerships with companies can lead to valuable internship opportunities, industry projects, and exposure to real-world engineering challenges.
- Explore the availability of research opportunities. Participation in research projects can enhance your learning experience and open doors to innovative career paths.
- Look for programs that offer professional development resources, such as workshops, seminars, and networking events with industry professionals and alumni.
- Ensure the program provides robust support services, including academic advising, career counseling, mentorship programs, and assistance with job placement after graduation.
- Consider the cost of the program and available financial aid options, such as scholarships, grants, and fellowships. Evaluate the return on investment in terms of career prospects and potential earnings.
- Research the success of the program's alumni. High employment rates and successful careers of past graduates can indicate the program's effectiveness in preparing students for the engineering field.

Duties Responsibilities of the Faculty Mentor

Each student should have a faculty mentor for the Institute.

- Get the approval from the Chairperson Autonomous of Examinations with the recommendations of the HOD/Principal for the topics.
- Provide comprehensive academic advising to help fellows select appropriate specializations, and research projects that align with their interests and career goals.
- Guide fellows through their research projects, offering expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributionsto the field.
- Assist fellows in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Offer career advice and support, helping fellows explore potential career paths, prepare for job searches, and connect with industry professionals and opportunities.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between fellows and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure fellows have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of fellows, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging fellows to practice integrity and responsibility in their work.
- Assist with administrative tasks related to the fellowship program, such as preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events thatenhance the learning experience and professional development of fellows.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the Fellowship Scholar

- Regularly meet with your faculty mentor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your mentor.
- Develop strong organizational skills. Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study

schedules. Prioritizetasks to manage your time efficiently.

- Take advantage of opportunities to participate in research projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge andgaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments andtrends in engineering by reading industry journals, attending conferences, and takingadditional courses.

Documents to be submitted by the student to offer fellowship.

- **Completed Application Form**: This is typically the standard form provided by the institution or fellowship program that includes personal information, educational background, and other relevant details.
- **Detailed CV/Resume**: A comprehensive document outlining your educational background, knowledge experience, interest in research experience, publications, presentations, awards, and other relevant achievements if any.
- **Personal Statement**: A document explaining your motivation for applying to the fellowship, your career goals, how the fellowship aligns with those goals, and what you intend to achieve through the program.
- **Recommendation Letters**: Letters from faculty mentor, employer, or professionals who can attest to your academic abilities, professional skills, and suitability for the fellowship.
- **Proposal/Description**: A detailed proposal or description of the fellowship project orstudy you plan to undertake during the fellowship. This should include objectives, methodology, expected outcomes, and significance of the project.
- **Enrollment Verification**: Documentation verifying your current acceptance status in the academic institution or industry where the fellowship will be conducted.

- **Funding Information**: Details about any other sources of funding or financial aid youare receiving, if applicable. Some fellowships may also require a budget proposal forthe intended use of the fellowship funds.
- **Samples of Work**: Copies of the relevant work that demonstrates your capabilities and accomplishments in your field.
- **Endorsement Letter**: A letter from your current academic institution endorsing your application for the fellowship, if required.
- **Ethical Approval Documents**: If your research involves human subjects or animals, you may need to submit proof of ethical approval from the relevant ethics committee.
- **Additional Documents**: Any other documents requested by the fellowship program required by the institution.

Attendance Certification

Every month students have to get their attendance certified by the supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the faculty mentor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Rubrics for Fellowship.

Sl. No.	Topics	Description
1.	Alignment with Objectives	Assess how well the project aligns with the stated objectives and requirements. Determine if the student has addressed the key aspects outlined inthe project guidelines.
2.	Depth of Research:	Evaluate the depth and thoroughness of the literature review. Assess the student's ability to identify and address gaps in existing research.
3.	Clarity of Objectives:	Check if the student has clearly defined and articulated the objectives of the project. Ensure that the objectives are specific, measurable, achievable, relevant, and time-bound (SMART).
4.	Methodology and Data Collection:	Evaluate the appropriateness and justification of the research methodology. Assess the methods used for data collection and their relevance to the research questions.
5.	Analysis and Interpretation:	Examine the quality of data analysis techniques used. Assess the student's ability to interpret results and draw meaningful conclusions.
6.	Project Management:	Evaluate the project management aspects, including adherence to timelines and milestones. Assess the student's ability to plan and execute the project effectively.
7.	Documentation and Reporting:	Check the quality of documentation, including code, experimental details, and any other relevant materials. Evaluate the clarity, structure, and coherence of the final report.
8.	Originality and Creativity:	Assess the level of originality and creativity demonstrated in the project. Determine if the student has brought a unique perspective or solution to the research problem.
9.	Critical Thinking:	Evaluate the student's critical thinking skills in analyzing information and forming conclusions. Assess the ability to evaluate alternative solutions and make informed decisions.
10.	Problem-Solving Skills:	Evaluate the student's ability to identify and solve problems encountered during the project. Assess adaptability and resilience in the face of challenges.

INTERNAL MARKS - 40 MARKS

As per the rubrics each topic should be considered for the Review 1 and Review 2. Equal weightage should be given for all the topics. It should be assessed by a faculty mentor and the industrial professional or research guide.

Review 1 shall be conducted after 8th week and Review 2 shall be conducted after 14th week in the semester. Average marks scored in the reviews shall be considered for the internal assessment of 40 Marks.

Scheme of Evaluation

PART	DESCRIPTION	MARKS
A	Assessment as per the rubrics.	30
B	Attendance	10
Total		**40**

END SEMESTER EXAMINATION - PROJECT EXAM

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairperson Autonomous of Examinations after the completion of fellowship. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report of the Fellowship Work.	30
C	Presentation by the student.	30
D	Viva Voce	20
Total		**100**

AIE6374 – IN HOUSE PROJECT

Programme Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Code : AIE6374
Semester : VI SEMESTER
Course Title : IN HOUSE PROJECT
Course Type : PROJECT

Periods	C
540	12

COURSE DESCRIPTION

Every student must do one major project in the Final year of their program. Studentscan do their major project in Industry or R&D Lab or in-house or a combination of any two for the partial fulfillment for the award of Diploma in Engineering.

For the project works, the Department will constitute a three-member faculty committee to monitor the progress of the project and conduct reviews regularly.

If the projects are done in-house, the students must obtain the bonafide certificate for project work from the Project supervisor and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the Project Viva Voce examination.

For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular bonafide certificate mentioned above. For Industry related projects there must be one internal faculty advisor / Supervisor from Industry (External), thisis in addition to the regular faculty supervision.

The final examination for project work will be evaluated based on the final report submittedby the project group **of not exceeding four students**, and the viva voce by an external examiner.

COURSE OBJECTIVES

Academic project work plays a crucial role in the education of Diploma in Engineering students, as it helps them apply theoretical knowledge to practical situations and prepares them for real-world engineering challenges.

- **Integration of Knowledge**: Consolidate and integrate theoretical knowledge acquiredin coursework to solve practical engineering problems.
- **Skill Development**: Enhance technical skills related to the specific field of engineering through hands-on experience and application.
- **Problem-Solving Abilities**: Develop critical thinking and problem-solving abilities byaddressing complex engineering issues within a defined scope.
- **Project Management**: Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.
- **Teamwork and Collaboration**: Foster teamwork and collaboration by working in multidisciplinary teams to achieve project goals and objectives.

- **Research Skills**: Acquire research skills by conducting literature reviews, gathering relevant data, and applying research methodologies to investigate engineering problems.
- **Innovation and Creativity**: Encourage innovation and creativity in proposing and developing engineering solutions that may be novel or improve upon existing methods.
- **Communication Skills**: Improve communication skills, both oral and written, by presenting project findings, writing technical reports, and effectively conveying ideas to stakeholders.
- **Ethical Considerations**: Consider ethical implications related to engineering practices, including safety, environmental impact, and societal concerns.
- **Professional Development**: Prepare for future professional roles by demonstrating professionalism, initiative, and responsibility throughout the project lifecycle.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to	
E6374.1	Demonstrate the ability to apply theoretical concepts and principles learned in coursework to solve practical engineering problems encountered during the project.
E6374.2	Develop and enhance technical skills specific to the field of engineering relevant to the project, such as design, analysis, simulation, construction, testing, and implementation.
E6374.3	Apply critical thinking and problem-solving skills to identify, analyze, and propose solutions to engineering challenges encountered throughout the project lifecycle.
E6374.4	Acquire project management skills by effectively planning, organizing, and executing project tasks within defined timelines and resource constraints.
E6374.5	Improve communication skills through the preparation and delivery of project reports, presentations, and documentation that effectively convey technical information to stakeholders.

CO- POs & PSOs MAPPING MATRIX:

CO/ PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
E6353.1	3	3	3	3	2	2	3	2	3	2
E6353.2	3	3	3	3	2	2	3	2	3	2
E6353.3	3	3	3	3	2	2	3	2	3	2
E6353.4	3	3	3	3	2	2	3	2	3	2
E6353.5	3	3	3	3	2	2	3	2	3	2
Total	**15**	**15**	**15**	**15**	**10**	**10**	**15**	**10**	**15**	**10**
Correlation level	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**2**

Correlation level 1 – Slight (low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (high)

Important points to consider to select the In-house project.

- Selecting a project work in Diploma Engineering is a significant decision that can greatly influence your learning experience and future career prospects.
- Choose a project that aligns with your career aspirations and interests within the field of engineering. Consider how the project can contribute to your professional development and future opportunities.
- Ensure the project aligns with your coursework and specialization within the Diploma program. It should complement and build upon the knowledge and skills you have acquired in your studies.
- Evaluate the scope of the project to ensure it is manageable within the given timeframe, resources, and constraints. Avoid projects that are overly ambitious or impractical to complete effectively.
- Assess the availability of resources needed to conduct the project, such as equipment, materials, laboratory facilities, and access to relevant software or tools. Lack of resources can hinder project progress.
- Select a project that genuinely interests and motivates you. A project that captures your curiosity and passion will keep you engaged and committed throughout the project duration.
- Consider the availability and expertise of faculty advisors or industry mentors who can provide guidance and support throughout the project. Effective mentorship is crucial for success.
- Clearly define the learning objectives and expected outcomes of the project. Ensure that the project will help you achieve specific learning goals related to technical skills, problem-solving, and professional development.

- Look for opportunities to propose innovative solutions or explore new methodologies within your project. Projects that encourage creativity can set you apart and enhance your learning experience.
- Consider ethical implications related to the project, such as safety protocols, environmental impact, and compliance with ethical guidelines in research and engineering practices.
- Evaluate whether the project offers opportunities for collaboration with peers, experts from other disciplines, or industry partners. Interdisciplinary projects can broaden your perspective and enhance your teamwork skills.
- Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

By carefully considering these points, Diploma Engineering students can make informed/decisions when selecting project work that not only enhances their academic learning but also prepares them for successful careers in engineering.

Duties Responsibilities of the internal faculty advisor.

Each group should have an internal faculty advisor assigned by the HOD/Principal.

- The in-house project should be approved by the project monitoring committee constituted by the Chairperson Autonomous of Examinations.
- The in-house project should be selected in the fifth semester itself. Each in-house project shall have a maximum of four students in the project group.
- Provide comprehensive academic advising to help in the selection of appropriate in-house project that align with their interests and career goals.
- Offer expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between students and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure students have access to necessary resources, including research materials,lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of the in-house project, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging students to practice integrity and responsibility in their work.

- Assist in preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development .
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the students.

- Regularly meet with your internal faculty advisor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your faculty advisor.
- Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in in-house projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

Documents to be submitted by the student for an in-house project.

Submit a printed report of your in-house project work along with the fabrication model / analysis report for the End Semester Examination.

Rubrics for In-House Project Work

Sl. No.	Topics	Description
1	Objectives	Clearly defined and specific objectives outlined.
2	Literature Review	Thorough review of relevant literature. Identification of gaps and justification for the project's contribution.
3	Research Design and	Clear explanation of the research design. Appropriateness and
4	Project Management	Adherence to project timeline and milestones. Effective
5	Documentation	Comprehensive documentation of project details. Clarity and completeness in recording methods, results, and challenges.
6	Presentation Skills	Clear and articulate communication of project findings. Effective use of visuals, if applicable.
7	Analysis and	In-depth analysis of data.
8	Problem-Solving	Demonstrated ability to identify and address challenges encountered during the project. Innovative solutions considered where applicable.
9	Professionalism and Compliance	Adherence to ethical standards in research. Compliance with project guidelines and requirements.
10	Quality of Work	Overall quality and contribution of the project to the field. Demonstrated effort to produce high-quality work.

SCHEME OF EVALUATION

The mark allocation for Internal and End Semester Viva Voce are as below.

Internal Mark Split (40 Marks)*		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 marks)
Committee : 5 Marks. Supervisor : 5 Marks	Committee : 7.5 Marks Supervisor : 7.5 Marks	Committee : 7.5 Marks Supervisor : 7.5 Marks

Note: * The rubrics should be followed for the evaluation of the internal marks during reviews.

End Semester Examination - Project Exam

The performance of each student in the project group would be evaluated in a viva voce examination conducted by a committee consisting of an external examiner and the Department project supervisor and an internal examiner.

End Semester (100)#			
Record (20 Marks)	Presentation (20 Marks)	Viva Voce (20 Marks)	Model / Analysis Report (40 Marks)
External : 10 Internal : 5 Supervisor: 5	External : 10 Internal : 5 Supervisor: 5	External : 10 Internal : 5 Supervisor: 5	External : 20 Internal : 10 Supervisor: 10

The marks scored will be converted to 60 Marks.

Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for a period of a maximum of two months. For those students who extendthe project work for two months, Viva Voce will be carried out and results will be declared separately. If the project report is not submitted even beyond the extended time, then students are not eligible to appear for Project Viva Voce Examination.