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PREFACE

The rapid pace of technological advancement, driven by globalization and digital transformation, has created an unprecedented demand for skilled professionals in the Computer & IT industry. The traditional boundaries between sectors have blurred, giving rise to a highly interconnected and data-driven world. To equip students with the competencies necessary to thrive in this dynamic environment, a comprehensive overhaul of technical education curricula is imperative.

Polytechnic institutions, as key players in vocational training, have a vital role to play in producing skilled graduates who can meet the evolving needs of the industry. This revised syllabus aims to address the industry's current and anticipated requirements by incorporating cutting-edge technologies, emerging trends, and real-world applications.

By aligning the curriculum with industry standards and best practices, we seek to foster a culture of innovation, critical thinking, and problem-solving among our students. This includes emphasizing the development of essential skills such as programming, data analysis, cyber security, artificial intelligence, cloud computing and IOT.

Furthermore, we recognize the importance of experiential learning and industry collaboration. To bridge the gap between academia and the workplace, we will explore opportunities for internships, industry projects, and guest lectures from industry experts.

The landscape of education is rapidly evolving, driven by technological advancements and changing student needs. Massive Open Online Courses (MOOCs) have emerged as a powerful tool for expanding access to quality learning resources and fostering a more flexible and personalized educational experience. This syllabus revision incorporates MOOC courses to complement traditional classroom instruction, providing students with a rich and diverse learning environment.

We believe that by implementing these changes, we can empower our students to become highly skilled and adaptable professionals who can contribute meaningfully to the growth and development of the Computer & IT industry.

PRINCIPAL & CHAIRMAN

2. ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

i) Commissioner and Principal Secretary, Directorate of Technical Education, Govt. of Tamil Nadu.

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iv) All the faculty members of the Computer Engineering department for their sustained effort and support in the design of this curriculum and documentation.

Coordinator

3. DEPARTMENT VISION, MISSION, PO and PEOs

VISION AND MISSION OF THE DEPARTMENT

VISION OF THE INSTITUTION

Seshasayee Institute of Technology transforms into a creative Center of Excellence, with the laudable task of uplifting economically weaker sections of the community in the Central region Tamilnadu, enhancing their social status coupled with an elevated lifestyle.

MISSION OF THE INSTITUTION

The Vision of the Institute is being ignited and propelled by

- A benevolent Management, Committed Faculty and creative Leadership
- Well planned curriculum and extra-curricular programs, career guidance and Entrepreneurship development programs to enhance employment opportunity of students
- Innovative, productive indigenous inputs , Maintenance of high moral standards and ethical values and a salubrious, clean, green, eco-friendly environment

VISION OF THE DEPARTMENT

To foster technically proficient, creative and self- governing diploma computer engineers with essential technical competency, skills and knowledge, to meet the current and future needs of industries and society.

MISSION OF THE DEPARTMENT

- To develop high calibre computer engineers with integrated knowledge of computer and allied engineering, science and technology, for the betterment of society.
- To impart quality education, skills with moral values and to bridge the gaps between industry and academics in emerging areas towards employability.
- To promote activities that cultivates the spirit of entrepreneurship, team work, leadership, and ethics among the students.

PROGRAM 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 **analyze** 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 analyze individual needs and engage in updating in the context of technological changes.

PSO (PROGRAM SPECIFIC OUTCOMES)

1. Students will have proficiency in designing and developing computer applications

2. Students will have competencies in servicing and administration of Computer systems, servers, networks and Cloud

PROGRAM EDUCATIONAL OBJECTIVES STATEMENTS

PEO1

Function effectively as computer professionals in industries / organizations, designing, implementing, testing solutions for real world problems and/or may opt for higher studies.

PEO2

Have professional and ethical attitude, effective communication and team work skills to become a successful engineer or programmer or entrepreneur.

PEO3

Have lifelong learning abilities for gaining multidisciplinary knowledge through projects and industrial training to meet the social needs.

4. REGULATIONS

DIPLOMA COURSES IN ENGINEERING
(TERM PATTERN)
(Implemented from 2023-2024)
G-SCHEME
(Common to all Programmes)

PREAMBLE

Polytechnic colleges contribute significantly to the state's talent pipeline, and it is known that polytechnic was initially started with the primary objective of producing skilled technicians to support mass industrialization.

Today there is a changing manpower need, as TN's economy is beginning to focus on advanced technology and knowledge-based industries, rather than low-cost labor-intensive manufacturing. To produce future- ready talent and bridge the industry-academia gap, it is only pertinent to rethink the existing curriculum and revamp the syllabi.

The current dynamic ecosystem poses challenges that span across fields and demands multidisciplinary knowledge to address them; this has propelled the need for higher technical education to cover diverse areas such as STEM, arts, humanities, design, innovation, business, and entrepreneurship; hence the program is modelled to incorporate all these areas.

The challenges of the 21st century demand young diploma engineers to have a command of the ever-changing body of technical knowledge along with an array of personal, interpersonal, and system-building knowledge that will prepare them with skills & competencies to address the modern-day challenges by building a new generation of machines, methods and materials.

Higher technical institutions being the primary source for companies to source talent, are under pressure to design a dynamic system of technical education to meet the demands.

The program is offered through the core, electives, certifications, capstone projects and other ways to enable a student's transformation. Each domain is carefully crafted to cater to diversified needs, dynamic contexts, and differentiated expectations in a learner-centric environment.

Objective

To retain and further strengthen the quality of the human capital produced by our higher technical education at the diploma level as the 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

(i) 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.

(ii) 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.

(iii) There is no **age limit prescribed for admissions to Diploma programs.**

(iv) **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.

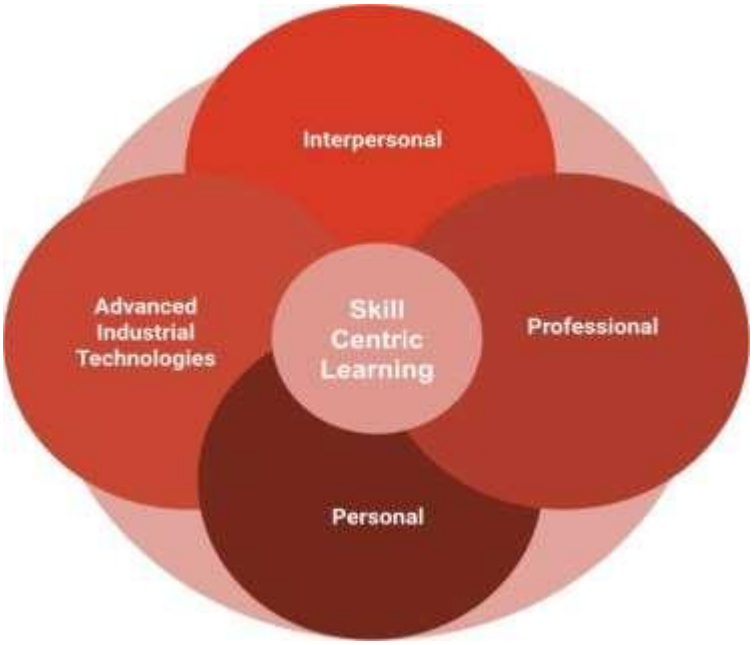
There are courses offered for the specific pathways in their final semesters that will aid them to choose their career in their specific pathways. Pathway direction for the students can be assisted by faculty mentors from time to time.

- **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

(1) Foundation (F), (2) Concentration (C) and the (3) Specialization (S) 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.
- **Specialization(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 (PO) as per the Outcome Based Education (OBE) model. The content of each course is designed based on the intended Course Outcomes (CO). Every program shall have a distinct curriculum with syllabi consisting of courses broadly categorized under:

1. **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.

2. **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.

3. **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.

4. **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.

5. **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.

6. **In-House Projects (J)** - 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 multi- domains / 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.

7. **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.

8. **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 re- do the same course whenever offered.

9. **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.

10. 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.

11. 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".

Definition 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) - 45 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
Programme 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	Industrial visit
Health & Wellness	PT,Yoga
Student-Led Initiative	Non-Credits Course
Special Interest Groups (Placement Training)	Non-Credits Course
Emerging Technology Seminars	TED, NPTEL Videos

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. **Professional 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 Elective:** 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-centered, 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/realize 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 PO 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 CO 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 organizing talks from the industry, bridge courses, organizing 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 Diploma 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 HoD, COE of the institution, and 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 Board comprising the Head of the department, COE, the Principal & Chairman Autonomous Examinations along with the Equivalent Credit(s). (Online Courses offered by Swayam, NPTEL.)

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/DoTE).

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 and COE with intimation to DoTE.

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.

Note: Exam fee paid will be adjusted in the subsequent semester.

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, co- curricular 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, specialization, and capstone project and deferred placement option.

Peer 2 Peer Learning

P2P 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, and 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 fail 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 organized 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 organized 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 degree. The minimum and maximum period of study shall be;

Diploma program	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
Sandwich[Lateral Entry]	2.5 Years	5.5 Years

Attendance Requirements

- A student who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a Term.
- Ideally every student is expected to attend all classes of all the attendance.

1. However, in order to make provision for certain unavoidable reasons 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 overall attendance for each semester.

2. 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.

3. 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.

4. Students who secure less than 50% 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.

Award of Marks for Course Attendance

Award of marks for Course attendance to each Course Theory / Practical /Practicum /Project will be as per the range given below
(Reference : DOTE Letter No:47391/Y3/CDC/2018 dated: 28.04.2023)

Sl.No	Course Attendance (%)	(Theory / Practical / Practicum) Marks	(Health & Wellness) Marks
1	75 % - 70 %	1	4
2	81 % - 85 %	2	8
3	86 % - 90 %	3	12
4	91 % - 95 %	4	16
5	96 % - 100 %	5	20

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:

- 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 adviser(s) 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.

- 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 Marks Supervisor: 5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks	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 Requirements for Award of Diploma

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) Minimum Marks to be secured in end semester exam is 35 out of 100, (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 Term examination answer paper in a theory course, as per the guidelines of Autonomous Exam cell, SIT on payment of a prescribed fee along with prescribed application to the Autonomous Examination account.

The Autonomous Examination cell will arrange for the revaluation and the results will be intimated to the student concerned through institute web site

Revaluation is not permitted for laboratory courses and projects.

Award of Grades

The award of letter grades will be decided using absolute 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
O (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 degree. These courses will be monitored by the central committee constituted by DoTE. 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.

$$\text{CGPA} = \frac{\sum_{i=1}^{n} \text{CiGPi}}{\sum_{i=1}^{n} \text{Ci}}$$

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 by the Directorate of Technical education whenever the student is readmitted under Regulations 2023 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 degree 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 Board of 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.

Revision of Regulation, Curriculum and Syllabi

The Directorate of Technical Education may from time-to-time revise, amend or change the regulations, curriculum, syllabus and scheme of examinations through the Leadership Committee with the approval of the Board.

5. SALIENT FEATURES OF THE DIPLOMA PROGRAMME IN COMPUTER ENGINEERING

Name of the Programme	**Diploma in Computer Engineering**
Duration of the Programme	Three years (Six Terms)
Entry Qualification	Matriculation or equivalent as prescribed by State Board of Technical Education, Tamil Nadu
Intake	50 (or as approved by AICTE)
Pattern of the Programme	Term Pattern
Ratio between theory and practical	50:50 (Approximately)

6. EMPLOYMENT OPPORTUNITIES AND JOB/ACTIVITY PROFILE FOR DIPLOMA HOLDERS IN COMPUTER ENGINEERING

(A) EMPLOYMENT OPPORTUNITIES

Diploma holders in computer engineering can find employment in following divisions:

(1) Service Division (IT enabled services, maintenance service and installation Computers)

(2) Assembly and Quality Control Division

(3) Techno Marketing (Corporate Handling, SME, Institutional Segment, Government Tender Business)

(4) Telecommunication Sector

(5) Teaching Organizations (Technical Institution, Vocational Institutions etc)

(6) Networking (LAN, WAN etc)

(7) Cloud industry

(8) Cyber security industry

(9) In Govt. Services like Railway, Law Enforcement Agencies

(10) Call Centers, KPO, BPO etc.

(11) Financial Institutions.

While in employment, the following areas of activity in different organizations (Industry and service sector) are visualized for Diploma holders in Computer Engineering:

- Assembly and Installation of computer systems, peripherals and software
- Programming customer based applications including web page designing
- Software testing and Maintenance of computer systems
- Techno Marketing and pre sales
- Teaching and training at technical institutions
- Self-employment – call canters, BPO, EPO and KPO etc.
- Network installation and maintenance

Various designations for diploma holders in Computer Engineering are given as follows:-

Wage Employment

(1) Service engineer/customer support engineer/maintenance engineer in installation, Maintenance and service of computer systems and networking

(2) Software tester in testing of software systems and mobile applications

(3) Assembly supervisor in manufacturing and production activity

(4) DTP operator, Technician

(5) Technical Consultant

(6) Web designer/developers

(7) Search Engine Optimization Professionals and Social Media Optimization Professionals

(8) Technical Assistant/ Junior engineer in quality control and testing activities of Computer systems manufacturing

(9) Junior marketing executive/sales engineer in marketing activities

(10) Technical assistant/ Instructor/Junior Programmer in R&D laboratories and Educational institutions to help in maintaining computers and networks

Self-Employment

(1) Small scale unit doing third party service and maintenance of computer systems and networks

(2) Small scale vendor of computer cards, computer peripherals and electronic Components and devices

(3) Setting up of computer assembly unit (small scale)

(4) Setting up of training institute for computer assembly, maintenance and Networking

(5) As Web designer, web application developer.

7. COMPETENCY PROFILE DIPLOMA HOLDERS IN COMPUTER ENGINEERING

Keeping the job opportunities, activity profile and domains of learning of diploma holders in Computer Engineering in view, the Programme is aimed at developing following competency Profile in terms of knowledge and skills in the students:

1. Able to read and interpret drawings related to plant layout, equipment and Components.
2. Understand the working of computers and peripherals and is able to install computer system including software loading
3. Able to assemble computers and change/ replace various parts and peripherals
4. Able to write computer programs in high level languages
5. Knowledge of data structure and programming techniques
6. Proficiency in operating computer systems and ability to use various application and Software/package
7. Understand the functioning and administration of various operating systems
8. Able to prepare specifications for computer systems, evaluating the specifications And Verifying computer system for given specifications
9. Understanding of databases and knowledge of database management system
10. Able to troubleshoot various faults in computer system and networks
11. Understand architecture of microprocessor, interfacing techniques (memory I/O and Interrupts).
12. Knowledge about computer system architecture and organization
13. Knowledge of principles of digital data transmission, communication methodologies, protocols and networking equipment used in data transmission and concept of network security.
14. Understand the basic concept of network technology, Local Area Network (LAN) and Wide Area Network (WAN) and establish Local Area Networks using wired and wireless technologies
15. Able to prepare layout and environmental specifications for site can supervise the installation and testing of computers systems
16. Proficient in developing a software and web sites
17. Understand system software and ability to use applications and open source software
18. Understand basic principles of management and manage the resources optimally.
19. Aware about the opportunity available for setting up one's own enterprise and its benefits

20. Reflect generic skills of thinking, problem solving, good communication, interpersonal skills and entrepreneurial qualities for effective functioning in the world of work.
21. Aware about technological advancements and forthcoming areas of development and current trends in the field of Computer Engineering and IT
22. Understand basic principles of Applied Sciences and Mathematics for developing scientific temper.
23. Understand basic principles of electrical and electronic Engineering
24. Understand basic principle of digital electronics
25. Able to design complex software as an individual and contribute as a team member.
26. Able to test software using various techniques.

8. DERIVING CURRICULUM AREAS FROM COMPETENCY PROFILE

Following curriculum areas have been derived from competency profile:

S.NO	Competency Profile	Subject Areas
1.	Able to read and interpret drawings related to plant layout, equipment and components	Engineering Graphics
2.	Understand the working of computers and peripherals and is able to install computer system including software loading	Computer Hardware and Servicing
3.	Able to assemble computers and change/ replace various parts and peripherals	Computer Hardware and Servicing
4.	Able to write computer programs in high level languages	C Programming Object oriented Programming with Java Open source software Python Programming Component based Technology
5.	Knowledge of data structure and programming techniques	Data Structures
6.	Proficiency in operating computer systems and ability to use various application and software/package	Operating System Linux Lab
7.	Understand the functioning and administration of various operating systems	Operating System
8.	Able to prepare specifications for computer systems, evaluating the specifications and verifying computer system for given specifications	Computer Hardware Servicing and Networks Lab
9.	Understanding of databases and knowledge of database management system	RDBMS
10.	Able to troubleshoot various faults in computer system and networks	Hardware and Networks Lab

11.	Understand architecture of microprocessor, interfacing techniques (memory I/O and interrupts).	Operating System Computer Hardware Servicing
12.	Knowledge of principles of digital data transmission, communication methodologies, protocols and networking equipment used in data transmission	Computer Networks and Security
13.	Understand the basic concept of network technology, Local Area Network (LAN) and Wide Area Network (WAN) and establish Local Area Networks using wired and wireless technologies	Computer Networks and Security Computer Hardware Servicing and Networks lab Cloud Computing and IoT
14.	Able to prepare layout and environmental specifications for site can supervise the installation and testing of computers systems	Computer Hardware Servicing and Networks lab
15.	Proficient in developing a software and web sites	Component Based Technology Web Design and Programming
16.	Understand system software and ability to use applications and open source software	C Programming Object Oriented programming using Java Open source software Python Programming
17.	Understand basic principles of Management and manage the resources optimally.	Entrepreneurship and Startup
18.	Aware about the opportunity available for setting up one's own enterprise and its benefits	Entrepreneurship and Startup
19.	Reflect generic skills of thinking, problem solving, good communication. interpersonal skills and entrepreneurial qualities for effective functioning in the world of work	Entrepreneurship and Startup Communication and life skill practice lab
20.	Aware about technological advancements and forthcoming areas of development and current trends in the field of Computer Engineering and IT	Cloud Computing and IoT

21.	Understand basic principles of Applied Sciences and Mathematics for developing scientific temper	Physics I & II Chemistry I & II Mathematics I, and II.
22.	Understand basic principles Electronic Engineering	Basics of Electrical and Electronics Engineering
23.	Understand the graphics, 2D animation and image manipulation	E-Publishing Lab
24.	Understand and able to work with Linux operating system and to program	Linux Lab
25.	Understand and aware about career development and Human values	Concurrent career development Universal human values

9. CURRICULAM OUTLINE

TERM III

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	4G233110	Digital Logic Design	3-0-0	45	3	Theory
2	Program Core	Practicum	4G233230	RDBMS	3-0-2	75	4	Theory
3	Program Core	Practical/Lab	4G233320	Digital Logic Design Lab	0-0-4	60	2	Practical
4	Program Core	Practicum	4G233440	C Programming	1-0-4	75	3	Practical
5	Program Core	Practicum	4G233540	Web Designing	1-0-4	75	3	Practical
6	Program Core	Practicum	4G233640	Operating Systems	1-0-2	45	2	Practical
7	Open Elective	Advanced Skill Certification	4G233760	Advanced Skills Certification-3	1-0-3	60	2	NA
8	Humanities &Social Science	Integrated Learning Experience	4G233880	Growth Lab	0-0-2	30	0	NA
9	Audit Course	Integrated Learning Experience	4G233881	Induction Program II	-	16	0	-
10	Audit Course	Integrated Learning Experience	4G233882	I&E/Club Activity/ Community Initiatives	-	15	0	-
11	Audit Course	Integrated Learning Experience	4G233883	Shop floor Immersion	-	8	0	-
12	Audit Course	Integrated Learning Experience	4G233884	Student-Led Initiative	-	23	0	-
13	Audit Course	Integrated Learning Experience	4G233885	Emerging Technology Seminars	-	8	0	-
14	Audit Course	Integrated Learning Experience	4G233886	Health &Wellness	-	30	1	-
					Test & Revisions	60		
					Library	15		
					Total Periods	640	20	

TERM IV

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	4G234110	Computer Networks and Security	3-0-0	45	3	Theory
2	Program Core	Practicum	4G234230	Data Structures Using Python	3-0-2	75	4	Theory
3	Program Core	Practicum	4G234340	Java Programming	2-0-4	90	4	Practical
4	Program Core	Practicum	4G234440	Python Programming	1-0-4	75	3	Practical
5	Program Core	Practicum	4G234540	E-Publishing Tools	1-0-4	75	3	Practical
6	Program Core	Project/Internship	4G234640	Scripting Languages	0-0-6	90	3	Practical
7	Open Elective	Advanced Skill Certification	4G234760	Advanced Skills Certification-4	1-0-2	45	2	NA
8	Audit Course	Integrated Learning Experience	4G234882	I&E/ Club Activity/ Community Initiatives		30	0	
9	Audit Course	Integrated Learning Experience	4G234883	Shop floor Immersion	-	8	0	-
10	Audit Course	Integrated Learning Experience	4G234884	Student-Led Initiative	-	24	0	-
11	Audit Course	Integrated Learning Experience	4G234885	Emerging Technology Seminars	-	8	0	-
12	Audit Course	Integrated Learning Experience	4G234886	Health &Wellness	-	30	0	-
13	Audit Course	Integrated Learning Experience	4G234887	Special Interest Groups (Placement Training)	-	30	0	-
					Test & Revisions	45		
					Library	15		
					Total Periods	640	22	

TERM V

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Practicum	4G235130	Cloud Computing	2-0-2	60	3	Theory
2	Program Elective	Theory		Elective-1	3-0-0	45	3	Theory
3	Program Core	Practical/Lab	4G235320	Internet of Things & Digital Twins	0-0-4	60	2	Practical
4	Program Core	Practicum	4G235440	Computer Hardware and Networking	1-0-4	75	3	Practical
5	Program Core	Practicum		Elective-2	1-0-4	75	3	Practical
6	Humanities & Social Science	Practicum	4G235640	Innovation & Startup	1-0-3	60	2	Project
7	Project/ Internship	Project/Internship	4G235773	Industrial Training * [SummerVacation-90 Hours]	-	-	2	Project
8	Open Elective	Advanced Skill Certification	4G235860	Advanced Skills Certification-5	1-0-2	45	2	NA
9	Audit Course	Integrated Learning Experience	4G235882	I&E/ Club Activity/ Community Initiatives		30	0	
10	Audit Course	Integrated Learning Experience	4G235883	Shop floor Immersion	-	8	0	-
11	Audit Course	Integrated Learning Experience	4G235884	Student-Led Initiative	-	24	0	-
12	Audit Course	Integrated Learning Experience	4G235885	Emerging Technology Seminars	-	8	0	-
13	Audit Course	Integrated Learning Experience	4G235886	Health & Wellness	-	30	0	-
14	Audit Course	Integrated Learning Experience	4G235887	Special Interest Groups	-	30	0	-
					Test & Revision	60		
					Library	15		
					Total Periods	605	20	

Elective 1

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	4G235211	Machine Learning	3-0-0	45	3	Theory
2	Program Elective	Theory	4G235212	Data Ware housing and Data Mining	3-0-0	45	3	Theory
3	Program Elective	Theory	4G235213	Ethical Hacking	3-0-0	45	3	Theory
4	Program Elective	Theory	4G235214	Agile Product Development	3-0-0	45	3	Theory
5	Program Elective	Theory	4G235215	Artificial Intelligence	3-0-0	45	3	Theory

Elective 2

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Practicum	4G235541	Data Analytics	1-0-4	75	3	Practical
2	Program Elective	Practicum	4G235542	Mobile Computing	1-0-4	75	3	Practical
3	Program Elective	Practicum	4G235543	Component Based Technologies	1-0-4	75	3	Practical
4	Program Elective	Practicum	4G235544	Multimedia Systems	1-0-4	75	3	Practical
5	Program Elective	Practicum	4G235545	Full Stack Developer	1-0-4	75	3	Practical
6	Program Elective	Practicum	4G235546	Robotic Process Automation	1-0-4	75	3	Practical

TERM VI

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Open Elective	Theory	4G2361XX	Electives-3(Pathway)	3-0-0	45	3	Theory
2	Open Elective	Practicum	4G2362XX	Elective-4(Specialisation)	1-0-4	75	3	Practical
3	Project/Internship	Project/Internship	4G23637X	In-house Project/Internship/ Fellowship	-	540	12	Project
				Total Periods		660	18	

Elective 3

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective |Higher Education	Theory	4G236111	Advanced Engineering Mathematics	3-0-0	45	3	Theory
2	Elective| Entrepreneurship	Theory	4G236112	Entrepreneurship	3-0-0	45	3	Theory
3	Elective |Technocrats	Theory	4G236113	Project Management	3-0-0	45	3	Theory
4	Elective |Technocrats	Theory	4G236114	Finance Fundamentals	3-0-0	45	3	Theory
5	Elective| Technologists	Theory	4G236115	5G Technology	3-0-0	45	3	Theory
6	Elective| Technologists	Theory	4G236116	DevOps	3-0-0	45	3	Theory

Elective 4

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective	Practicum	4G236241	Data Science	1-0-4	75	3	Practical
2	Elective	Practicum	4G236242	CloudPlatform	1-0-4	75	3	Practical
	Elective			Data Visualization	1-0-4	75		
4	Elective	Practicum	4G236244	Advance DBMS	1-0-4	75	3	Practical
5	Elective	Practicum	4G236245	Mobile Application Development	1-0-4	75	3	Practical
6	Elective	Practicum	4G236246	UI & UX Design	1-0-4	75	3	Practical

Project / Internship

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Project/Internship	Project/ Internship	4G236351	Internship	-	540	12	Project
2	Project/Internship	Project/ Internship	4G236352	Fellowship	-	540	12	Project
3	Project/Internship	Project/ Internship	4G236374	In-house Project	-	540	12	Project

10. SCHEME OF EXAMINATIONS

10. SCHEME OF EXAMINATION

III TERM

SL. NO	COURSE CODE	COURSE	Examination Marks			Minimum for Pass	Duration
			Internal	External*	Total		
1	4G233110	Digital Logic Design	40	100	100	40	3
2	4G233230	RDBMS	40	100	100	40	4
3	4G233320	Digital Logic Design Lab	40	100	100	40	2
4	4G233440	C Programming	40	100	100	50	3
5	4G233540	Web Designing	40	100	100	50	3
6	4G233640	Operating Systems	40	100	100	50	2
7	4G233886	Health & Wellness	100	---	100	50	1

IV TERM

SL. NO	COURSE CODE	COURSE	Examination Marks			Minimum for Pass	Duration
			Internal	External*	Total		
1	4G234110	Computer Networks and Security	40	100	100	40	3
2	4G234230	Data Structures Using Python	40	100	100	40	4
3	4G234340	Java Programming	40	100	100	50	4
4	4G234440	Python Programming	40	100	100	50	3
5	4G234540	E-Publishing Tools	40	100	100	50	3
6	4G234640	Scripting Languages	40	100	100	50	3
7	4G234760	Advanced Skills Certification - 4	40	100	100	50	2

V TERM

SL. NO	COURSE CODE	COURSE	Examination Marks			Minimum for Pass	Duration
			Internal	External *	Total		
1	4G235130	Cloud Computing	40	100	100	40	3
		ELECTIVE THEORY-I					
2	4G235211	Machine Learning	40	100	100	40	3
	4G235212	Data Warehousing and Data Mining	40	100	100	40	
	4G235213	Ethical Hacking	40				
	4G235214	Agile Product Development	40	100	100	40	
	4G235215	Artificial Intelligence	40	100	100	40	
3.	4G235320	Internet of Things & Digital Twins	40	100	100	50	2
4.	4G235440	Computer Hardware and Networking	40	100	100	50	3
		ELECTIVE PRACTICAL-II	40				
5.	4G235541	Data Analytics	40	100	100	50	3
	4G235542	Mobile Computing	40	100	100	50	
	4G235543	Component Based Technologies	40	100	100	50	
	4G235544	Multimedia Systems	40	100	100	50	
	4G235545	Full Stack Developer	40	100	100	50	
	4G235546	Robotic Process Automation	40	100	100	50	
6.	4G235640	Innovation & Startup	40	100	100	50	2
7.	4G235773	Industrial Training * [Summer Vacation - 90 Hours]	40	100	100	50	2
8.	4G235860	Advanced Skills Certification – 5	40	100	100	50	2

VI TERM

SL.NO	COURSE CODE	COURSE	Examination Marks			Minimum for Pass	Duration
			Internal	External*	Total		
		ELECTIVE 3:					
1.	4G236111	Advanced Engineering Mathematics	40	100	100	40	3
	4G236112	Entrepreneurship	40				
	4G236113	Project Management	40	100	100	40	
	4G236114	Finance Fundamentals	40	100	100	40	
	4G236115	5G Technology	40	100	100	40	
	4G236116	DevOps	40	100	100	50	
		ELECTIVE 4:	40				
2.	4G236241	Data Science	40	100	100	50	3
	4G236241	Data Science	40	100	100	50	
	4G236242	Cloud Platform	40	100	100	50	
	4G236243	Data Visualization	40	100	100	50	
	4G236244	Advance DBMS	40	100	100	50	
	4G236245	Mobile Application Development	40	100	100	50	
	4G236246	UI & UX Design	40	100	100	50	
3.	4G236351	**PROJECT:** Internship	40	100	100	50	12
	4G236352	Fellowship	40	100	100	50	
	4G236374	In-house Project	40	100	100	50	

***External Marks are conducted for 100 Marks and converted to 60 Marks**

11. COMPARISON OF

F SCHEME TO G SCHEME

11. COMPARISON OF F SCHEME TO G SCHEME

TERM III

Course type	Course in F scheme	Course type	Course in G scheme	Remarks
Theory	Basics Of Electrical And Electronics Engineering	Theory	Digital Logic Design	Included Digital Interfacing, ADC , DAC and Memory and PLD concepts
Theory	Operating System	Practicum	Operating Systems	Theory and Practical combined
Practical	Linux Practical			
Theory	C Programming	Practicum	C Programming	Theory and Practical combined
Practical	C Programming Practical			
Practical	Basics of Electrical And Electronics Engineering Practical	Practical	Digital Logic Design Lab	Included 2 b it magnitude comparator, SIPO
Practical	E Publishing Practical	Practicum		In IV semester of G scheme as Practicum
--	--	Practicum	Web Designing	In IV semester of F scheme as Theory and practical. In G scheme it's a Practicum

TERM IV

Course type	Course in F scheme	Course type	Course in G scheme	Remarks
Theory	Data structures	--	--	--
Practical	Data structures			
Theory	Object oriented programming with java	Practicum	Java Programming	Practical subject
Practical	Data Structures using Java Practical	Practicum	Data structure using Python	Data structure implemented using python
--	--	Theory	Computer Networks and Security	In VI term of F Scheme
--	--	Practicum	Python Programming	In V term of F scheme as Theory and Practical
Theory	Web design and programming	Practicum	Web Designing	In III Term G scheme it's a Practicum
Practical	Web design and programming			
--	--	Practicum	Scripting Languages	New subject

TERM V

Course Type	Course in F scheme	Course Type	Course in G scheme	Remarks
Theory	Python programming	Practicum	Python programming	In IV term of G scheme as Practicum
Practical	Python programming practical			
Theory	Cloud computing and Internet of things	Theory	Cloud Computing	--
Theory	**Elective:** (a) Software engineering	Theory	**Elective 1 :** --	--
Theory	(b)Artificial intelligence and Data analytics	Theory	Artificial Intelligence	--
Theory	(c)Mobile computing	Theory	--	--
		Theory	Machine Learning	New subject
		Theory	Data Warehousing and Data Mining	New subject
		Theory	Ethical Hacking	New subject
		Theory	Agile Product Development	New subject
Practical	Cloud computing and internet of things practical	Practical	Internet of Things & Digital Twins	--
		Practicum	Computer Hardware and Networking	In VI term of F scheme as Theory
Practical	Entrepreneurship and Startups	--	--	In VI term of G scheme as elective Theory
	Universal Human Values	--	--	--
--	--	Practicum	**Elective 2 :** Data Analytics	New subject
--	--	Practicum	Mobile Computing	New

				subject
--	--	Practicum	Component Based Technologies	In VI term of F scheme as Theory and Practical
--	--	Practicum	Multimedia Systems	--
--	--	Practicum	Full Stack Developer	--
--	--	Practicum	Robotic Process Automation	--
--	--	Practicum	Innovation & Startup	New subject
--	--	Project/Internship	Industrial Training * [Summer Vacation - 90 Hours]	New subject

TERM VI

Course Type	Course in F scheme	Course type	Course in G scheme	Remarks
Theory	Computer hardware and servicing	--	--	In V term of G scheme as Practicum
Practical	Computer hardware and networking practical			
Theory	Computer network and security	--	--	In IV term of G scheme as Theory
Theory	**Elective:** (a)Component based technology	--	--	In V term of G scheme as Elective theory 2
Theory	(b)Multimedia systems	--	--	New subject
Theory	(c) Data science and	--	--	New subject

	big data			
Project	Project Work and Internship	Project	In-house Project / Internship / Fellowship	--
--	--	Theory	**Elective 3:** Advanced Engineering Mathematics	New subject
--	--	Theory	Entrepreneurship	In V term F scheme as Practical
--	--	Theory	Project Management	New subject
--	--	Theory	Finance Fundamentals	New subject
--	--	Theory	5G Technology	New subject
--	--	Theory	DevOps	New subject
--	--	Practicum	**Elective 4:** Data Science	New subject
--	--	Practicum	Cloud Platform	In V term of F scheme as Theory
--	--	Practicum	Data Visualization	New subject
--	--	Practicum	Advance DBMS	New subject
--	--	Practicum	Mobile Application Development	New subject
--	--	Practicum	UI & UX Design	New subject

12. ALTERNATIVE COURSES FOR F – SCHEME

12. ALTERNATIVE COURSES FOR F – SCHEME

TERM III

Sl. No	Course Code	Course type	Course in F scheme	Course Code	Course type	Course in G scheme
1	4F3201	Theory	Basics Of Electrical And Electronics Engineering	4G233110	Theory	Digital Logic Design
2	4F3202	Theory	Operating System	4G233640	Practicum	Operating Systems
3	4F3205	Practical	Linux Practical			
4	4F3203	Theory	C Programming	4G233440	Practicum	C Programming
5	4F3206	Practical	C Programming Practical			
6	4F3204	Practical	Basics of Electrical And Electronics Engineering Practical	4G233320	Practical	Digital Logic Design Lab
7	4F3301	Practical	E Publishing Practical	4G234540	Practicum	E Publishing Tools

TERM IV

Sl. No	Course Code	Course Type	Course in F Scheme	Course Type	Course Code	Course in G Scheme
1	4F4207	Theory	Data structures	Practicum	4G234230	Data structure using Python
2	4F4209	Theory	Relational Database Management System	Practicum	4G233230	RDBMS
3	4F4302	Theory	Object oriented programming with java	Practicum	4G234340	Java Programming
4	4F4303	Practical	Data Structures using Java Practical			
5	4F4208	Theory	Web design and programming	Practicum	4G233540	Web Designing
6	4F4210	Practical	Web design and programming Practical			
7	4F0007		Concurrent Career development	No alternative Course		

TERM V

Sl. No	Course Code	Course Type	Course in F scheme	Course Code	Course Type	Course in G scheme
1	4F5212	Theory	Python programming	4G234440	Practicum	Python programming
2	4F5213	Practical	Python programming practical			
3	4F5304	Theory	Cloud computing and Internet of things	4G235130	Theory	Cloud Computing
4	4F5305.1	Theory	**Elective:** Software Engineering	4G236113	Theory	Project Management
5	4F5305.2	Theory	Artificial intelligence and Data analytics	4G235215	Theory	Artificial Intelligence
6	4F5307.2	Practical	Data Analytics using Python Practical			
7	4F5305.3	Theory	Mobile computing	4G236245	Practicum	Mobile Application Development
8	4F5307.3	Practical	Mobile computing practical			
9	4F5306	Practical	Cloud computing and internet of things practical	4G235320	Practical	Internet of Things & Digital Twins
10	4F5307.1	Practical	Software Engineering Practical	No alternative Course		
11	4F5401	Practical	Entrepreneurship and Startups	4G236112	Theory	Entrepreneurship
12			Universal Human Values	No alternative Course		

TERM VI

Sl. No	Course Code	Course Type	Course in F scheme	Course type	Course Code	Course in G scheme
1	4F6308	Theory	Computer hardware and servicing	Practicum	4G235440	Computer hardware and networking
2	4F6310	Practical	Computer hardware and networking practical			
3	4F6214	Theory	Computer network and security	Theory	4G234110	Computer networks and security
4	4F6309.1	Theory	**Elective:** Component based technology	Practicum	4G235543	Component based technologies
5	4F6309.2	Theory	Multimedia systems	Practicum	4G235544	Multimedia systems
6	4F6309.3	Theory	Data science and big data	Practicum	4G236241	Data Science
7	4F6402	Project	Project Work and Internship	Project	4G236374	In-house Project / Internship / Fellowship

13. HORIZONAL AND VERTICAL ORGANIZATION OF THE COURSES

13. HORIZONAL AND VERTICAL ORGANIZATION OF THE COURSES

Sl.No	Course code	Couse Name	Distribution of credits in various TERMs					
			I	II	III	IV	V	VI
1	4G233110	Digital Logic Design			3			
2	4G233230	RDBMS			4			
3	4G233320	Digital Logic Design Lab			2			
4	4G233440	C Programming			3			
5	4G233540	Web Designing			3			
6	4G233640	Operating Systems			2			
7	4G233886	Health & Wellness			1			
8	4G234110	Computer Networks and Security				3		
9	4G234230	Data Structures Using Python				4		
10	4G234340	Java Programming				4		
11	4G234440	Python Programming				3		
12	4G234540	E-Publishing Tools				3		
13	4G234640	Scripting Languages				3		
14	4G234760	Advanced Skills Certification - 4				2		
15	4G235130	Cloud Computing					3	
16	4G235211	**ELECTIVE 1:** Machine Learning					3	
	4G235212	Data Machine Learning Warehousing and Data Mining						
	4G235213	Ethical Hacking						
	4G235214	Agile Product Development						
	4G235215	Artificial Intelligence						

17	4G235320	Internet of Things & Digital Twins					2	
18	4G235440	Computer Hardware and Networking					3	
19	4G235541	**ELECTIVE 2:** Data Analytics					3	
	4G235542	Mobile Computing						
	4G235543	Component Based Technologies						
	4G235544	Multimedia Systems						
	4G235545	Full Stack Developer						
	4G235546	Robotic Process Automation						
20	4G235640	Innovation & Startup					2	
21	4G235773	Industrial Training * [Summer Vacation - 90 Hours]					2	
22	4G235860	Advanced Skills Certification – 5					2	
23	4G236111	**ELECTIVE 3:** Advanced Engineering Mathematics						3
	4G236112	Entrepreneurship						
	4G236113	Project Management						
	4G236114	Finance Fundamentals						
	4G236115	5G Technology						
	4G236116	DevOps						
24	4G236241	**ELECTIVE 4:** Data Science						3
	4G236242	Cloud Platform						
	4G236243	Data Visualization						
	4G236244	Advance DBMS						
	4G236245	Mobile Application Development						

	4G236246	UI & UX Design						
25	4G236351	**PROJECT:** Internship						12
	4G236352	Fellowship						
	4G236374	In-house Project						
TOTAL CREDITS					20	22	20	18
Total Credits = First year 40 + Programme Credit 80								**120**

14. DETAILED SUBJECTS

TERM - III

4G233110	DIGITAL LOGIC DESIGN	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction:

This subject introduces students to the fundamental concepts and techniques for designing and analyzing digital circuits, laying the groundwork for understanding and creatingdigital technologies.

Course Objectives:

The objective of this course is to enable the students to

- Provide comprehensive understanding of digital systems and their fundamentalcomponents, applications.
- Simplify and optimize digital logic circuits while gaining practical insights into its applications through Boolean algebra.
- Learn how to design sequential logic circuits using various components and techniques.
- Learn about digital sensor interfaces and their role in digital systems.
- Understand the principles and operation of various Analog-to-Digital Converters(ADC) and Digital-to-Analog Converters (DAC).
- Gain knowledge of different types of memory and their characteristics.
- Understand Programmable Logic Devices (PLDs) and their applications in digital system design.
- Analyze the societal impact of Digital Integrated Circuits (ICs) and their role in various industries and technologies.

This initial course offers students a gateway into the realm of digital electronics.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understanding digital systems fundamentals comprehensively.

CO2: Explore Boolean algebra fundamentals and practical applications.

CO3: Utilize sequential logic principles to create designs.

CO4: Design digital sensor interfaces and ADC/DAC converters.CO5:

Analyse memory and PLDs.

Pre-requisites: Nil

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	1	-	-	1
CO2	2	2	2	2	-	-	1
CO3	2	2	2	2	-	-	1
CO4	2	2	2	1	-	-	1
CO5	2	2	2	2	1	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

Real-world Applications: Integrate real-world examples and applications of digital logic design, such as binary arithmetic in computer architecture, digital communication systems, andcontrol systems. Showing practical applications helps students understand the relevance of thesubject.

Interactive Lectures: Conduct interactive lectures with demonstrations, multimedia presentations, and interactive whiteboards to illustrate abstract concepts effectively. Encourage student participation through discussions, questions, and problem-solving exercises.

Case Studies: Present case studies of real-world digital systems, highlighting design challenges, solutions, and outcomes.

Use of Visual Aids: Utilize visual aids such as diagrams, charts, and animations to clarify complex concepts like Boolean algebra, logic gates, and sequential logic circuits. Visual representations help reinforce learning and improve comprehension.

Flipped Classroom Approach: Implement a flipped classroom model where students review lecture materials and resources independently before class and use class time for hands-on activities, problem-solving, and discussions. This approach encourages active learning.

Formative Assessment: Use formative assessment techniques such as quizzes, concept

mapping, and in-class exercises to gauge student understanding and provide timely feedback. Adjust teaching strategies based on assessment results to address areas of difficulty.

Self-directed Learning Resources: Provide self-directed learning resources such as textbooks, online tutorials, and supplementary materials to accommodate diverse learning styles and allow students to explore topics at their own pace.

4G233110	DIGITAL LOGIC DESIGN	L	T	P	C
Theory		3	0	0	3

UNIT I	FOUNDATIONS OF DIGITAL LOGIC	
Introduction: digital systems and their importance, Number systems: binary, octal, hexadecimal number, binary arithmetic: 1's and 2's complements arithmetic, binary conversion, binary code standards: ASCII, BCD. Logic Gates: AND, OR, NOT, NAND, NOR and Ex-OR operations and logic diagram, realization of gates using universal gates		9
UNIT II	**COMBINATIONAL LOGIC DESIGN**	
Basic concepts of Boolean algebra: Laws, theorems, De-Morgan's theorem, Standard representation of logic functions, K-map representation (upto 3 variable), simplification of logic functions using K-map. Applications: Adders, Subtractors, digital comparator, Multiplexer (MUX)/ data selector, De-Multiplexer (D-MUX)/decoder, priority encoder.		9
UNIT III	**SEQUENTIAL LOGIC DESIGN**	
Flip Flops: SR – JK and D type flip flop, concept of Edge Triggering, applications of flip flops. Registers: shift registers, serial to parallel converter, parallel to serial converter. Counters: Asynchronous up counters, Synchronous down counters, Decade counter.		9
UNIT IV	**DIGITAL INTERFACING , ADC AND DAC**	
Digital Interfacing: Introduction, sensors and their types, TTL and CMOS interface switch, LED, relay, motor and solenoid. A/D converters: successive approximation A/D converter, dual slope A/D converter, D/A converters: weighted resistor/converter, R-2RLadder D/A converter.		9
UNIT V	**MEMORIES, PROGRAMMABLE LOGIC DEVICES**	
Memory: Definition- i) memory read ii) memory write iii) access time iv) memory capacity v) address lines vi) word length, Different types of ROM & RAM, Memory accessing, processing, hierarchy and management, difference between Flash ROM andNVRAM, operation of pen drive, SD card and solid state hard disk. PLDs: Difference between fixed logic and programmable logic, PLA architecture.		**9**
	TOTAL PERIODS	**45**

Suggested List of Students Activity:

The following student activities or similar activities can be assigned

1. Collect the information about the different types of display devices used in digital circuitsand carry out a seminar.
2. Prepare a note on E-waste and disposal of PCBs and ICs, carry out a seminar.
3. Organize a series of problem-solving sessions where students work on Boolean algebra problems and logic circuit design tasks. Evaluate students based on their ability to manipulate Boolean expressions, simplify logic circuits, and design practical solutions. Assess their problem-solving skills, logical reasoning, and the correctness of their solutions
4. Provide industrial sensor datasheets or specifications for commonly used sensors in manufacturing processes (e.g., temperature sensors, pressure sensors, proximity sensors).
5. Ask students to design and implement digital sensor interfaces or ADC/DAC circuits to interface with these sensors and provide digital or analog measurements.
6. Provide specifications or requirements for industrial control tasks, such as sequence control, timing control, or data processing tasks. Ask students to design, simulate, and implement the sequential logic circuits using PLC programming software or microcontroller platformscommonly used in industrial automation.
7. Assign a group project where diploma students analyse the memory technologies, programmable logic devices (PLDs), and their societal impact in industrial applications. Focus on memory technologies commonly used in industrial control systems (e.g., EEPROM, flash memory) and PLDs used for logic control and customization in industrial automation.

Execution Notes:

- Maximum of 3 students in each batch for student activity
- Above activities may be distributed among different batches; Any one activity among 1 to 5 or any similar activities per batch may be assigned by the teacher based on interestof the students.

Textbook for Reference:

1. M. M. Mano,"Digital logic and Computer design", , Pearson Education India, 2016.
2. Wakerly, John”Digital Design Principles and Practices” 5/e, Pearson Education 2018.
3. Sarah Harris and David Harris, “Digital Design and Computer Architecture: ARM Edition, 2015.
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016

Website links for reference:

https://nptel.ac.in/

https://www.Nptelvideos.com/course.php?id=562

http://www.vlab.co.in

4G233230	RDBMS	L	T	P	C	End Exam
Practicum		3	0	2	4	Theory

Introduction

All modern database management systems like SQL, MS SQL 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 database is the most commonly used database. 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

1. To know the fundamentals of DBMS
2. To share of data and speedy forming of new applications, restrict repetition orredundancy of data
3. To avoid data inconsistencies providing better integrity
4. To familiarize all the possible operations of data in the database
5. To familiarize programming skills for all the operations in database

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Describe fundamentals of DBMS, installation and working with admin.

CO2: Apply SQL commands to create, insert, retrieve, update, and delete data from theRelational databases.

CO3: Describe MySQLprogramming constructs, control statements and subprograms.

CO4: Describe how to Tune MySQL performance.

CO5: Apply cursors, triggers and Exception handling concepts.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	3	2	---	---
CO2	3	2	3	2	3	---	---
CO3	2	3	2	2	2	---	---
CO4	2	2	3	3	3	---	---
CO5	3	3	3	2	2	---	---

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

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

4G233230	RDBMS	L	T	P	C
Practicum		3	0	2	4

Unit I	RELATIONAL DATA MODEL & MYSQL ADMINISTRATION	
	Relational Data Model Introduction to database concepts- CODD's Rules – Components of DBMS – Table Structure – Keys : types of Keys – Data Constraints and types of Constraints -difference between SQL and MySQL **MySQL Installation** Install ,configure and test MySQL server on Microsoft Windows **Working with MySQL Admin** Creating , selecting and describing database – show command – backing up databases	9
	Ex No 1: Install, configure and connect to MySQL server and MySQL workbench in Windows **Ex No 2**: Write a query to create a database, show and backing up databases	6
Unit II	**INTERACTIVE MYSQL**	
	Introduction to MYSQL MySQL data types – Data Definition Commands – Data Manipulation Commands – Data Retrieval Commands **MySQL operators and Expressions** Types of operators – Arithmetic, Comparison and Logical Operators – PatternMatching- Import and Export Data **Built – in Functions** Single Row functions – Aggregate functions – conversion functions	9
	Ex No 3: create a database named 'college' and create a table for student andemployee with the fields as you like. **Ex No 4:** create a table 'student' with marks field for 10 students. Apply built in	6

Functions to do calculations.		
Unit III	**FLOW CONTROL IN MYSQL**	
Flow Control IF(), IF NULL(),CASE ,LOOP,LEAVE ,ITERATE , REPEAT,WHILE **Querying the table** Selecting rows using where, order by, group by and Having clauses-Sub-queries-correlated sub-queries **Views** Introduction – Advantages of views – creating , updating and deleting views		9
Ex No 5: create a table 'bank' and apply flow control statements to do sometransactions **Ex No 6:** create a table ' library' with proper fields and create another table ' library1' and insert rows from library using views		6
UNIT IV	**MYSQL PERORMANCE TUNING**	
Indexes and Sequences Index Types – simple and compound – Sequences : creating , altering and dropping sequences **Joins & Unions** Joins- definition-types of joins: natural join, inner join, self join, outer join. Uniontypes : union , Union All, Union Distinct- order by and limit handling **User and transaction management** Creating – deleting – renaming users grant and and revoke commands – transaction command: commit, rollback and save points.		9
Ex No 7: Create a table named 'student' with sequences **Ex No 8**: Create any two tables with common column name and perform join and union.		6
UNIT V	**STORED PROGRAM CONCEPTS & DEVELOPMENT**	

MySQL Procedures & Functions Creating –executing and deleting stored procedures – creating – executing anddeleting stored functions -advantages **MySQL Trigger & Cursor** Use of trigger – creating trigger – types of triggers Cursor: creation and deletion	9
Ex No 9 : Create a stored procedure to get employee details from employee table **Ex No 10:** Create a program for trigger and cursor	6
TOTAL HOURS	75

Textbook for Reference:

- Adam Aspin, Querying MySQL: Make your MySQL database analytics accessiblewith SQL operations, data extraction, and custom queries, 1st Edition, BPB Publication ,2022
- Vikram Vaswani, MySQL: The Complete Reference (Osborne CompleteReference Series), 1st edition, McGraw Hill Education,2017
- George Reese, MySQL Pocket Reference, 2nd Edition, O'Reilly Media 2007
- Baron Schwartz, Peter Zaitsev, et al. ,High Performance MySQL: Optimization,Backups, Replication, Third Edition, O'Reilly Media,2012

Website links for reference:

- https://www.w3schools.com/mysql/
- https://www.mysqltutorial.org/
- https://www.javatpoint.com/mysql-tutorial
- https://www.guru99.com/mysql-tutorial.html

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based onthe course.
- Periodic class/online quizzes conducted based on the course.

- Blended learning activities to explore the recent trends and developments in the field.

Equipment / Facilities required to conduct the Practical Portion

a) **Hardware Requirement:**

- Desktop Computers / Laptop
- Printer

b) **Software Requirement:**

- Windows / Linux Operating System
- https://dev.mysql.com/downloads/installer/

4G233320	DIGITAL LOGIC DESIGN LAB	L	T	P	C	End Exam
Practical		0	0	4	2	Practical

Rationale

This course emphasizes practical application alongside theoretical knowledge, covering digital logic devices and circuits, hands-on experiments, understanding IC specifications, and application through simulation exercises and mini-projects, fostering critical thinking and problem-solving abilities.

Course Objectives

The objective of this course is to

a) To familiarize students with digital logic devices and circuits about logic gates

b) To enable students to understand the concepts on decoder and encoder.

c) To provide hands-on experience about the flip flops

d) To introduce students to understand about counters.

e) To develop students' skills in designing and troubleshooting digital circuits throughsimulation and practical experimentation.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Test the truth tables of logic gates. Build combinational logic circuits and validate their truth tables

CO2: Construct sequential logic circuits and verify their truth tables.

CO3: Construct and verify the truth tables of multiplexer/demuliplexer

CO4: Construct and verify the truth tables of decoder/encoder

CO5: Simulate digital logic circuits using any tool.

Pre-requisites

a) Students should have knowledge of basic logic gate operations, Boolean algebra, anddigital circuit design principles.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	2	-	-	1
CO2	2	2	1	2	-	-	1
CO3	2	2	1	2	-	-	1
CO4	2	2	2	2	1	1	1
CO5	2	2	2	2	1	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers make the learning experience more engaging by introducing innovative and interesting ways of teaching. The teachers need to expose the students tomaterial in multiple modes help them learn it faster and retain it longer.
- **Use of Visual Aids:** Utilize visual aids such as diagrams, charts, and animations to clarify complex concepts like Boolean algebra, logic gates, and sequential logic circuits. Visual representations help reinforce learning and improve comprehension.
- **Hands-on Labs and Simulations:** Provide hands-on experience with logic gates, flip- flops, and other digital components through laboratory sessions. Additionally, utilize digital logic simulation software to allow students to design and simulate circuits, providing a practical understanding of concepts
- **Group Projects:** Assign group projects that require students to design and implement digital circuits to solve specific problems or tasks. This encourages teamwork, enhances problem-solving skills, and reinforces learning through practical application.
- **Guest Lectures and Industry Visits:** Invite guest speakers from industry or

academia to share insights into digital logic design applications, emerging technologies, and career opportunities. Organize visits to relevant industries or laboratories to expose students to real-world digital design practices.

4G233320	DIGITAL LOGIC DESIGN LAB	L	T	P	C
Practical		0	0	4	2

Part - A		
Ex.No	**Name of the Experiment**	
1	Verify the truth tables of any 3 Logic Gates.	30
2	Construct and verify the truth tables of full adder	
3	Construct and verify the truth tables of full subtractor.	
4	Construct and validate the truth table of DE multiplexer	
5	Construct and validate the truth table of decoder	
Part - B		
Ex.No	**Name of the Experiment**	
6	Construct and verify the truth tables of 2 bit magnitude comparator.	30
7	Construct and verify the truth tables of JK flip flop.	
8	Construct and verify the performance of decade counter.	
9	Design 4 bit asynchronous up counter using any simulation tool.	
10	Design 4 bit shift register (Serial in Parallel Out) using any simulation tool.	
	TOTAL HOURS	**60**

Suggested List of Students Activity

Proposed List of Student Activities for Digital Logic Design:

a) Research and present on the evolution of digital display technologies, including LED, LCD, OLED, and e-paper displays. Discuss their working principles, advantages, and applications in digital circuits.

b) Investigate and compare the specifications, availability, and costs of two different Analog-to-Digital Converter (ADC) and Digital-to-Analog Converter (DAC) ICs. Analyze their features and suitability for various applications.

c) Develop a block diagram approach for constructing a digital clock, frequency counter, or digital voltmeter using digital logic circuits. Estimate the cost of components required for the project and discuss potential challenges and solutions.

d) Explore the environmental impact of electronic waste (E-waste) and the proper disposal methods for printed circuit boards (PCBs) and integrated circuits (ICs). Conduct a seminarto raise awareness about E-waste management practices.

e) Design and simulate the functionality of a simple logic circuit using a modern Software tool such as Logisim, Proteus, or LTspice.

Execution Guidelines:

vii. Limit each batch to a maximum of three students per activity.

viii. Assign activity No. 5 (logic circuit simulation) as mandatory for all batches.

ix. Assign any one activity from Nos. 1 to 5 or propose similar activities based onstudent interest and teacher discretion.

Textbook for Reference:

- R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
- A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016
- Sarah Harris and David Harris, “Digital Design and Computer Architecture: ARM Edition, 2015.

Website links for reference:

- https://nptel.ac.in/
- http://www.vlab.co.in

Equipment / Facilities required to conduct the Practical Course

Software Requirement:

- Pspice software: https://www.pspice.com/
- LogiSim software : https://logisim.software.informer.com/2.7/
- Xcircuit Software : http://opencircuitdesign.com/xcircuit/
- Scilab : https://cloud.scilab.in/
- **Proprietor Software:**

  Pspice, Multisim (available student version).
- Ltspice (available freely version).

Hardware Requirement:

1. Digital Trainer Kit.
2. Logic Gates: Basic logic gate ICs like 7400 (Quad 2-input NAND), 7402 (Quad 2-input NOR), and 7486 (Quad 2-input XOR).
3. Multiplexer/ Demultiplexer , Decoder and Encoder
4. Flip flop ICs
5. 2-bit magnitude comparator.
6. Power Supply (0-30V).
7. 5V DC Motor
8. Resistors, capacitors, diodes, LEDs.
9. Breadboard, power supply, wires, and other necessary components for circuit construction and testing.

PRACTICAL EXAMINATION

PART – A

1. Verify the truth tables of any 3 Logic Gates.
2. Construct and verify the truth tables of full adder
3. Construct and verify the truth tables of full subtractor.
4. Construct and validate the truth table of demultiplexer
5. Construct and validate the truth table of decoder.

PART – B

6. Construct and verify the truth tables of 2 bit magnitude comparator.
7. Construct and verify the truth tables of JK flip flop.
8. Construct and verify the performance of decade counter.
9. Design 4 bit asynchronous up counter using any simulation tool.
10. Design 4 bit shift (Serial in Parallel Out) using any simulation tool.

SCHEME OF VALUATION

Section	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	5
TOTAL MARKS		**100**

4G233440	C PROGRAMMING	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction

In this course, students will learn the C programming language and its fundamental concepts. Also, they gain the knowledge to write simple C programs and undertake future courses that assume some background in computer programming. This course introduces programming principles using the C language. Students will learn C tokens, variables, data types, control structures, functions, arrays, pointers, structures and file concepts. Through hands-on students will develop proficiency in writing structured and efficient C programs to solve a variety of computational problems.

Course Objectives

The objectives of this course are enabling the students

- To learn problem solving skills.
- To gain knowledge of arrays and strings.
- To understand the concept of functions and their role in modular programming.
- To comprehend the basics of structures and its importance in application development.
- To recognize the importance of files and its related operations.

Course Outcomes

At the end of the course, students will be able

CO1: Demonstrate knowledge on C Programming concepts.

CO2: Develop simple programs in C using basic constructs.

CO3: Design modular C programs with reusable functions to improve code readability and maintainability.

CO4: Develop applications using structures and unions.

CO5: Apply programming skills to solve numerical problems and real-time problems.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	1	1	1
CO2	3	3	3	3	1	2	2
CO3	3	3	3	3	1	2	1
CO4	3	3	3	3	1	2	2
CO5	3	3	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learningconfidence.
- 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 anengaging 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 assessexperiment outcomes and analyze potential sources of error in case of discrepancies.

4G233440	C PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

UNIT I	INTRODUCTION TO C	
Overview of C: Basic Structure of C program, Compiling and Executing a C program. C Basics: Constants, Variable, Operators and Datatypes -Character Set - C Tokens - Keywords and Identifiers – Declaration and Use of Variables – Managing Input and Output Operations: Formatted and Unformatted Input and Output statements.		3
Ex No 1: Write a C program to calculate the simple interest and compound interest. **Ex No 2**: Write a C program to find the area of a circle and a rectangle (use Preprocessing directory for defining pi value).		12
UNIT II	**CONTROL STRUCTURES AND LOOPING**	
Decision Making and Branching: Simple if Statement - if-else Statement – Nested if-else Statements - else if ladder – Switch case statement. Looping: While Statement – do..while statement – for loop statement-break and Continue statement- goto statement.		3
Ex No 3: Write a C program to find the largest of three numbers. **Ex No 4:** Write a C program to generate all prime numbers from 1 to N.		12
UNIT III	**ARRAYS AND FUNCTIONS**	
Arrays: One-dimensional Arrays- Declaration of One-dimensional Arrays - Initialization of One-dimensional Arrays-Two-dimensional Arrays- Declaration of Two-dimensional Arrays - Initialization and accessing Two-dimensional Arrays.		3
User-Defined Functions: Need for Functions -Elements of User Defined Functions – Functions Types – Call by Value-Call by Reference-Passing Arrays to Functions-Recursion		12
Ex No 5: Write a C program to demonstrate matrix addition and transpose		

operations. **Ex No 6:** Write a C program to find factorial of a given number using recursion.		
UNIT IV	**STRINGS AND POINTERS**	
Strings: Declaring and Initializing String Variables –String Built-in Functions.		3
Pointer: Declaring, Initialization and Accessing a pointer Variable-Pointer Expressions – Pointer Arithmetic – Pointer to Pointer - Pointer to an Array.		
Ex No 7: Write a C program to find the length and reverse a string using pointers. **Ex No 8**: Write a C program for implementing linear search using pointer to an array.		12
UNIT V	**STRUCTURES AND FILE MANAGEMENT**	
Structures and Union: Introduction -Defining a Structure -Declaring Structure Variables – Accessing Structure Members – structure initialization -Array of Structures-Union. File Management in C: Introduction – File Types- Defining File Modes -Opening And Closing a File – File Operations.		3
Ex No 09: Write a C program to collect and print students details like name, marks, etc. and then calculate total and average mark using structure. **Ex No 10:** Write a C program to count the number of characters, words and Lines in a file.		12
TOTAL PERIODS		**75**

Textbook for Reference:

- Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2015.
- Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
- E.Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill, ThirdEdition Edition, 2012.

Website links for reference:

- https://www.w3schools.com/c/
- https://www.programiz.com/c-programming
- https://www.tutorialspoint.com/cprogramming/index.htm
- https://egyankosh.ac.in/
- https://archive.nptel.ac.in/courses/106/104/106104128/

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based onthe 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.

Equipment / Facilities required to conduct the Practical Portion

Hardware(s) Requirement:

- Desktop / Laptop
- Printer

Software(s) Requirement:

- Windows / Linux Operating System
- Code Blocks / Turbo C

PRACTICAL EXAMINATION

PART – A

1. Write a C program to calculate the simple and compound interest.
2. Write a C program to find the area of a circle and a rectangle (use preprocessingdirectory for defining pi value).
3. Write a C program to find the largest of three numbers.
4. Write a C program to generate all prime numbers from 1 to N..
5. Write a C program to find factorial of a given number using recursion.

PART - B

6. Write a C program to demonstrate matrix addition and transpose operations.

7. Write a C program to find the length of a string and reverse a string using pointers
8. Write a C program for implementing linear search using pointer to an array.
9. Write a C program to collect and print student's details like name, marks, etc. andthen calculate total and average mark using structure.
10. Write a C program to count the number of characters, words and lines in a file.

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	05
6	Total	100

4G233540	WEB DESIGNING	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction:

This course provides an introductory overview of the principles and practices of web design. Students will learn the fundamentals of creating visually appealing and user-friendly websites. Through a combination of theory and hands-on projects, students will explore variousaspects of web design through basic coding languages such as HTML, CSS and client-side scripting language like JavaScript.

Course Objectives:

- Learn the syntax, structure, and basic elements of HTML, including tags,attributes, and semantic markup.
- Gain proficiency in creating and organizing content using HTML elements such as headings, paragraphs, lists, and links and media elements.
- Explore CSS syntax, selectors, properties, and values for styling HTML elements.
- Learn how to apply CSS styling to text, backgrounds, borders, and other page elements.
- Understand the role and importance of client-side scripting in web development.
- Gain proficiency in JavaScript syntax, data types, and operators.
- Learn how to manipulate the Document Object Model (DOM) using JavaScript.
- Explore various techniques for handling user interactions and events on web pages.
- Learn how to validate form inputs and handle form submissions using JavaScript.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Develop well-structured web pages using HTML.

CO2: Develop web pages using HTML links and media elements.

CO3: Apply CSS to effectively style and format HTML elements to create visually appealing web pages.

CO4: Write and deploy Javascript code to solve practical web design problems

CO5: Utilize JavaScript to add interactivity and dynamic behavior to web pages including event handling, DOM manipulation, and form validation.

Pre-requisites: Knowledge of web browsers, websites, and basic internet terminologies.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	3	2	1	1	2
CO2	2	3	3	3	1	1	2
CO3	2	3	3	2	1	1	2
CO4	2	3	3	3	1	1	2
CO5	2	3	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. It is advised to assign practical projects that allow students to apply concepts learned in class. Projects could include designing and coding websites from scratch, creating prototypes, or redesigning existing websites to improve usability and aesthetics.
2. Conduct of interactive demos to help students learn specific techniques and tools. Provide step-by-step guidance and encourage questions and participation.
3. Real-world examples of websites to understand design principles, usability issues, and best practices and discuss how different design choices impact user experience and business goals.

4G233540	WEB DESIGNING	L	T	P	C
Practicum		1	0	4	3

UNIT I	HTML & HTML TAGS	
Introduction to HTML: HTML editors-HTML5- HTML Elements & Attributes. HTML Tags -Page Formatting Tags: DOCTYPE Tag- html tag- head, title, body,meta, script, style tags Text Formatting Tags: Heading Tags- Paragraph Tags- Horizontal rules- Line breaks- Superscript- Subscript- Underline- Italic- Bold- Emphasis- del tags HTML List Tags: Unordered List- Ordered List-Definition List HTML Link Tags & attributes- HTML Table Tags: table, th, tr, td, colspan, rowspan		3
1. Write a HTML code to display welcome text using different text formatting tags.(Use h1-h6, bold, italic, underline, strike through, div, p, pretags) **(HTML Basic tags)**		6
2. Design a HTML page to list the computer languages where each language is a link.Prepare separate HTML documents for each language and call them in the appropriate link. **(Lists and Links)**		6
Unit II	**HTML & CSS**	
HTML Document Layout Tags: header, footer, main, section tags HTML Media Tags- Images- <img> tags & attributes, Image Mapping using <map> and <area> tags - background images- Other media tags- <audio>, <video>, <iframe>, <embed>, <svg>, <canvas> CSS- Introduction- Need for CSS- Syntax- Selector- Declaration, Property, value- Types of CSS selector: Class, id, pseudo-class, attribute, universal selector- Types of style sheets: Internal - External- Inline- Color values. CSSbackgroundproperties- Borderproperties- margin properties- padding properties- height, width properties- CSS Text properties- CSS Fonts properties		4

3. Write a HTML program to display the image of a computer as a link to the web page Describing the components of computers. **(Images and link tags)**	**6**
4.Develop a web page using CSS to create a timetable for the class using different border style. **(Table tags and internal style sheets)**	**6**
5. Design a webpage of your college with attractive background color, text-color, font-face, an image by using external CSS formatting .**(External Stylesheets)**	**6**
Unit III JavaScript	
Scripting Languages: Client Side Scripting- Server Side Scripting- Need for javascript - structure of javascript - Variables- Datatypes- String- Number- Boolean- Undefined- Null JavaScript Objects: Array- String- Date- Math- Number- Boolean- User Defined Objects. Operators: Arithmetic - Assignment - Comparison - String - Logical - Bitwise - Ternary –Type Conditional Statements: if, if-else, else-if, switch. Loop statements- for, while, do-while- break- continue statements. JavaScript functions: definition- parameters-function call- function invocation	**4**
6. Write a JavaScript program to create a clock in 24 hours format using Date Object.(Do not include AM/PM) (**JavaScript Objects and Functions**)	**6**
7. Write a JavaScript program to control (play, pause, stop) the audio/video in a web Page. **(JavaScript User defined Objects and Media Tags)**	**6**
Unit IV JavaScript Advanced	

Forms: Form tag- action, method, target, auto complete attributes, input tag, type attribute values- text, radio, checkbox, button, submit, password, other attributes for input tag -id, name, value, size, required. Special tags in forms - textarea tag, select tag,button tag, label tag. Message Boxes: Dialog Box- Alert Box- Confirm Box- Prompt Box JavaScript Document Object Model: Methods of Document object- Javascript Events- Event Handlers- Mouse events- Keyboard Events- Form Events- Window Events JavaScript Form Validation- Email validation	**4**
8. Write a JavaScript program to change the color of a web page to the color typed bythe user in the text box. **(DOM)**	**6**
9.Write a JavaScript program to develop a simple calculator (with basic arithmetic operations like add, subtract, multiply, divide, equal to) by getting two` numbers in twotext boxes, buttons for operations and display the result in the third text box. **(Event Handling)**	**6**
10. Create a form with text fields such as username, mail id, password, retype password, gender (radio), languages known (check box), Describe yourself (textarea), submit button and perform form validation such as username must not be less than 8 characters, mail id should contain @ symbol, password and retype password must be the same. **(Forms & Form validation)**	**6**
Total Periods	**75**

Text Books for Reference:

- Web Development and Design Foundations with HTML5,9th Edition, Pearson, 2018.
- Laura Lemay, Rafe Colburn",“Mastering HTML, CSS & JavaScript Web Publishing”, First Edition, BPB Publications, 2016.
- Thomas Powell, Fritz Schneider, Java Script: The Complete Reference, 3rd Edition,McGraw Hill Education(India), 2017.

Web site for Reference:

- https://www.w3schools.com/
- https://javascript.info/
- https://www.javatpoint.com/javascript-tutorial
- https://www.freecodecamp.org/news/html-css-and-javascript-explained-for-beginners/
- https://nptel.ac.in/courses/106105084

Suggested List of Students Activity:

- Quizzes/ Seminars/ Presentations to students to evaluate their learning concepts.
- Mini Project based learning to work on a website project incorporating HTML, CSS, and JavaScript as an extension to real life applications.
- Conduct code reviews to provide feedback on HTML, CSS, and JavaScript code and to debug and troubleshoot it.

Equipment / Facilities required to conduct the Practical Course

Hardware Required:

1. Desktop Computers / Laptop
2. Laser Printer

Software Required:

- Notepad / Notepad++ / Dreamweaver
- Any Browser.

PRACTICAL EXAMINATION

PART – A

1. Write a HTML code to display welcome text using different text formatting tags.(Use h1-h6, bold, italic, underline, strikethrough, div, p, pre tags) **(HTML Basic tags)**
2. Design a HTML page to list the computer languages where each language is a link. Prepare separate HTML documents for each language and call them in the appropriate link.**(Lists and Links)**
3. Write a HTML program to display the image of a computer as a link to the web pagedescribing the components of computers. **(Images and link tags)**
4. Develop a web page using CSS to create a timetable for the class using different borderstyle. **(Table tags and internal style sheets)**
5. Design a webpage of your college with attractive background color, text-color, font-face,an image by using external CSS formatting .**(External Style sheets)**

PART – B

6. Write a JavaScript program to create a clock in 24 hours format using Date Object. (Donot include AM/PM) (**JavaScript Objects and Functions**)
7. Write a JavaScript program to control (play, pause, stop) the audio/video in a web page. **(JavaScript User defined Objects and Media Tags)**
8. Write a JavaScript program to change the color of a web page to the color typed by theuser in the text box**. (DOM)**

   Write a JavaScript program to develop a simple calculator (with basic arithmetic operations like add, subtract, multiply, divide, equal to) by getting two numbers in two text boxes, buttons for operations and display the result in the third text box. **(Event Handling)** 10.Create a form with text fields such as username, mail id, password, retype password, gender (radio), languages known (check box), Describe yourself (textarea), submit buttonand perform form validation such as username must not be less than 8 characters, mail id should contain @ symbol, password and retype password must be the same. **(Forms & Form validation)**

SCHEME OF VALUATION		
SNO	**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	05
6	Total	100

4G233640	OPERATING SYSTEMS	L	T	P	C	End Exam
Practicum		1	0	2	2	Practical

Introduction

Students have to be conversant with computer, its terminology and functioning. The heart of a computer is based around its Operating System. An operating system acts as an interface between the user of a computer and the computer hardware. The processor deals withrequest 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 shellscript for various problems.

Course Outcomes

After successful completion of this course, the students should be able to

CO1:understand functional architecture of an operating system.

CO2: distinguish CPU scheduling algorithms.CO3:

analyze process coordination.

CO4: classify File System and directory implementations.CO5:

Resource Management

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	2	2	---	---
CO2	2	3	3	2	2	---	---
CO3	2	2	2	3	3	---	---
CO4	2	2	3	2	2	---	---
CO5	2	3	2	3	3	---	---

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learningconfidence.
- 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 anengaging 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 assessexperiment outcomes and analyze potential sources of error in case of discrepancies.

4G233640	OPERATING SYSTEMS	L	T	P	C
Practicum		1	0	2	2

PART A		
UNIT 1	**INTRODUCTION TO OS**	
Introduction to operating system: Basics of Operating system- types of operatingsystem- operating system services - operating system structures		**4**
Ex No:1 Write a syntax and execute the directory management commands : ls, cd,pwd, mkdir, rmdir **Ex No:2** Write a syntax and execute the file management commands such as cat,chmod, cp, mv, rm, more		**6**
UNIT 2	**PROCESS MANAGEMENT**	
Process Management – Process scheduling-Process synchronization, critical section,Deadlocks. Memory Management : swapping, Contiguous memory allocation, paging, Virtual Memory, Page Replacement Algorithms.		**4**
Ex No:3 Write a syntax and execute the general purpose commands : wc, cal,date, who, tty, ln **Ex No:4** Using the simple filters verify pr, head, tail, cut, paste, nl, sort		**6**
UNIT 3	**BASICS OF LINUX OS**	
Basics of Linux OS: Entering and Exiting from a Linux System – User Accounts – Different shells – Learn the syntax and usage of Directory Management Commands – Check the process status – process management commands –search patterns		**2**
Ex No:5 Using the simple filters verify grep, egrep, fgrep, write and wall,sed,awk		**4**
PART B		

UNIT 4	FILE OPERATIONS	
File operations (New, Open, Close, Save, Save and Exit, Print) – Text Editing operations (inserting ,deleting ,finding, replacing, copying and moving)-		2
Ex No 6: Write a shell script that accepts a numerical value N and find sum . **Ex No 7 :** Write a shell script to find factorial of the given number **Ex No 8:** Write a shell script to perform arithmetic calculator using case statement.		9
UNIT 5	**SHELL SCRIPTS**	
use of shell scripts – Numerical operations – Looping – Swapping techniques – string operations- using command line arguments – filters-date function- Relational Operations -Logical Operations – Boolean operations – Basic Arithmetic operations – case statement – search directory or file .		2
Ex No 9 : Write a shell script using command line arguments and reports on Whether it is a directory, file or something else. **Ex No 10 :** Write a shell script to reverse a string and display it.		6
TOTAL PERIODS		**45**

Textbook for Reference:

- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Principles, 9thEdition, John Wiley &Sons, 2018.
- William Stallings, Operating Systems – Internal and Design Principle", 9thEdition,Pearson Education/PHI, 2018.
- Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson/PHI, 2014.

Website links for reference:

- https://nptel.ac.in/courses/106/105/106105214/
- https://ocw.mit.edu/courses/6-828-operating-system-engineering-fall-2012/pages/lecture-notes-and-readings/
- https://www.geeksforgeeks.org/what-is-an-operating-system/
- https://www.w3schools.in/operating-system/intro

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments

based onthe course.

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

Equipment / Facilities required to conduct the Practical Portion

- **Hardware Requirement:**
  - Desktop Computers
  - Printer
- Software Requirement:
  - Linux Operating System

PRACTICAL EXAMINATION

PART – A

Ex No:1 Write a syntax and execute the directory management commands :ls, cd, pwd, mkdir, rmdir

Ex No: 2 Write a syntax and execute the file management commands such as cat,chmod, cp, mv, rm, more

Ex No: 3 Write a syntax and execute the general purpose commands: wc, cal, date,who, tty, ln

Ex No: 4 Using the simple filters verify pr, head, tail, cut, paste, nl, sort

Ex No: 5 using the simple filters verify grep, egrep, fgrep, write and wall, sed, awkPART – B

Ex No 6: Write a shell script that accepts a numerical value N and find sum.

Ex No 7: Write a shell script to find factorial of the given number.

Ex No 8: Write a shell script to perform arithmetic calculator using case.

Ex No 9: Write a shell script using command line arguments and reports onwhether it is a directory, file or something else.

Ex No 10: Write a shell script to reverse a string and display it.

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	05
6	Total	100

TERM - IV

4G234110	COMPUTER NETWORKS AND SECURITY	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction

The course aims to groom the students to gain concepts, knowledge and skills required to work on Computer Networking and Security industry. Course curriculum has been designed to give overview and use cases of Data Communication, Layered Networks, and Inter-networkingtechnology/protocolsandComputerSecurityiscoveredandthiswillhelpto prepare the students to keep pace with computer networking and security industry trends.

Course Objectives

The objective of this course is to enable the student to

- Understand the concept of data communication
- To know the functions and protocols of each layer of OSIand TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- Understand the main principles of computer and network security.
- Know different networking devices and their practical usages.
- Know the IP addressing and its mechanisms.
- Identify the attacks and threats.
- Study about Cryptography and different Cryptography Algorithms.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Remember the fundamentals of Computer Networks.

CO2: Identify core networking and infrastructure components, and the services

CO3: Examine the different networking applications

CO4: Understand fundamental properties of computer security, such as

Authentication, Authorization, and Data confidentiality and Integrity.

CO5: Identify the concept of the internet and security issues.

Pre-requisites: **Nil**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	1	1
CO2	3	3	3	1	1	1	2
CO3	3	3	3	1	1	1	1
CO4	3	3	3	1	1	1	2
CO5	3	3	3	1	1	1	2

Legend: 3-HighCorrelation, 2-MediumCorrelation, 1-LowCorrelation

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 throughoutthecoursetoensureoutcome-drivenlearningandemployability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyse potential sources of error in case of discrepancies.

4G234110	COMPUTER NETWORKS AND SECURITY	L	T	P	C
Theory		3	0	0	3

Unit I	DATA COMMUNICATION	
Data Communication: Components of a data communication– Data flow: Simplex - Half duplex - Full duplex .Types of Connections: Point to Point – Multipoint; Topologies: Star, Bus, Ring, and Mesh, Hybrid – Advantages and Disadvantages of eachtopology. Types of Networks: Need of Computer Networks – LAN – MAN – WAN – Internet –Intranet – Internet Service Providers (ISP) – Client-server – Peer to Peer – Wi-Fi – Bluetooth. Network Devices: Switches – Bridges – Routers – Gateways.		09
Unit II	**OSI MODEL AND 802.X PRTOCOLS**	
Network Models: OSI Model – Layered Architecture – Function of Layers – TCP/IPProtocol Suite 802.X Protocols: Concepts and PDU format of CSMA/CD(802.3) – Token ring(802.5) – Ethernet – Types of Ethernet(Fast Ethernet, gigabit Ethernet, High speed Ethernet 10GE to 800GE) – Comparison between 802.3 and 802.5.		09
Unit III	**NETWORK, TRANSPORT AND APPLICATION LAYER PROTOCOLS**	
Network Layer Protocol: IP – Interior Gateway Protocols: ARP, RARP (conceptsonly) IP Addressing: Dotted Decimal Notation – Subnetting and Supernetting – Ipv4 –Ipv6 Overview of TCP/IP - Transport Layer Protocols: Stop and wait protocol- ConnectionOriented and Connectionless Service – Sockets – TCP and UDP Application Layer Protocols: FTP – HTTP – Telnet		09
Unit IV	**NETWORK SECURITY**	
Network Security: Definition – Need of Network Security – Principles of Security – Attacks – Types of Attacks – Criminal Attacks – Legal Attacks – Passive and Active Attacks – Software Supply Chain Attacks .Cryptography: Definition – Symmetric Encryption Principles – Symmetric Block Encryption algorithms – DES - Digest Function – Public key cryptography principles – RSA– Digital Signature (concepts only)		10
Unit V	**NETWORK SECURITY APPLICATIONS**	

Hackers Techniques: Historical hacking techniques and Open sharing – BadPasswords – Advanced techniques – Viruses – Worms – Trojan Horses – SPAM Security Mechanisms: Introduction – Types of Firewalls – Packet Filters –Application Gateways – Limitation of Firewalls .Intrusion: Intruders – Intruder detection – Classification of Intruder - Detection Systems – Honeypots	8
TOTAL PERIODS	**45**

Suggested List of Students Activity

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

Textbook for Reference:

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw-Hill, 2007.
2. Andrew S. Tanenbaum “Computer Networks”, Fifth Edition, Pearson Prentice Hall Edition, 2011.
3. William Stallings, “Data and Computer Communications”, Eighth Edition, Pearson Education, 2011.

Web-based/Online Resources

1. https://www.pynetlabs.com/network-devices-and-its-various-types/
2. https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket-services
3. https://portswigger.net/research/top-10-web-hacking-techniques-of-2021

4G234230	DATA STRUCTURES USING PYTHON	L	T	P	C	End Exam
Practicum		3	0	2	4	Theory

Rationale

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

1. Provide the knowledge of various types of data structures
2. Familiarize with the representation of data structures
3. Use various data structures in organizing data
4. Reinforce theoretical concepts by writing relevant programs
5. Gain knowledge in practical applications of data structures

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand the fundamental data structures

CO2: Understand the concepts of linked lists

CO3: Apply the operations of stack and queue

CO4: Illustrate tree structure and apply trees traversal techniques

CO5: Implement various sorting and searching techniques

Pre-requisites : Knowledge in C and python programming.

CO/POMapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	-	-	-
CO2	3	2	2	1	-	-	-
CO3	3	3	3	2	-	-	-
CO4	3	3	3	2	-	-	-
CO5	3	3	2	2	-	-	-

Legend: 3-HighCorrelation, 2-MediumCorrelation, 1-LowCorrelation

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 throughoutthecoursetoensureoutcome-drivenlearningandemployability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G234230	DATA STRUCTURES USING PYTHON	L	T	P	C
Practicum		3	0	2	4

UNIT I	INTRODUCTION TO DATA STRUCTURES	
	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, Implementingthe ADT. **Algorithm Analysis** – space complexity, time complexity, Asymptomatic Notations: Big-O notation.	9
Ex.No	Name of the Experiment	
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	2
UNIT II	**LINEAR DATA STRUCTURES - LINKED LISTS**	
	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)	8
Ex.No	Name of the Experiment	
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	4

UNIT III	**LINEAR DATA STRUCTURES – STACK & QUEUE**	
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 (conceptsonly)		10
Ex.No	Name of the Experiment	
3	Write a python program to implement stack	8
4	Write a python program to implement queue	
UNIT IV	**NON-LINEAR DATA STRUCTURES - TREES**	
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.		9
Ex.No	Name of the Experiment	
5	Write the python program for pre-order traversal of a binary tree	4
UNIT V	**SEQUENTIAL STORAGE REPRESENTATION – SORTING & SEARCHING**	
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.		9
Ex.No	Name of the Experiment	
6	Write a python program to implement bubble sort	12
7	Write a python program to implement linear search	
8	Write a python program to implement binary search	
	TOTAL PERIODS	**75**

Text Book for Reference:

1. Rance D. Necaise, Data Structures and Algorithms using Python, John Wiley, 2011
2. Benjamin Baka, Python Data Structures and Algorithms, Packt Publishing Ltd., 2017
3. Roberto Tamassia, Michael H. Goldwasser, Michael T. Goodrich, Data Structures and Algorithms in Python, 1st Edition, Wiley, 2013

Web-based/Online Resources

1. https://www.pynetlabs.com/network-devices-and-its-various-types/
2. https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket- services
3. https://portswigger.net/research/top-10-web-hacking-techniques-of-2021

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.

Equipment / Facilities required to conduct the practical portion

1. Hardware Requirement:

- Desktop Computers / Laptop
- Printer

2. Software Requirement:

- Windows / Linux Operating System
- Python IDLE / Spyder.

4G234340	JAVA PROGRAMMING	L	T	P	C	End Exam
Practicum		2	0	4	4	Practical

Introduction

Java is a class-based, object-oriented programming language .It is intended to let application developers write once, and run anywhere (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java is widely used for developing applications for desktop, web, and mobile devices. Java is known for its simplicity, robustness, and security features, making it a popular choice for enterprise-level applications. Students will learn Java tokens, variables, data types, 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

At the end of the course, students will be able

CO 1: Demonstrate knowledge on Java Programming fundamentals.

CO2: Develop programs in Java using control structures, array and string.

CO3: Demonstrate use of object - oriented programming concepts in Java.

CO4: Apply programming skills to solve overriding problems using interface.

CO5: Develop applications using swing components.

Pre-requisites: Nil

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	1	1	2
CO2	3	3	3	3	1	1	2
CO3	3	3	3	3	1	2	2
CO4	3	3	3	3	1	2	2
CO5	3	3	3	3	1	3	2

Legend: 3-HighCorrelation, 2-MediumCorrelation, 1-LowCorrelation

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.

4G234340	JAVA PROGRAMMING	L	T	P	C
Practicum		2	0	4	4

UNIT I	INTRODUCTION TO JAVA	
Introduction to OOPS: Paradigms of Programming Languages – 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.		6
Ex No 1: Write a java program to read the temperature in Celsius and convert intoFahrenheit. **Ex No 2**: Write a program to read 2 integers and find the largest number using conditional operator. **Ex No 3**: Write a Java program to implement command line arguments.		12
UNIT II	**CONTROL STRUCTURES, ARRAY AND STRING**	
Control structures: Decision making statements - looping statements - branching statement - Arrays: One Dimensional Array –Multidimensional Array – String: String Array – String Methods.		6
Ex No 4: Write a Java program to find the sum and average of your tenth standard marks. **Ex No 5:** Write a Java Program to sort 10 student names in alphabetical order using bubble sort		12
UNIT III	**CLASS AND OBJECTS**	
Class and objects: Defining a class – Methods – Creating objects – Accessing Class members – Constructors – Method overloading – Static members –Nesting of Methods - Final methods.		6
Ex No 6: Write a Java program to collect student details using constructors. **Ex No 7:** Write a Java program to calculate area of rectangle, triangle and square using method overloading.		12
UNIT IV	**INHERITANCE AND INTERFACE**	

Inheritance: Defining Inheritance –Types of Inheritances– Overriding Methods – Final Variables and Methods - Abstract Class**- Interfaces:** Defining Interface – Types of Interfaces**.**		6
Ex No 8: Write a Java program to create a class called Shape with methods called getPerimeter () and getArea (). Create a subclass called Circle that overrides the getPerimeter () and getArea () methods to calculate the area and perimeter of a circle. **Ex No 9**: Write a Java program to create an interface Shape with the getArea () method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for Each of the three classes.		12
UNIT V	**EXCEPTION HANDLING AND SWING**	
Exception Handling: Basics of Exception Handling – try blocks – throwing an exception – catching an exception – finally statement. Swing Components and Event Handlers: – Event Handlers – Event Listeners –Input Events.		6
Ex No 10: Write a Java program to create a panel with three buttons, labeled Red, Blue and Yellow, so that clicking each button results in the background color changing to the appropriate color.		12
	TOTAL PERIODS	**75**

Textbook for Reference:

- E. Balagurusamy, Programming with Java, 5th Edition, TataMc-Graw Hill.
- Sagayaraj, Denis, Karthick and Gajalakshmi, Java Programming for Core and advanced learners, Universities Press (INDIA) Private Limited, 2018.
- Herbert Schildt, The complete reference Java, TataMc-Graw Hill, 7th Edition.

Website links for reference:

- NPTEL & MOOC courses titled Java: https://nptel.ac.in/courses/106105191/

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.

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware(s) Requirement:**
    - Desktop / Laptop
    - Printer
2. **Software(s) Requirement:**
    - Windows Operating System
    - Net Beans 8.0.2 / 8.2 with JDK.

Practical Examination

PART – A

1. Write a Java program to read the temperature in Celsius and convert into Fahrenheit.
2. Write a Java program to read 2 integers and find the largest number using conditional operator.
3. Write a Java program to implement command line arguments.
4. Write a Java program to find the sum and average of your tenth standard marks.
5. Write a Java Program to sort 10 student names in alphabetical order using bubble sort.

PART – B

6. Write a Java program to collect student details using constructors.
7. Write a Java program to calculate area of rectangle, triangle and square using method overloading.
8. Write a Java program to create a class called Shape with methods called getPerimeter () and getArea (). Create a subclass called Circle that overrides the getPerimeter () and getArea () methods to calculate the area and perimeter of a circle.

9. Write a Java program to create an interface Shape with the getArea () method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea () method for each of the three classes.
10. Write a Java program to create a panel with three buttons, labeled Red, Blue and Yellow, so that clicking each button results in the background color changing to the appropriate color.

SCHEME OF VALUATION FOR END EXAM		
SNO	**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	05
6	Total	100

4G234440	PYTHON PROGRAMMING	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction

Being able to implement the basic logical statements in python and explore python's various data structures and packages which are much useful in the fields of data science, artificial intelligence.

Course Objectives

The objective of this course is to enable the student to

1. To read and write simple python programs.
2. To define strings in python and operations on string.
3. Represent compound data using python lists, tuples, and dictionaries.
4. To define and access multi-dimensional arrays using NumPy.
5. To do input/output with files in python.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Demonstrate the installation process of python IDE and modules.

CO2: Implement the decision making and looping statements in python.

CO3: Define regular expression for the pattern and verify for the validity.

CO4: Create and access string, list, tuple, and dictionary and NumPy array.

CO5: Read and write text and csv file using python.

Pre-requisites: Nil

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	3	---	---	---
CO2	3	3	3	3	---	---	---
CO3	3	3	3	3	---	---	---
CO4	3	2	3	3	---	---	---
CO5	3	3	3	3	---	---	---

Legend: 3-HighCorrelation,2-MediumCorrelation, 1-LowCorrelation

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 tactivities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughoutthecoursetoensureoutcome-drivenlearningandemployability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyse potential sources of error in case of discrepancies.

4G234440	PYTHON PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

UNIT I	INTRODUCTION TO PYTHON	
Installing and running Python in interpreter and Interactive mode, Basic Datatypes in Python: int, float, string. Storing Values in Variables, Basic functions in Python: input (), print (), str (), int (), float (). Decision Making – Simple if, if…else and if … Elif statement; Control Statement: while, break, and continue, for loop, range ().		4
Ex No 1: Write a python program to read three numbers and print the greatest of three numbers. **Ex No 2**: Write a python program to find the sum of N number using range () Function in for loop.		12
UNIT II	**STRING, LIST, TUPLE, DICTIONARY**	
Sequence Data types. Operations on sequence data types: Indexing and slicing, concatenation, and replication, in and not in operators to access elements. List: Creation, mutable property, In build methods of List: index (), append (), insert (), sort (), reverse (). Tuple: immutable property, converting types using tuple (), list (). Dictionary Data type: Creation, keys (), values () and items () methods.		4
Ex No 3: Write a python program to demonstrate the string slicing, concatenation, replication and len () method. **Ex No 4:** Write a python program to create a tuple and convert into a list and print the list in sorted order. **Ex No 5:** Write a python program to create a dictionary and check whether a key or value exist in the dictionary.		16
UNIT III	**NumPy**	
Install and import NumPy module, Creation of one dimensional, 2D-dimensional NumPy array using array (), Slicing, indexing, NumPy methods: shape (), reshape		4

(), concatenate (), where (). Arithmetic operations in NumPy, Aggregation functions in NumPy.	
Ex No 6: Write a python program to create one dimensional array and convert into a 2D-dimensional array using reshape (), print the first two columns alone using slicing. **Ex No 7:** Write a python program to create two-dimensional array and search for An element using where () function.	16
Ex No 8: Write a python program to create a 2D-dimensional array and demonstrate aggregation functions sum (), min () and max () in the row and column wise.	
UNIT IV **FILE HANDLING**	
Text file handling: file opening mode, reading from a file: read (), readline (), readlines () and writing into a file: write (), writeline (). Pandas package: install andimport pandas, read and write a csv file, pandas methods: head (), describe ().	3
Ex No 9: Write a python program to read a text file and write the content in another file. **Ex No 10**: Write a python program to read a csv file using pandas and print the content.	16
TOTAL PERIODS	**75**

Textbook for Reference:

- AI Sweigart, Automate the Boring Stuff with Python, Second Edition, No Starch Press, 2019.
- Jake Vanderplas, Python Data Science Handbook, Essential tool for working with data, First Edition, O'Reilly Media, Inc, 2017.
- Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy and Ipython, Wes McKinney, Second Edition, O'REILLY, 2017.

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.

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers / Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - Python IDLE /Spyder.

PRACTICAL EXAMINATION

PART – A

Ex No 1: Write a python program to read three numbers and print the greatest of three numbers.

Ex No 2: Write a python program to find the sum of N number using range () function in for loop.

Ex No 3: Write a python program to demonstrate the string slicing, concatenation, replication and len() method.

Ex No 4: Write a python program to create a tuple and convert into a list and print the list in sorted order.

Ex No 5: Write a python program to create a dictionary and check whether a key or value exist in the dictionary.

PART – B

Ex No 6: Write a python program to create one dimensional array and convert into a 2D-dimensional array using reshape (), print the first two columns alone using slicing.

Ex No 7: Write a python program to create two-dimensional array and search for an element

using where () function.

Ex No 8: Write a python program to create a 2D-dimensional array and demonstrate aggregation functions sum (), min () and max () in the row and column wise.

Ex No 9: Write a python program to read a text file and write the content in another file.

Ex No 10: Write a python program to read **a csv file** using pandas and print the content.

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SNO	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	05
6	Total	100

4G234540	E-PUBLISHING TOOLS	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction:

This course provides an introductory exploration of e-publishing tools and technologies for creating and distributing digital publications. Students will learn about various e-publishing formats, tools used to create e-books, digital magazines, interactive documents and more. Through hands-on projects and practical exercises, students will gain proficiency in using popular e-publishing software and tools to design, format, and publish digital content for different devices and platforms.

Course Objectives

The objective of this course is to

1. Learn all tools and options in Text editing software.
2. Create Vector drawings using CorelDraw.
3. Learn all tools and options in Bitmapped image editing software.
4. Learn to use Layer masks, filters and blending modes in Adobe Photoshop.
5. Learn to use online publishing software like Canva, Figma.
6. Learn to use character styles, paragraph styles, text effects, and frames in any page layout software like Adobe Indesign or any other equivalent open source software.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Create designs like Business Cards, Notebook wrapper and logo.

CO2: Create passport size photo by removing background.

CO3: Design a new image by blending two images using layer masking and filters.

CO4: Prepare new designs for brochures, calendar and invitations.

CO5: Learn online graphic design platform to design presentations, social mediagraphics,

posters, flyers, and infographics.

Pre-requisites

Basic Knowledge about computer and multimedia elements.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	2	1	1	2
CO2	3	3	2	2	1	1	2
CO3	3	3	2	2	1	1	2
CO4	3	3	2	2	1	1	2
CO5	3	3	2	2	1	1	2

Legend: 3-HighCorrelation, 2-MediumCorrelation, 1-LowCorrelation

Instructional Strategy:

- It is advised to assign hands-on projects to students create digital publications using e-publishing tools such as Adobe Photoshop, CorelDraw, AdobePageMaker etc. Projects could include designing and formatting interactive documents.
- Conduct of interactive demos to help students learn specific techniques and tools. Provide step-by-step guidance and encourage questions and participation.
- Analysis of real-world examples of successful digital publications and their design, formatting, and distribution strategies.

4G234540	E-PUBLISHING TOOLS	L	T	P	C
Practicum		1	0	4	3

UNIT I E-PUBLISHING & VECTOR DRAWING APPLICATIONS	
Introduction to E-Publishing- Evolution -Categories of E-Publishing Tools- Text Editors- Word Processors- Vector Drawing Applications- Page Layout Applications- Bitmapped image Applications. Installing vector drawing application - Starting and Opening Drawings - Previewing - Viewing Modes - Saving and Closing Drawings - Workspace - Lines, Shapes, and Outlines- Working with Objects, Symbols, and Layers- Colour, Fills, and Transparencies- Exploring Special Effects- Working with Text- Templates and Styles- Pages and Layout.	**6**
1. Create a business card with a logo using various text styles, rectangle tool,and Ellipse tool.	**6**
2. Design a notebook wrapper using fountain filling and pattern filling tools.	**6**
3. Transform one object into another object using a blend tool. (Students can be allowed to use any other open source vector drawing software)	**6**
UNIT II PAGE LAYOUT APPLICATIONS	
Getting started with Scribes- Opening, closing and navigating- Text Tools- Shape Tools- Image Frame Tools- Color Management Tools- Master Pages- Layers- Alignment and Distribution Tools- PDF Export Options.	**2**
4. Design an invitation for your college convocation using text tools Shape Tools-Image tables in the page layout software. (Students can be allowed to use any other open source page layout software)	8
UNIT III BITMAPPED IMAGE APPLICATIONS	

Installing Image editing application- Opening, moving, editing, saving images- Essential Keyboards Shortcuts- Workspace- panels- Selection tools- Crop and slicetools- Colour selection and measuring tools- Text tools- Navigation tools- Retouching tools- Painting tools- Drawing tools- Customizing Toolbars- Layers - Layer Mask- Blending modes- Filters.	**4**
5. Create a design by using various selection tools, cutting and pasting the images.	**6**
6. Create a passport size photo by removing the background of a photo and change It to blue color.	**6**
7. Change the image looks by applying various filters and blending modes. (any one among Pencil sketch, Water Color, Blurred Background)	**6**
8. Create a design with the use of a layer mask using two images as background and foreground. (Students can be allowed to use any other open source image editing software)	**6**
UNIT IV ONLINE GRAPHIC DESIGN (CANVA CONTROLS)	
Introduction to Canvas- Templates- Backgrounds- Working with text- Font Styles- Elements- images, icons, or graphs- Shapes- Audio- Video- Animation- Applying Filters and Effects- Save- Download and share.	**3**
9. Design a multipage document like a tri-fold brochure using various elements for the college workshop.	**5**
10. Prepare a stylish calendar sheet by using tables and its formatting tools. (Students can be allowed to use any other open source online graphic designsoftware)	**5**
Total Periods	**75**

Text Books for Reference:

- Gary David Bouton, CorelDraw X7: The Official Guide- 12th Edition, O'Reilly Media, 2017.
- Conrad Chavez, Andrew Faulkner, Adobe Photoshop classroom in a book, 1st Edition,

Pearson, 2018.

- Latheefah Raji, Design with Canvas: A complete guide on how to use Canvas, 1stedition, Independent Publisher, 2021.

Website links for reference:

- https://www.psdstack.com/resources/photoshop-tutorials/
- https://www.vandelaydesign.com/free-CorelDraw-tutorial
- https://www.canva.com/designschool/tutorials/
- https://www.youtube.com/watch?v=uCcPDSE6vLw
- https://www.scribd.com/doc/13080717/CorelDraw-Course-Manual
- Getting Started with Adobe Photoshop (photoshopessentials.com)
- https://www.CorelDraw.com/en/learn/tutorials/
- https://www.CorelDraw.com/en/learn/webinars/

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.
-

Equipment / Facilities required to conduct the Practical Course

Hardware Requirements

- Desktop Computers with Internet Connectivity,Laser printer,
- Scanner

Software Requirements

- Any Open Source Software,
- GIMP,
- Scribes ,
- Inscape ,
- Adobe Photoshop,CorelDraw

PRACTICAL EXAMINATION

PART - A

1. Create a business card with a logo using various text styles, rectangle tool, and ellipse tool.
2. Design a notebook wrapper using fountain filling and pattern filling tools.
3. Transform one object into another object using a blend tool.
4. Design an invitation for your college convocation using text tools Shape Tools- Image tables in the page layout software.
5. Create a design by using various selection tools, cutting and pasting the images.

PART - B

6. Create a passport size photo by removing the background of a photo and change it to blue colour.
7. Change the image looks by applying various filters and blending modes. (any one among Pencil sketch, Water Colour, Blurred Background)
8. Create a design with the use of a layer mask using two images as background and foreground.
9. Design a multipage document like a tri-fold brochure using various elements for the college workshop.
10. Prepare a stylish calendar sheet by using tables and its formatting tools.

SCHEME OF EVALUATION

End Semester Examination-Practical Exam

SNO	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	VivaVoce	05
6	Total	100

4G234640	SCRIPTING LANGUAGES	L	T	P	C	End Exam
Project		0	0	6	3	Practical

Rationale:

The main objective of the course is to introduce the students with the advanced Web-based software development using JavaScript, PHP, and MySQL. The subject will impart knowledge to design visually appealing, dynamic, device-independent, and interactive web-based applications with client-side and server-side scripting. Additionally, this course aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course by undertaking a project. The individual students have different skills, attitudes, and strengths. At the end of this course, the students will learn how to work with the team and how to prepare the report.

Course Objectives:

- To learn to utilize the PHP statements for Application Development
- To learn to develop web applications using PHP and MysQL
- To design the interactive and dynamic web applications using AJAX,JQUERY and Node.js
- To learn to work in teams and to utilize the knowledge gained into an application suitable for a real practical working environment
- Learn and understand the gap between the technological knowledge acquired and the actual industrial need and to compensate it by acquiring additional knowledge as required

Course Outcomes:

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

CO1: Write PHP script to store, access and display the data in the MySQL Database.

CO2: Design the dynamic web pages using AJAX, Jquery and Node.js

CO3: Develop device-independent Web application using Bootstrap

CO4: Identify, discuss and justify the technical aspects of the chosen project with aComprehensive and systematic approach with the team.

CO5: Communicate and report effectively project related activities and findings and reproduce, improve and refine the acquired result

Pre-requisites:- Web Designing Course

CO/PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	2	1	-	1
CO2	3	3	3	2	1	-	1
CO3	3	3	3	3	2	-	2
CO4	3	3	3	3	2	3	3
CO5	3	3	3	3	2	3	3

Legend: 3-HighCorrelation, 2-MediumCorrelation, 1-LowCorrelation

Instructional Strategy:

- 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.
- Simulation and Real-World Practice : Conduct demonstrations and hands-on activities in with built in Models
- Encourage Critical Analysis and Thinking: Foster an environment where students can think over the real world problem and find the solution for the same also they can honestlyassessexperimentoutcomesandanalyzepotentialsourcesoferrorincase of discrepancies.
- Cooperative & Team-Based Learning: Foster the environment where in the students can work in the team, discuss among the team to find the solution for the real-world problem.

Guidelines for Project Team Formulation

Batch size: Maximum 6 students per batch

4G234640	SCRIPTING LANGUAGES	L	T	P	C
Project		0	0	6	3

UNIT I	PHP INTRODUCTION	
Theory: Introduction to Server Side Scripting - PHP: PHP Structure and Syntax - Integrating HTML with PHP - if Statements - if and else – switch case - for loop –for each loop- Strings – Arrays - HTML Form Elements Processing in PHP - Passing Variables between Pages.		8
Practice Experiments: **Ex No 1:** Write PHP code to implement any five string and array functions **Ex No 2:** Design the HTML form to collect student biodata and SSLC Mark, Process the collected data in the PHP and Find Total and Average for Mark.		

UNIT II	PHP PRGRAMMING AND MYSQL PHP	
Theory : Sessions and Cookies- Page redirection- Connecting to the MySQL Server – Insert, Edit, Update, Delete and Querying the Database from PHP		8
Practice Experiments: **Ex No 3:**Develop the simple application which display result of the student by getting register number as user input(assume student marks are already available in the database) **Ex No 4:** Develop the simple login page, which validates the username, and password (assume username, password and student name are stored in the database). If username and password are correct, the page should redirect to Welcome. Php file and display the student name in that page. If username or password is incorrect page should remain in login page itself.		

UNIT III	AJAX AND JQUERY

Theory: Introduction to AJAX -The XML Http Request Object - JSON - Introduction to jQuery - jQuery Events – jQuery Effects - AJAX and JQuery.		8
Practice Experiments: **Ex No 5:**Write the code to disable right-click option in the webpage using the jQuery **Ex No 6:** Develop the simple application which display details of the college by getting college code as input using AJAX without reloading the page (assume college details like code, name, courses offered, address, hostel facility,etc., are already available in the database)		
UNIT IV	**WEB APPLICATIONS FRAMEWORKS**	
Theory: Bootstrap 5.0: Cards – Nav Bar- Form elements- Node.js : Introduction – NPM-Node js Modules-upload files- Send an Email – Events-Node.js and MySQL-introduction to Django		8
Practice Experiments: **Ex No 7:**Develop the Node.js code to upload the file to server **Ex No 8:**Develop the Node.js code to send an email		
	Project Development & Report Preparation	58
	TOTAL PERIODS	**90**

Suggested List of Project (Not limited to this list):

1. College Management Software
2. Livestock Management software
3. Online Student Attendance and Biodata Management Software
4. Online Employee Management Software
5. Online Event Management Software
6. Online Transport Management Software
7. Online Library Management Software

8. Online Blood Bank
9. Online Shopping / Billing Software
10. Online Book / Music Store

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments inWeb development.
- online quizzes
- Project Development

Textbook for Reference:

- Thomas Powell, Fritz Schneider “Java Script: The Complete Reference”, Third Edition,Tata McGras-Hill, July 2017.
- Timothy Boronczyk, Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass “Beginning PHP6, Apache, MySQL, Web Development”, John Wiley & Sons Ltd, 2009.SandroPasquali, Kevin
- Faaborg “Mastering Node.js” Second Edition, Packt Publishing, 2017.

Equipment / Facilities required conducting the Practical Course / Project

Hardware Required.

1. Desktop / Laptop Computers.

Software Required.

1. Apache / Http / Wamp/ Xamp Webserver
2. MySQL
3. Any Web browser

TERM -V

4G235130	CLOUD COMPUTING	L	T	P	C	End Exam
Practicum		2	0	2	3	Theory

Rationale

This course will introduce the emerging technology cloud computing. The advantages of cloud services and cloud applications will give the students the much needed exposure to the current trend.

Course Objectives

The objective of this course is to

1. Introduce the concept of virtualization.
2. Outline the concepts of cloud computing.
3. Summarize the different types of web services and cloud service providers.
4. Elaborate the security issues in cloud.
5. Present the cloud applications.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand the concept of virtualization.

CO2: Differentiate various cloud services.

CO3: Explore the different cloud service providers.

CO4: Understand the security issues with cloud and security policies.

CO5: Comprehend the various cloud applications.

Pre-requisites

The student should have taken up Computer Networks and Security

The student should have the basic Knowledge about network protocols.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	3
CO2	2	3	3	1	1	1	3
CO3	3	2	2	1	1	1	3
CO4	3	2	3	1	1	1	3
CO5	3	2	3	2	1	1	3

Legend:3-HighCorrelation,2-MediumCorrelation, 1-LowCorrelation

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 necessaryto 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.

4G235130		L	T	P	C
Practicum	CLOUD COMPUTING	2	0	2	3

UNIT - 1	**CLOUD COMPUTING**	
Characteristics of Cloud - Benefits – limitations - Cloud Deployment Models - Cloud service models - Infrastructure as a service(IaaS), Platform as a Service(PaaS), Software as a Service (SaaS), Anything as a Service(XaaS) – SPI Vs. Traditional IT Models – Cloud Data Centers.		6
Ex.No.	Name of the Experiment	
1	Create a professional portfolio using Google Slides.	6
2	Use Google Drive as Storage as a Service to Store, Organize, Share and Collaborate.	
UNIT - 2	**VIRTUALIZATION**	
Virtualization, Hypervisors, Types of hypervisors. Virtualization techniques - para Virtualization - full virtualization, - hardware assisted virtualization - hybrid virtualization.		6
Ex.No.	Name of the Experiment	
3	Install Virtualbox/VMware Workstation with different flavours of Linux or windows OS on top of existing OS.	6
4	Setting up a Java development Virtual Machine with VirtualBox.	
UNIT - 3	**WEB SERVICES AND CLOUD SERVICE PROVIDERS**	
Web Services and its types, Google compute engine, Google App Engine, Amazon - Amazon Elastic Compute Cloud - Amazon Simple DB - Amazon Simple Storage Service (S3) - Amazon Cloud Front.		6
Ex. No.	Name of the Experiment	
5	Install a PaaS Engine (Google App Engine / AWS / Azure or any one PaaS Engine) and create simple web applications using python/java.	6

UNIT - 4	**SECURITY IN THE CLOUD**	
Storage Location and Tenancy -Cloud Security Challenges -CSA Reference Model - Security Policies and Implementation – Virtualization Security Management.		6
Ex. No.	Name of the Experiment	
6	Protect Google Sheets and Range with various access permissions.	6
UNIT - 5	**CLOUD COMPUTING APPLICATIONS**	
Adobe Creative Cloud Firefly design models– Git Hub repository basics– LinkedIn Benefits– Zoho Work Drive Features – Storage Concept of Google Big table.		6
Ex. No.	Name of the Experiment	
7	Setup a GitHub account and develop a simple python application.	6
8	Create a column family with an age-based garbage-collection policy in Google Bigtable.	
	TOTAL PERIODS	**60**

Textbook for Reference:

- Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, First Edition, Tata Mcgraw Hill, 2013.
- George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, First Edition, O'Reilly, 2009.
- Ashish Bhatnagar, Shailza Sharma, Cloud Computing, First Edition, S.K. Kataria & Sons, 2019.

Website links for reference:

- https://www.virtualbox.org/
- https://colab.research.google.com/
- https://cloud.google.com/appengine/
- http://www.seanmcilvenna.com/2018/03/26/setting-up-a-java-development-vm-with-virtualbox/
- https://cloud.google.com/bigtable/docs/samples/bigtable-create-family-gc-max-age
- https://www.accenture.com/gb-en/case-studies/about/cloud-security

- https://www.zoho.com/workdrive/features.html

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

4G235211	MACHINE LEARNING	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction:

With the increased availability of data from varied sources there has been increasing attention paid to the various data driven disciplines such as analytics and machine learning.Therefore, this course provides an introduction to the field of machine learning,coveringfundamentalconcepts,algorithms,andapplications.Itprovidesasetof techniques that can automatically detect patterns in data which can then be utilized for predictions and for developing models.

Course Objectives:

- To learn the basic concepts of machine learning.
- To gain knowledge on supervised learning concepts and their applications.
- To understand unsupervised learning models and their applications.
- To evaluate the algorithms based on corresponding metrics identified
- To learn other learning aspects such as reinforcement learning and other technologies

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Explain the basic concepts of machine learning algorithms.

CO2: Evaluate and compare various machine learning models

CO3: Design and develop various supervised learning models.

CO3: Design and develop various unsupervised learning algorithms

CO5: Apply machine learning techniques to solve real-time problems

Pre-requisites: Nil

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	1	1	1
CO2	3	3	3	2	1	1	1
CO3	3	3	3	3	1	2	2
CO4	3	3	3	3	1	1	2
CO5	3	3	3	3	1	2	2

Legend: 3-HighCorrelation,2-MediumCorrelation, 1-LowCorrelation

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

4G235211	MACHINE LEARNING	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Unit I	INTRODUCTION TO MACHINE LEARNING	
Fundamentals of Machine Learning (ML): Definition and Scope –-Basic Steps in Knowledge Discovery Process - Types- Applications. Data Descriptive Analysis: Mean- Median- Mode -Standard Deviation-Percentile Data. Workflow of Machine Learning Application Development: Data Cleaning, Data Integration, Data Reduction,Data Transformation, Algorithms and Visualizing Results.		9

Unit II	PREDICTIVE MODELLING	
Predictive Modelling: Basic Concepts- Needs- Types- Regression: Linear Regression–Logistic Regression-Evaluation Metrics for Regression. Frequent Pattern Mining: Needs-Associations Rules Mining-Algorithms: Apriori Algorithm-Pattern Evaluation Measures.		9

Unit III	SUPERVISED LEARNING TECHNIQUES	
Classification: Basic Concepts- Needs- Types - Features, Labels, Training Data, Testing Data, and models. Algorithms: Decision Tree Induction - Naive Bayes classifier – K-Nearest Neighbors'(KNN) - Model Evaluation Metrics. Ensemble Approaches: Voting Classifiers – Bagging and Boosting Sampling Techniques.		9

Unit IV	UNSUPERVISED LEARNING TECHNIQUES	
Clustering: Basic Concepts- Needs- Types- Types of Data-Data similarity and Dissimilarity Measures –Partitioning Method: K-Means Algorithms - Hierarchical Method: Agglomerative-Divisive Algorithm. Cluster Analysis: Metrics for Evaluating Clusters.		9

Unit V	ADVANCED CONCEPTS, TRENDS AND APPLICATIONS	
Text Mining- Web Mining- Time series Analysis. Case Studies: Market Basket Analysis- Recommendation System- Email Spam and Malware Filtering – Online Fraud Detection – Weather Forecasting- Challenges and Issues in		9

Machine Learning- Tools for Machine Learning.	
TOTAL PERIODS	**45**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course.
- Project based Learning in emerging application areas like finance, healthcare etc.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Assignments on different types of learnings
- Tutorials on solving problems using machine learning.
- Flipped classroom activities to explore application areas

Textbook for Reference:

- Ethem Alpaydin, “Introduction to Machine Learning”, Fourth Edition, MIT Press , 2020.
- Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Morgan, 3rd Edition, Kaufmann Publishers, 2011.
- Sebastain Raschka, Vahid Mirjalili, “Python Machine Learning”, 3rd Edition, Packt publishing 2019.

Website links for reference:

- https://www.javatpoint.com/machine-learning
- https://www.kaggle.com/learn/intro-to-machine-learning
- https://nptel.ac.in/courses/106106139
- https://nptel.ac.in/courses/106106236
- https://egyankosh.ac.in/

4G235212	DATA WAREHOUSING AND DATA MINING	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction

This course covers key aspects of data management and analysis. It starts with Data Warehousing, covering architecture, Dimensional Modeling, and ETL processes, along with tools and technologies. Then, students explore Data Warehousing Techniques, focusing on lifecycle management, metadata, and cloud-based analysis. The course then moves to DataMining, covering fundamental concepts, preprocessing, classification, and advanced techniques like Support Vector Machines and Neural Networks. Real-world Applications and Case Studies demonstrate Data Mining's use in retail, healthcare, CRM, and fraud detection.

Course Objectives

The objective of this course is to enable the student to

- Learn Data Warehousing fundamentals.
- Acquaint themselves with various Data Warehousing tools and technologies.
- Understand the Data Warehousing lifecycle, emphasizing quality, metadata management, and cloud analysis.
- Explore core Data Mining concepts, preprocessing, and classification/clusteringmethods.
- Master advanced Data Mining techniques.
- Analyze real-world Data Mining applications in different sectors.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand Data Warehousing principles, architecture, and ETL processes, including Dimensional Modeling.

CO2: Utilize tools and technologies proficiently for Data Warehousing.

CO3: Develop skills in core Data Mining concepts.

CO4: Master advanced Data Mining techniques like Support Vector Machines, Neural Networks, Text Mining, and DBSCAN for in-depth analysis.

CO5: Apply Data Warehousing and Data Mining in real-world scenarios.

Pre-requisites: Nil

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	2	1
CO2	3	3	3	1	1	3	2
CO3	3	3	3	1	1	3	1
CO4	3	3	3	1	1	3	2
CO5	3	3	3	1	1	3	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activitiesin a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G235212	DATA WAREHOUSING AND DATA MINING	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

UNIT I	INTRODUCTION TO DATA WARE HOUSING	
Introduction to Data Warehousing: Concepts and Architecture - Data Warehouse Design: Dimensional Modeling, Fact, and Dimension Tables - ETL Processes: Data Extraction, Transformation, and Loading - Data Warehouse Implementation: Tools and Technologies		8
UNIT II	**DATA WAREHOUSING TECHNIQUES AND TOOLS**	
Data Warehouse Lifecycle: Planning, Design, Implementation, and Maintenance -Data Quality and Metadata Management - OLAP and Multidimensional Data Analysis - Data Warehousing in Cloud Environments		9
UNIT III	**INTRODUCTION TO DATA MINING**	
Fundamentals of Data Mining: Concepts, Tasks, and Challenges - Data Preprocessing: Data Cleaning, Integration, Transformation, and Reduction - Classification Techniques: Decision Trees, Naive Bayes, and k-Nearest Neighbors - Clustering Techniques: K-means, Hierarchical Clustering - Association Rule Mining and Frequent Pattern Analysis		10
UNIT IV	**CLASSIFICATION TECHNIQUES**	
Introduction to Classification: supervised learning and classification - Decision Trees: ID3, C4.5, and CART algorithms, handling overfitting and pruning techniques - Naive Bayes Classifier: Principles of Bayesian classification, Naive Bayes algorithm for text classification - k-Nearest Neighbors (KNN): KNNalgorithm, Distance metrics and parameter selection		10

UNIT V	**CLUSTERING TECHNIQUES**	
Introduction to Clustering – Basics concepts of clustering – Partitioning Methods: K-Means clustering – hierarchical clustering: Agglomerative and Divisive Hierarchical clustering Methods - Comparison between partitioning and Hierarchical clustering approaches		8
	TOTAL PERIODS	**45**

Suggested List of Students Activity

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

Textbook for Reference:

- C.S.R.Prabhu , DATA WAREHOUSING Concepts, Techniques, Products and Applications ,Third Edition, PHI Learning,2008
- Robert Wrembel ,Data Warehouses and OLAP Concepts, Architectures, andSolutions,1st Edition IRM Press,2007
- Mehmed Kantardzic ,Data Mining Concepts, Models, Methods, and Algorithms2ndEdition, Wiley,2011

Website links for reference:

- https://www.geeksforgeeks.org/data-mining/
- https://www.javatpoint.com/data-mining-cluster-analysis
- https://www.tutorialspoint.com/dwh/dwh_schemas.html

4G235213	ETHICAL HACKING	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Rationale:

Ethical hacking is designed to provide individuals with the knowledge and skills required to understand, identify, and mitigate security vulnerabilities and threats in computer systems, networks, and applications. This course introduces the concepts of Ethical Hacking and gives the learner the opportunity to learn about different tools and techniques in Ethical hacking and security and to identify and analyze the stages an ethical hacker requires to take in order to compromise a target system as well as will apply preventive, corrective and protective measures to safeguard the system.

Course Objectives:

- Learn the fundamentals of ethical hacking principles, methodologies, and terminology, distinguishing between ethical and malicious hacking practices.
- Learn to identify and assess vulnerabilities and weaknesses in computer systems, networks, and applications through various reconnaissance techniques.
- Explore various hacking tools and techniques used by ethical hackers.
- Learn network scanning and penetration testing to identify security flaws and assess the effectiveness of defense mechanisms.
- Understand key information security concepts and their relevance to ethical hacking.
- Explore common attack vectors and learn how to defend against them.
- Learn how to secure systems and networks by implementing intrusion detection and prevention systems, firewalls, and encryption.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: gain a solid understanding of network basics and basic principles of information security.

CO2: be familiarized with various types of cyber attacks, such as malware, social

engineering, and denial-of-service (DoS), as well as common vulnerabilities like SQL injection and cross-site scripting (XSS).

CO3: identify and assess vulnerabilities in computer systems, networks and applications through reconnaissance techniques, vulnerability scanning, and analysis.

CO4: develop practical skills in exploiting security weaknesses within legal and

Ethical boundaries.

CO5: develop practical skills in using a variety of tools and techniques employed by ethical hackers.

Pre-requisites:

Basic Knowledge of Computers and networking fundamentals

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	2	2	2	3
CO2	3	3	3	2	3	2	3
CO3	3	3	2	2	2	2	3
CO4	3	3	2	2	2	1	3
CO5	3	3	2	2	2	1	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Provide students with hands-on experience in simulated environments where they can practice hacking techniques ethically.
- Integrate case studies and real-life scenarios to illustrate ethical dilemmas, ethical hacking methodologies, and the consequences of unethical behavior.
- Implement regular quizzes, and practical exercises to evaluate students' understanding of ethical hacking concepts, tools and techniques.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to

ensure that learning is outcome and employability-based.

4G235213	ETHICAL HACKING	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

UNIT I	INTRODUCTION TO ETHICAL HACKING	
Introduction to ethical hacking: Types of hacking- advantages, disadvantages and purpose of hacking- Types of hackers- Difference between ethical and non-ethical hacking- Ethical Hacking Terminologies- Tools and Skills- Phases of hacking- Lawsof the Land.Information Security Overview- CIA triad (Confidentiality, Integrity, Availability)- The Indian IT Act 2000 and Amendments to the Indian IT Act (2008).		09
UNIT II	**RECONNAISSANCE & FOOT PRINTING**	
Reconnaissance: Active Reconnaissance- Passive Reconnaissance- Footprinting: Domain Name Information- Finding IP Address- Finding Hosting Company- IP Address Ranges- History of the Website.Fingerprinting: Banner Grabbing- application fingerprinting, web application scanning, and DNS fingerprinting. DNS Enumeration.		09
UNIT III	**SCANNING & SNIFFING**	
Scanning: port scanning- Ping Sweep-Scanning Networks- Network discovery- Vulnerability scanning Sniffing: Introduction- Wire trapping and its types, packet sniffing- ARP spoofing, DNS spoofing and MAC flooding, active and passive sniffing,wi-fi sniffing- session hijacking- Man-In The Middle attack, sniffing countermeasures, sniffing detection techniques.		07
UNIT IV	**ENUMERATION, VULNERABILIY ANALYSIS & MALWARES**	
Enumeration- System enumeration- User enumeration- Service enumeration- Vulnerability Analysis- Vulnerability assessment- Common vulnerabilities and exposures (CVE)- Risk assessment.TCP/IP Hijacking- EMAIL Hijacking -Password Hacking- Dictionary Attack-Hybrid Dictionary Attack-Brute-Force Attack-Rainbow Tables- System Hacking- Password cracking- Privilege escalation- Maintaining access. Malware Threats: Types of malware (Types of viruses, worms, trojans, etc.)- Anti-malware tools and Techniques.		10
UNIT V	**SOCIAL ENGINEERING & WEB APPLICATION SECURITY**	

Social Engineering: Types of social engineering attacks- Prevention and awareness-Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks- DoS and DDoS concepts- DoS and DDoS attack techniques- Mitigation strategies- Web Application Security- Common web vulnerabilities -SQL injection- XSS, CSRF- Introduction to Pen Testing: need for pen testing, types and techniques of pen testing, phases of pen testing.	10
TOTAL PERIODS	45

Text Books for Reference:

- Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing made easy, 2nd Edition, Syngress, 2013.
- William Stallings, Lawrie Brown, Computer Security Principles and Practice, Fourth Edition, Pearson Education, 2017.
- Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, Grey Hat Hacking: The Ethical Hacker's Handbook, 3rd Edition, The McGraw-Hill Companies, 2011.

Website Links for Reference:

- https://www.udemy.com/topic/ethical-hacking/free/
- https://nielit.gov.in/gorakhpur/sites/default/files/Gorakhpur/B01_Ethical_Hacking_220125.pdf
- https://archive.nptel.ac.in/courses/106/105/106105217/
- https://mu.ac.in/wp-content/uploads/2023/08/TYBSC-CS-Ethical-hacking.pdf
- https://aaplesarkar.maharashtra.gov.in/file/AapleSarkar-CyberSecurityAwarenessGuide.pdf

Suggested List of Students Activity:

- Virtual environments can be set up to practice hacking techniques in a controlled environment and students can be assigned real-world scenarios where they need to perform penetration tests on simulated corporate networks, web applications, or wireless networks.

- Students can be provided with vulnerable systems to exploit. Reverse engineering techniques can be taught to students by providing them with malware samples or binary executables to analyze.

4G235214	AGILE PRODUCT DEVELOPMENT	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction:

Agile Product Development is a model in Software Engineering, which deals with reliability and quality assurance of the software under development. It provides framework for development of quality software product. The course covers important aspects of product development such as software lifecycle, requirement analysis and documentation, characteristics of good design, design techniques, testing, software implementation, maintenance etc. This course also provides the students with a theoretical understanding of agile software development practices and how small teams can apply them to create high-quality software.

Course Objectives:

The student should be made to

- Define Software Engineering and to understand the phases in a software project.
- Understand different software development models.
- Understand the benefits and pitfalls of working in an agile team.
- Understand agile development and testing.
- To learn how the agility is incorporated in Requirement engineering and quality assurance.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Explain different software development models

CO2: Interpret the concept of agile software engineering and its advantages in software development.

CO3: Analyze the core practices behind the given agile methodologies.

CO4: Interpret how agility is incorporated in Knowledge Management

CO5: Explain and Make use of various tools available to agile teams to facilitate the project and to perform quality assurance in agile team

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2			1	1
CO2	3	2	2	1		2	2
CO3	3	3	3	1		2	2
CO4	3	3	3	1		2	1
CO5	3	3	2	2		1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.

4G235214	AGILE PRODUCT DEVELOPMENT	L		P	C
Theory		3		0	3

UNIT I	INTRODUCTION TO SOFTWARE ENGINEERING	
Basics of Software Engineering : Need for Software Engineering – Definition – Software Characteristics –Program versus Software Products- Software Development Life Cycle Models: Introduction –Waterfall Model – Prototyping model – Spiral Model – Iterative Enhancement model – Agile model.		9
UNIT II	**AGILE METHODOLOGY**	
Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agile Documentations – Agile Drivers,Capabilities and Values.		9
UNIT III	**AGILE PROCESSES**	
Lean Production – SCRUM- Crystal -Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.		9
Unit IV	**AGILITY IN KNOWLEDGE MANAGEMENT**	
Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle: Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Story Card Maturity Model (SMM).		9
UNIT V	**AGILITY IN REQUIREMENTS ENGINEERING & QUALITY ASSURANCE**	
Impact of Agile Processes in Requirements Engineering(RE)– Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation —Requirements Management in Agile Environment- Agile Requirements Prioritization.– Agile Metrics —- Agility in Quality Assurance.		9
	TOTAL PERIODS	**45**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments in Software Development.
- Blended learning activities to explore the recent trends and developments in the field.
- Roleplay and case studies

Textbook for Reference:

- Roger S. Pressman, Software Engineering – A Practitioner's Approach, Seventh Edition, McGrawHill International Edition, 2010
- Ken Schawber, Mike Beedle, Agile Software Development with Scrum, International Edition, Pearson.
- Robert C. Martin, Agile Software Development, Principles, Patterns and Practices, First International Edition, Prentice Hall,2014

Website links for reference:

- https://clearbridgemobile.com/complete-guideagile-software-development/
- https://agileken.com/agilefundamentals-ebook/
- https://www.edx.org/course/agile-software-development
- https://dl.ebooksworld.ir/motoman/Pearson.Agile.Software.Development.Principles.Patterns.and.Practices.www.EBooksWorld.ir.pdf
- https://www.coursera.org/learn/agile-software-development

4G235215	ARTIFICIAL INTELLIGENCE	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction

Artificial Intelligence has grown to be very popular in today's world. The amount of data that is generated, by both humans and machines, far outpaces humans' ability to absorb, interpret, and make complex decisions based on that data. Artificial intelligence forms the basis for all computer learning and is the future of all complex decision making. Computers are extremely efficient at calculating these combinations and permutations to arrive at the best decision. Artificial intelligence and its logical evolution of machine learning are the foundational future of business decision making.

Course Objectives

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

- Describe and use the basic concepts of intelligent agents.
- Design a knowledge-based system.
- Develop general-purpose problem-solving agents, logical reasoning agents, and agents that reason under uncertainty.
- Identify systems with Artificial Intelligence.
- Choose appropriate algorithms for solving given AI problems.
- Design and implement logical reasoning agents.
- Design and implement agents that can reason under uncertainty.
- Apply Artificial Intelligence techniques for problem solving.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Remember the basic concepts of Artificial intelligence.

CO2: Solve basic AI based problems.

CO3: Define the concept of Artificial Intelligence.

CO4: Apply AI techniques to real-world problems to develop intelligent Systems.

CO5: Select appropriately from a range of techniques when implementing intelligent systems.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	3	1
CO2	3	3	3	1	1	3	2
CO3	3	3	3	1	1	3	1
CO4	3	3	3	1	1	3	2
CO5	3	3	3	1	1	3	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activitiesin a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G235215	ARTIFICIAL INTELLIGENCE	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

UNIT I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	9

Introduction to AI – Definition - Goals of AI – Applications of AI - History of AI -Types of AI –Components of AI - Human vs Machine Intelligence Agents – Rationality – Structure of Agents - Problem Solving Agents–Types of Agents - Environments-Nature of Environments

Unit II	PROBLEM SOLVING USING SEARCH TEHNIQUES	9

Search Algorithms: Evaluating Search Strategies - Breadth-first search, Uniform cost search, Depth-first search, Bidirectional Search.Heuristic Search Strategies: Best First Search, Heuristic Search, A* Search

UNIT III	KNOWLEDGE REPRESENTATION AND OPTIMIZATION TECHNIQUES	9

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories **Optimization Algorithms:** Hill Climbing, Local Beam Search and Genetic Algorithm

UNIT IV	GAME PLAYING AND CONSTRAINT SATISFACTION PROBLEMS 9	9

Game Theory: The Mini-Max search – Alpha-Beta Search- Introduction to CSPs Constraint
Networks - Binary and Non-Binary Constraints –Constraint Propagation –Backtracking Search forCSP–Local Search for CSP–Structure of CSP.

UNIT V	INTELLIGENT AGENTS 9	9

Knowledge-Based Agents –Propositional Logic – Propositional Theorem Proving – PropositionalModel Checking – Agents Based on Propositional Logic.Architecture for Intelligent Agents—Agent communication— Argumentation among Agents.

TOTAL PERIODS	45

Suggested List of Students Activity

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

Textbook for Reference:

- Stuart Russel, Peter Norvig, Artificial intelligence, A modern Approach, 2nd edition , Prentice Hall,2007
- Rich, Kevin Knight, Shiv Shankar B Nair , Artificial Intelligence, 3rd Edition, , TMH , 2009
- Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition, , Pearson India, 2015

Website links for reference:

- https://www.ibm.com/blog/the-benefits-of-ai-in-healthcare/
- https://en.wikipedia.org/wiki/Reinforcement_learning
- https://www.javatpoint.com/computer-vision

Suggested List of Students Activity

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

4G235320	INTERNET OF THINGS AND DIGITAL TWINS	L	T	P	C	End Exam
Practical		0	0	4	2	Practical

Rationale

This course will give a hands-on experience to the students in designing and developing Internet of Things applications and models.

Course Objectives

The objective of this course is to

1. Enable the students to understand the basic concepts of Internet of Things.
2. Summarize the functionalities of sensors and actuators.
3. Facilitate the students to design simple IoT concepts.
4. Illustrate the usage of cloud in IoT applications.
5. Introduce digital-twin technology to the students.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Interface sensors with micro controllers.

CO2: Design Internet of Things models using sensors and actuators.

CO3: Setup a cloud interface to visualize the data.

CO4: Understand the concept of digital twin technology.

CO5: Develop digital twin models using the software.

Pre-requisites

The student should have taken up Computer Networks.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	3
CO2	3	2	3	1	1	1	3
CO3	3	3	2	1	1	1	3
CO4	3	2	2	1	1	1	3
CO5	3	2	3	1	1	1	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers make the learning experience more engaging by introducing innovative and interesting ways of teaching.
- The teachers need to expose the students to material in multiple modes help them learn it faster and retain it longer.
- The teacher can focus the pupils' attention on the relevant facts and introduce scientific principles and concepts with the help of demonstration.

4G235440	INTERNET OF THINGS AND DIGITAL TWINS	L	T	P	C
Practical		0	0	4	2

Part - A	INTRODUCTION TO INTERNET OF THINGS	
Internet of Things – Sensors – Actuators – Micro Controllers - Introduction to Arduino Board and Arduino IDE – Arduino Programming.		30
Ex.No	Name of the Experiment	
1	Creating different LED patterns and controlling them with push button Switches using Arduino.	
2	Controlling servo motor based on the input from Joystick or PIR or IR Sensor using Arduino.	
3	Calculate the distance to an object with the help of ultrasonic sensor and Display it on an LCD using Arduino.	
4	Build a basic burglar alert security system with the help of PIR or IR Sensor and Buzzer/LED Pattern using Arduino.	
5	Create automated LED light control based on the input from LDR using Arduino.	
Part - B	**CLOUD AND DIGITAL TWINS**	
Thing Speak Cloud – Introduction to Digital Twin Technology - Setting up a cloud Account in Thing Speak cloud platform.		30
Ex.No	Name of the Experiment	
6	Upload the temperature data from LM35 sensor to ThingSpeak cloud With Node MCU/Raspberry Pi.	
7	Automatic streetlight simulation with Wokwi and ThingSpeak.	
8	Create your first thing using ditto.	
9	Query an existing thing using ditto.	
10	Connect an Arduino based device to Eclipse ditto.	
TOTAL HOURS		**60**

Suggested List of Students Activity

- Conduct of Ideathon to generate innovative solutions for real life problems.
- Micro project that shall be an extension of any practical lab exercise to real-world application

Textbook for Reference:

- Arsheep Bahga, Vijay Madisetti, Internet of Things - A Hands-On Approach, First Edition, Universities Press, 2015.
- Raj Kamal, Internet of Things, First Edition, McGraw Hill Education, 2017.
- Gopal Chaudhary, Manju Khari, Mohamed Elhoseny,Digital Twin Technology, First Edition, CRC Press, 2022.

Website links for reference:

- Arduino IDE: https://www.arduino.cc/en/IoT/HomePage
- Wokwi Simulator: https://wokwi.com/
- Eclipse Ditto: https://eclipse.dev/ditto/
- Ditto Example: https://github.com/eclipse-ditto/ditto-examples
- Thing Speak Cloud: https://thingspeak.com/

Equipment / Facilities required to conduct the Practical Course

Software Requirement:

1. Arduino IDE
2. Wokwi Simulator
3. Eclipse Ditto
4. Thing Speak Cloud

Hardware Requirement:

1. Arduino kit - 10 Numbers
2. Node MCU / Raspberry Pi - 10 Numbers
3. LED Lights – 10 Numbers
4. 330K Resistor - 10 Numbers
5. Push Button - 10 Number

6. Servo Motor 5 V DC - 10 Numbers
7. Joystick - 10 Numbers
8. Ultrasonic Sensor - 10 Numbers
9. 16x2 LCD Display - 10 Numbers
10. PIR Sensor - 10 Numbers
11. Buzzer - 10 Numbers
12. IR Sensor - 10 Numbers
13. LDR - 10 Numbers
14. LM35 Temperature Sensor- 10 Numbers
15. 5V DC Relay - 10 Numbers
16. Mini Bread Board - 10 Numbers
17. Jumper Wires
18. Data Cables - 10 Numbers

PRACTICAL EXAMINATION
PART - A

1. CreatingdifferentLEDpatternsandcontrollingthemwithpushbuttonswitchesusing Arduino.
2. Controlling servo motor based on the input from Joystick or PIR or IR sensor using Arduino.
3. Calculate the distance to an object with the help of ultrasonic sensor and display it on an LCD using Arduino.
4. BuildabasicburglaralertsecuritysystemwiththehelpofPIRorIRsensorand Buzzer/LED Pattern using Arduino.
5. CreateautomatedLEDlightcontrolbasedontheinputfromLDRusingArduino.

PART-B

6. UploadthetemperaturedatafromLM35sensortoThingSpeakcloudwithNode MCU/Raspberry Pi.
7. Automatic street light simulation with Wokwi and Thing Speak.

8. Create your first thing using ditto.
9. Query an existing thing using ditto.
10. Connect an Arduino based device to Eclipse ditto.

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	05
6	Total	100

4G235440	COMPUTER HARDWARE AND NETWORKING	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Rationale

The course aims at making the students familiar with various parts of computers and know the different types of peripherals. They will learn to assemble and repair desktop PC with all its internal components. Students will able to install different types of operating system and all other application software, customization of OS, updating device driver, setting firewall security, junk file removal, data backup and data recovery techniques. The students will learn to setup and configure networking system using various network devices using crimping, punching, setting IP addressing techniques. They are able to share and control resource and internet connection over network. They learn to secure networking system from different types of attacks.

Course Objectives

The objective of this course is to enable the student to

1. Identify the hardware components, assembling a computer, install and configure peripheral device.
2. Install Windows Server OS
3. Do Network Cabling and IP Configuration, Testing
4. Configure DNS Server & AD
5. Configure Web Server, FTP Server, and SMTP Server.

Course Outcome

On completion of the following exercises, the students must be able to

CO1: Identify the hardware components, assembling a computer, Install and configure Peripheral device.

CO2: Install Windows Server OS

CO3: Do Network Cabling and IP Configuration, Testing

CO4: Configure DNS Server & AD

CO5: Configure Web Server, FTP Server, and SMTP Server.

Pre-requisites: Nil

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	-	-	1
CO2	3	3	3	3	-	-	1
CO3	3	3	3	3	-	-	1
CO4	3	3	3	3	-	-	1
CO5	3	3	3	3	-	-	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to get 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 employability-based.
- All demonstrations/Hand-on practices are under a simulated environment (may be followed by a real environment as far as possible).

4G235440	COMPUTER HARDWARE AND NETWORKING	L	T	P	C
Practicum		1	0	4	3

Unit I	**COMPUTER HARDWARE**	
Introduction: Hardware, Software and Firmware. Mother board Components, SMPS: Principles of Operation and block diagram of ATX Power supply, Connector Specifications. Processors, Memory: Introduction-Main Memory, Cache memory Secondary Storage: Hard Disk – SSD- Format, Partition I/O devices and interface Keyboard-Mouse-Printers-Scanner-Displays Graphic Cards		4
Ex.No	Name of the Experiment	
1	Assemble and disassembling a computer & Troubleshooting (Study Experiment). Hard Disk/SSD a) Partition and Format. b) Scan Disk, Disk Cleanup, Disk De-Fragmentation	6
Unit II	**OPERATING SYSTEM & PERIPHERAL DEVICE INSTALLATION**	
Operating System-Server OS Installation, User Creation, Disk Cleaning, Defragmentation .Peripheral device (Scanner, Web cam, and bio-metric) Installation & Updating of Device Driver Software.		2
Ex.No	Name of the Experiment	
2	Install and configure any one device (Printer, Scanner, Web cam, bio-Metric device) with system and troubleshoot the problems.	6
3	Windows Server OS installation	6
Unit III	**ADMINISTERING WINDOWS SERVER**	

Active directory- Use of AD-Installation & Configuration of AD, Domain Name Service Use of DNS-Installation & Configuration of DNS. Web Server - Installation& Configuration of IIS web Server –HTTP Protocol Usage. FTP Server - Installation & Configuration of FTP Server-FTP Protocol Usage .SMTP Server - Installation & Configuration of SMTP Server		3
Ex.No	Name of the Experiment	
4	Installation and configuration of DNS Server	6
5	Installation and configuration of DHCP Server	6
6	Installation and Configuration of any one of Service (Telnet, FTP Server, Web Server)	6
Unit IV	**NETWORK DEVICES**	
Network Devices: Cable, Cable Crimping (Cross, Straight Through Cabling), Switch -Features and concepts of Switches – Routers (Wired and Wireless) – Gateways. IP Addressing: Dotted Decimal Notation – Subnetting & Supernetting, Data backup and data recovery, Firewall, VPN		6
Ex.No	Name of the Experiment	
7	Practice the following cabling works in a network. a) Cable Crimping b) Standard Cabling c) Cross Cabling d) Testing the Crimped cable using a Cable tester	6
8		6
9	IP Configuration & Testing a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration). b) Configure Internet connection and use IPCONFIG, PING /Tracert and Netstat utilities to Debug the Network issues.	6

10.	Data Backup & Network Security a. Create and configure user accounts (Administrative and Standard) in Windows. b. Create automated backups to ensure no data loss & you always have a recent backup c. Create rules on firewall to allow clients to connect to the Server Service	6
	TOTAL PERIODS	**75**

Suggested List of Students Activity

I. PC Assembling, Troubleshooting of Hardware effects using indicators.

ii. OS installation & Configuration in Server and Client

iii. Printer, Scanner, Biometric, Camera Installation and Configuration

iv. Usage of various networking tools

Textbook for Reference:

- D.Balasubramanian ,Computer Installation And Servicing ,Second Edition, Tata Mc-Graw Hill, New Delhi 2010
- Behrouza.Forouzan, Data Communication and Networking, 4th Edition, Tata Mc-Graw Hill, New Delhi, 2017.
- Andrew S. Tanenbaum, David J. Wetherall ,Computer Networks, Fifth Edition, Pearson,2010

Website links for reference:

- https://epathshala.nic.in/process.php?id=students&type=eTextbooks&ln=en
- https://www.edx.org/learn/computer-hardware
- https://www.simplilearn.com/ccna-200-301-network-fundamentals-course-skillup
- https://rajshaladarpan.nic.in/sd4/home/public2/VocationalSchool/Textbook/

Equipment / Facilities required to conduct the Practical Portion

LIST OF EQUIPMENTS

Hardware Requirements:

Desktop Systems, Laser Printer, Web camera,

Biometric Device, Scanner, Crimping Tool,

Screwdriver set,

Network Cables, Switch,

Router, Cable, Cable Tester, RJ45

Software Requirements:

Windows server OS, Oracle Virtual Box, Windows OS (Host System),

Simulation Software (GNS3/ Cisco Packet Tracer)

PART – A

1. Hard Disk/SSD
   a) Partition and Format.
   b) Scan Disk, Disk Cleanup, Disk De-Fragmentation
2. Install and configure any one device (Printer, Scanner, Webcam, Bio-metric device) with system and troubleshoot the problems.
3. Server OS installation
4. Installation and configuration of DNS Server
5. Installation and configuration of DHCP Server

PART – B

6. Installation and Configuration of any one of Service (Telnet, FTP Server, Web Server)
7. Practice the following cabling works in a network
   a) Cable Crimping b) Standard Cabling
   c) Cross Cabling d) Testing the Crimped cable using a Cable tester
8. Create a Network topology using any network simulation software.

9. IP Configuration & Testing

   a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration).

   b) Configure Internet connection and use IPCONFIG, PING / Tracert and Netstat utilities to Debug the Network issues.

10. Data Backup & Network Security

   a. Create and configure user accounts (Administrative and Standard) in Windows.

   b. Create automated backups to ensure no data loss & you always have a recent backup

   c. Create rules on firewall to allow clients to connect to the Server Service

SCHEME OF VALUATION		
SNO	**ALLOCATION**	**MARKS**
1	Aim(05),Procedure from Part–A(30)	35
2	Aim(05),Procedure from Part–B(30)	35
3	Executing any one from (Part -A or Part–B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G235541	DATA ANALYTICS	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction

Being able to do the basics data analysis with Python to build and evaluate data models which includes collecting and importing data, cleaning & preparing data, summarizing & visualization data, building machine learning regression models with python inbuild libraries.

Course Objectives

The objective of this course is to enable the student to

1. Introduce the data analytics process and its applications.
2. Explore the python's sequence data structures and functional programming for data analytics.
3. Apply the functionality of python's package Pandas to import, clean and analyze data frommultiple sources.
4. Create data visualizations with Python library – pyplot.
5. Model and interpret data using Python library – scikit-learn.

Course Outcomes

After successful completion of this course, the students should be able toCO1: Demonstrate the process involved in data analytics.

CO2: Experiment the basic data analytics with python's sequence data structures & functionalprogramming.

CO3: Import, clean and analyze data from multiple sources using python library pandaCO4: Create data visualizations with Python library – pyplot.

CO5: Model and interpret data using Python library – scikit-learn.

Pre-requisites

Python Programming, Data Structures Using Python.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	2	-	2	1
CO2	3	3	3	3	-	1	3
CO3	3	2	3	3	-	-	-
CO4	3	3	3	3	2	-	-
CO5	3	3	3	3	2	-	-

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activitiesin a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G235541	DATA ANALYTICS	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO DATA ANALYTICS AND PYTHON	
Define Data, Types of Data, Data Analytics, - Data Analysis Vs Data Analytics, Data Analysis Process, Quantitative and Qualitative analysis, Application of Data Analysis: Prediction and recommendation. Python functional programming: map, filter, reduce, lamda, list comprehension.		4
Ex No 1: Write a python program to double the elements in list using map function and to find the sum of elements of a list using reduce functions. **Ex No 2**: Write a python program to filter only even numbers in the list using filter function and to create a list of squares of the elements of using list comprehension.		12
Unit II	**DATA LOADING AND CLEANING**	
Data loading, Panda's data structures: Data Frame- Creating a data frame from dictionary, loading a CSV file into a data frame. Methods of data frame: head (), tail (), shape (), column (), describe (). Data Cleaning: Handling missing data: Filtering out missing data, filling in missing data, Data Transformation: Removing duplicates, Replacing values.		4
Ex No 3: Load a CSV file into a Pandas data frame and print the first five rows, shape of the dataset, and column names and their types. **Ex No 4:** Load a data into a Pandas data frame, list out number of missing values in each column and fill the null values with suitable default value. **Ex No 5:** Load a dataset into a Pandas data frame, find and remove duplicate rows and rename indexes (Column name).		18
Unit III	**DATA ANALYSIS**	

Introduction to static analysis -Basic static analysis using describe function. Correlation Analysis of feature, Introduction to Seaborn, Correlation analysis using Heat map.	3
Ex No 6: Load a dataset into a data frame, drop the non- numeric columns and list out the basic static analysis of each column. **Ex No 7:** Load a dataset into a data frame, find correlation matrix and plot the heat map to find highly correlated feature of the target feature.	12
Unit IV	**DATA VISUALIZATION AND PREDICTION.**
Machine Learning Models: Linear Regression-Estimation, Logistic Regression - Classification. Introduction to Modelling Library – Scikit learn: Training Dataset, Testing Dataset, predicting target variable based on feature variable.	4
Ex No 8: Load a pre-cleaned dataset into a data frame, plot the values of feature and target variables using scatterplot to visualize their relation. **Ex No 9:** Visualize a pre-cleaned dataset to detect an outliner and filter out them. **Ex No 10:** Train the sklearn linear model with a pre-cleaned dataset using fit function and predict the target variable.	18
TOTAL PERIODS	**75**

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.

Sample CSV file Source:

1. https://www.kaggle.com/datasets/kunwarakash/chennai-housing-sales-price
2. https://www.kaggle.com/datasets/arshid/iris-flower-dataset
3. https://www.kaggle.com/datasets/ruchi798/housing-prices-in-metropolitan-areas-of-india

Textbook for Reference:

- Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
- Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy,and IPython, O'REILLY 2018, Second Edition.
- Jake Vanderplas, Python Data Science Handbook, Essential tool for working with data, First Edition, O'Reilly Media, Inc,2017.

Website links for reference:

- https://www.kaggle.com/code/kumudadk/introduction-to-machine-learning#pandas
- https://www.kaggle.com/code/doukanelik/missing-values
- https://www.kaggle.com/code/shtrausslearning/bayesian-regression-house-price- prediction#2-|-DATA-PREPARATION
- https://www.kaggle.com/code/sukethae/housing-prices-prediction-in-hyderabad-india
- https://www.kaggle.com/code/mahnazarjmand/clustring-model-on-iris-dataset/input
- https://www.kaggle.com/code/pythonafroz/titanic-survival-prediction-with-11-algorithm.

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers / Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - Python IDLE /Spyder.

PRACTICAL EXAMINATION

PART – A

Ex No 1: Write a python program to double the elements in list using map function.

Ex No 2: Write a python program to filter only even numbers in the list using filter function.

Ex No 3: Load a CSV file into a Pandas data frame and print the first five rows, shape of the dataset, and column names and their types.

Ex No 4: Load a data into a Pandas data frame, list out number of missing values in each

column and fill the null values with suitable default value.

Ex No 5: Load a dataset into a Pandas data frame, find and remove duplicate rows and rename indexes (Column name).

PART – B

Ex No 6: Load a dataset into a data frame, drop the non- numeric columns and list out the basic static analysis of each column.

Ex No 7: Load a dataset into a data frame, find correlation matrix and plot the heat map to find highly correlated feature of the target feature.

Ex No 8: Load a pre-cleaned dataset into a data frame, plot the values of feature and target variables using scatterplot to visualize their relation.

Ex No 9: Visualize a pre-cleaned dataset to detect an outliner and filter out them.

Ex No 10: Train the sklearn linear model with a pre-cleaned dataset using fit function and predict the target variable.

SCHEME OF VALUATION		
SNO	**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	05
6	Total	100

4G235542	MOBILE COMPUTING	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction:

This course introduces computer engineering students to the fundamental principles, theories, and practical aspects of mobile computing. Through a combination of theoretical lectures and hands-on practical exercises, students will gain a comprehensive understanding of mobile computing concepts and technologies.

Course Objectives:

- To learn the basics of wireless communication and cellular networks.
- To study the popular cellular networking technologies.
- To explore various protocols that support mobility at network layer and transport layer. The students should be able to simulate various network topologies with different routing algorithms and they can analyze how each routing algorithm is performing its job.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: To explore various modulation techniques, multiplexing techniques and familiarize with wireless LAN technologies including IEEE 802.11, HIPERLAN, and Bluetooth.

CO2: To understand the evolution and concepts of cellular communication explore the practical issues of mobile computing using network simulation tools.

CO3: To analyse and compare different ad hoc routing protocols.

CO4: To identify the limitations of traditional TCP and understand various TCP improvements and their benefits.

CO5: To understand mobile computing platforms and explore network simulators

and programming platforms for mobile applications.

Pre-requisites:

A background in computer networks is required.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	3	2	2
CO2	3	3	1	1	3	3	2
CO3	2	3	2	1	1	1	3
CO4	1	3	2	3	1	1	3
CO5	3	1	1	2	3	2	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Combination of lectures, practical exercises, and simulations to reinforce theoretical concepts.
- Emphasis on hands-on experience with network simulators and programming platforms to enhance understanding and skills in mobile communication technologies.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activitiesin a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.
- 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.

4G235542	MOBILE COMPUTING	L	T	P	C
Practicum		1	0	4	3

UNIT I WIRELESS COMMUNICATION AND WIRELESS NETWORKS	
Challenges of Wireless Transmission - Multi-carrier modulation - Spread Spectrum - Satellite Communication - Broadcast systems - Multiplexing - FDMA, TDMA and CDMA. Duplexing Techniques: FDD, TDD. Wireless LAN – Infrared Vs Radio Transmission – Infrastructure Networks – IEEE 802.11 – HIPERLAN – Bluetooth – Wireless ATM.	5
Practical Exercises * 1. Installation of Network Simulator (Eg.NS2) 2. Implementation of Bluetooth network (transfer a file from one device toanother). 3. Implement a basic function of Code Division Multiple Access (CDMA).	8
UNIT II CELLULAR COMMUNICATION	
Cellular Communication – Tessellation, Frequency Reuse and Handoff – Evolution of cellular communication systems: 1G, 2G, 3G, 4G and 5G. Overview of GSM - GPRS Network - UMTS and IMT 2000 - Packet Switching Domain - Core Network - Radio Access Network - LTE - Control Plane - User Plane.	5
Practical Exercises * 4. Simulate authentication and encryption techniques used in GSM and analyze their performance. 5. Illustration of Hidden Terminal Problem using Network Simulator.	12
UNIT III MOBILE NETWORK LAYER	
Mobile IP - Mobility features in IPv6 - Proactive and reactive ad hoc routing protocols - DSDV, DSR and AODV.	5
Practical Exercises * 6. Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc. 7. Simulate AODV Protocol.	12

UNIT IV MOBILE TRANSPORT LAYER	
Traditional TCP - Limitations of Traditional TCP - TCP improvements for Wireless Networks – Indirect TCP, Snoop TCP, Mobile TCP – Fast Retransmit/ Fast Recovery – Transmission/ Timeout Freezing – Selective Retransmission – Transaction Oriented TCP.	**5**
Practical Exercises * 8. Create a mobile chatting application using TCP with a mobile client.	**6**
UNIT V MOBILE COMPUTING PLATFORM	
PDA - Device characteristics and Software components - Smart Phone - Convergence of Mobile devices - Network simulators: NS2 – GLOMOSIM – SENSIM – OPNET – Programming Platforms – J2ME – Palm OS - SYMBIAN OS - Overview of other mobile Operating Systems.	**5**
Practical Exercises * 9. Set up a simple mobile network topology using a network simulator. Configure and manage mobile devices within a simulated network environment. 10. Setup & configure Wireless Access Point (AP) using Network Simulator. Analyze the Wi-Fi communication range in the presence of the access point (AP) and the base station (BS).	**12**
	75

Suggested List of Students Activity:

- Group activities challenging Network configuration.
- Performing a survey of popular mobile phones and exploring their configuration and exploring the structure and operation of a cell phone tower.
- Activities, like contest, to develop Mobile application using Network Simulator.

Textbook for Reference:

- J. Schiller, “Mobile Communication”, Pearson Education, 2009.
- K. Ashoke Talukder, Roopa Yavagal, “Mobile Computing”, Tata McGraw Hill, 2005
- Paul Bedell, “Cellular networks: Design and Operation – A real world Perspective”, Outskirts Press, 2014.

Equipment / Facilities required to conduct the Practical

Course.Hardware Requirement:

- Desktop Computers / Laptop
- Printer

Software required:

1. Any Network

SimulatorOptions

- NS2
- NS3
- OMNeT++ (Objective Modular Network Testbed in C++)
- Cisco Packet Tracer
- GNS3 (Graphical Network Simulator-3)

PRACTICAL EXAMINATION

PART – A

1. Installation of Network Simulator (Eg.NS2)
2. Implementation of Bluetooth network (transfer a file from one device to another).
3. Implement a basic function of Code Division Multiple Access (CDMA).
4. Simulate authentication and encryption techniques used in GSM and analyze their performance.
5. Illustration of Hidden Terminal Problem using Network Simulator.

PART – B

6. Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc.
7. Simulate AODV Protocol.
8. Create a mobile chatting application using TCP with a mobile client.
9. Set up a simple mobile network topology using a network simulator. Configure and

manage mobile devices within a simulated network environment.

10. Setup & configure Wireless Access Point (AP) using Network Simulator. Analyze the Wi-Fi communication range in the presence of the access point (AP) and the base station (BS).

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 orPart–B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G235543	COMPONENT BASED TECHNOLOGIES	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction

NET Framework provides a number of components to create many types of applications including those for consoles, Windows, mobile and the web. This Subject uses the .NET platform as a vehicle to master component-based Technology.

Course Objectives

The objective of this course is to enable the student to

- Develop simple applications using .NET
- Understand the concepts of event handlers, Windows Form Based Application.
- Access SQL database by using ADO.NET
- Create web pages using ASP.NET
- Create Web Service Using ASP.NET
- Develop XML database handling methodologies

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Develop simple applications using .NET

CO2: Understand the concepts of event handlers, Windows Form Based Application.CO3: Access SQL database by using ADO.NET

CO4: Create Web Pages, Web Service Using ASP.NET

CO5: Develop XML database handling methodologies

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	1	1	3
CO2	3	3	3	3	1	1	3
CO3	3	3	3	3	1	1	3
CO4	3	3	3	3	1	1	3
CO5	3	3	3	3	1	1	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.

4G235543	COMPONENT BASED TECHNOLOGIES	L	T	P	C
Practicum		1	0	4	3

UNIT I	INTRODUCTION TO C#.NET	
INTRODUCTION TO C#.NET Variables and constants–data types– declaration. Operators– types– precedence –Expressions – Program flow – Decision statements – if ... then, if...then…else, switch… Case, Loop statements– while, do...while, for. Next, for…each. Next, Array, Classes & objects – Creating and using your own classes – Data members and member methods – Instantiate an object, abstract class – static class Windows programming–Creating windows Forms-Working with Toolbox Controls &Advanced Controls – Events-Menus and Dialog Boxes		5
Exercise 1. Accept a character from console and check the case of the character. 2. Develop a menu-based application to implement a text editor with cut, copy, paste, save and close operations with accessing and shortcut keys.		12
UNIT II	**INTRODUCTION TO ASP.NET**	
Basics of web development with ASP.NET-Introduction to web forms and controls-Creating a simple ASP.NET web application **ASP.NET Web Forms and State Management** Working with web controls and server controls-State management techniques (view state, session, cookies) **Introduction to Web Services in .NET** Basics of web services and their importance-Creating and consuming web services in ASP.NET-SOAP and RESTful web services in .NET		4

Exercise 3. Develop a web application to input data through a web form to a database and validate the data. Use the Required Field Validator and Range Validator Controls. 4. Implement state management techniques such as view state, session, and cookies in an ASP.NET web application. 5. Create a simple SOAP or RESTful web service in ASP.NET and consume it in a client application.		18
UNIT III	**INTRODUCTION TO ADO.NET**	
Basics of database programming with ADO.NET-Connecting to a database using ADO.NET-Executing SQL queries and retrieving data -Stored Procedure **Advanced ADO.NET Programming** Working with disconnected data-Using Data Sets and Data Adapters-Handling concurrency and transactions in ADO.NET **Data Binding in ASP.NET** Data binding concepts-Binding data to web controls-Displaying database data in ASP.NET web forms		4
Exercise 6. Connect to a database using ADO.NET and retrieve data using SQL queries. 7. Create an ADO.Net application using Stored Procedure 8. Bind data from a database to web controls in an ASP.NET web form.		18
UNIT IV	**WORKING WITH XML IN .NET**	
Introduction to XML- Construction of an XML document -: XML Serialization in the .NET Framework		2
Exercise 9. Develop a Window application to read an XML document containing subject, mark scored, year of passing into a Dataset 10. Develop a Window application to read students records from Database using ADO.NET and generate XML document containing students' records		12
	TOTAL PERIODS	**75**

Suggested List of Students Activity

i. Creation of a Standalone .NET Application

ii. Creation of a Website.

iii. Creating a Web Service.

Textbook for Reference:

- Andrew Stellman , Jennifer Greene, Head First C#: A Learner's Guide to Real-World Programming with C#, XAML, and .NET, Third edition , O'Reilly ,2013
- Imar Spaanjaars , Beginning ASP.NET 4.5.1: in C# and VB, 1st Edition,Wrox,2014
- Tim Patrick, Microsoft ADO.NET 4 Step by Step, 1st Edition Prentice Hall India, 2010

Website links for reference:

- https://www.w3schools.com/asp/
- https://learn.microsoft.com/en-us/dotnet/framework/data/
- https://www.tutorialspoint.com/xml/index.htm
- https://learn.microsoft.com/en-us/sql/
- https://learn.microsoft.com/en-us/dotnet/framework/wcf/

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirement

1. Desktop Computer/Laptop

Software Requirement

1.Microsoft Visual Studio IDE

PRACTICAL EXAMINATION

PART – A

1. Accept a character from console and check the case of the character.
2. Develop a menu-based application to implement a text editor with cut, copy, paste, save and close operations with accessing and shortcut keys.
3. Develop a web application to input data through a web form to a database and validate the data. Use the Required Field Validator and Range Validator Controls.
4. Implement state management techniques such as view state, session, and cookies in an ASP.NET web application.
5. Create a simple SOAP or RESTful web service in ASP.NET and consume it in a client application.

PART – B

6. Connect to a database using ADO.NET and retrieve data using SQL queries.
7. Create an ADO.Net application using Stored Procedure
8. Bind data from a database to web controls in an ASP.NET web form.
9. Develop a Window application to read an XML document containing subject, mark scored, year of passing into a Dataset
10. Develop a Window application to read students records from Database using ADO.NET and generate XML document containing students' records

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 orPart–B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G235544	MULTIMEDIA SYSTEMS	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Rationale

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

- 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

CO1: Analyze the key components of multimedia systems

CO2: Design an image and edit images using image editing tools

CO3: Apply audio and video editing using different editing tools

CO4: Create an animation using animation tools

CO5: Apply acquired knowledge in the relevant field for the good cause

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	-	-	-
CO2	3	3	2	2	-	-	-
CO3	3	3	3	3	-	-	-
CO4	3	3	3	3	-	-	-
CO5	3	3	3	2	-	-	-

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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 andmedia are to be employed to develop the outcome.
- Guide students to create multimedia objects and applying it in relevant application

4G2235544	MULTIMEDIA SYSTEMS	L	T	P	C
Practicum		1	0	4	3

UNIT I	**INTRODUCTION TO MULTIMEDIA**	
Definition of Multimedia, Multimedia applications, Multimedia elements, Transition from conventional media to digital media, Delivering of Multimedia product, copy rights.		3
UNIT II	**TEXT**	
Usage of text in multimedia, Fonts and Faces, Hypermedia documents and Hypertext, Hypermedia Structures, Hypertext Tools, Text Editing and Word Processing Tools, OCR Software.		3
Ex.No	Name of the Experiment	
1	Design a poster with different text effects using suitable software	6
UNIT III	**IMAGES**	
Introduction to image, Making Still Images, Image editing tools, Color: Understanding Natural Light and Color, Color models, Color Palettes, Dithering, 2D graphics, Image compression and file formats: GIF, JPEG, JPG, PNG, TIFF, EXIF, PS, and PDF.		3
Ex.No	Name of the Experiment	
2	Convert the given image into pencil sketch using suitable photo editing Software.	18
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.	
4	Using photo editor software and/or GIF creator software create an Animation such as a flying balloon.	

UNIT IV	**SOUND**	
Digital Audio, Making Digital Audio Files, MIDI Audio, MIDI vs Digital Audio, Adding Sound to Your Multimedia Project, Audio Recording, Audio file formats, Sound Editing Tools, sound synthesis.		3
Ex.No	Name of the Experiment	
5	Use suitable software to (a) compress / decompress audio files. (b) Convert audio to different formats (c) split, join, rip audio.	12
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.	
UNIT V	**VIDEO & ANIMATION**	
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.		3
Ex.No	Name of the Experiment	
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.	24
8	Create a movie from video clips to demonstrate audio-video mixing, Music, video effects, video transitions and titles.	
9	Sketching of cartoon characters using suitable software	
10	Create a 2D animation of an aero plane take off using suitable software.	
TOTAL PERIODS		**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
- Blended learning activities to explore the recent trends and developments in the field.

Textbook for Reference:

- Ze- Nian Li and M.S. Drew, Fundamental of Multimedia, Second Edition, Pearson Education, 2014.
- Tay Vaughan, Multimedia: Making It Work, Ninth Edition, Tata-McGrawHill, 2014.

Website links for reference:

- https://helpx.adobe.com/in/photoshop/using/tools.html

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers
    - Printer
2. **Software Requirement:**
    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**.**

List of Software's

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 MovieMaker

PRACTICAL EXAMINATION

PART - A

1. Design a poster with different text effects using suitable software
2. Convert the given image into pencil sketch using suitable photo editing software.
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.
4. Using photo editor software and /or GIF creator software create an animation such as a flying balloon.
5. Use suitable software to (a) compress / decompress audio files.
   (b). convert audio to different formats. (c) Split, join, rip audio.

PART - B

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.
7. Use a video processing software to perform – Trim video clips, crop video, rotate video, join video, add subtitles, and edit video dimension, bit rate, frame rate, sample rate, channel, and video/audio quality tasks on a video.
8. Create a movie from video clips to demonstrate - audio-video mixing, music, video effects, video transitions, and titles.
9. Sketching of cartoon characters using suitable software
10. Create a 2D animation of an aero plane take off using suitable software.

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 orPart–B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G235545	FULL STACK DEVELOPER	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction

Being able to understand the full stack development process and develop a complete website by using various frontend and backend frameworks.

Course Objectives

The objective of this course is to enable the student to

1. Introduce the basic concepts of Full Stack development.
2. Explore the Frontend frameworks - Bootstrap and AngularJS.
3. Develop a website with front-end development languages and tools such as HTML, CSS, JavaScript, React, and Bootstrap.
4. Create a backend for the website with Django.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Describe the Web Application Development Ecosystem.

CO2: Develop and host the website in the localhost.

CO3: Experiment the Frontend frameworks –Bootrap, AngularJS, ReactJS

CO4: Development of Database for a website using Django.

CO5: Connect the Front end of database with the backend.

Pre-requisites

Web Designing and Scripting Languages.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	-	-	2	1
CO2	3	3	3	3	-	-	1
CO3	3	3	3	3	-	1	2
CO4	3	3	3	3	-	-	1
CO5	3	3	3	3	-	-	-

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activitiesin a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G235545	FULL STACK DEVELOPER	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO FULL STACK DEVELOPMENT	
Introduction: Roles and Responsibilities of a full stack developer, Overview of Front -end Technologies: HTML5, CSS and JavaScript, HTML5: Semantic Elements - <article> , <figure>, <footer>, <header>, <main>, <nav>, <section>, Form Creation. JavaScript: Validation of inputs.		3
Ex No: 1 Design a webpage with header, footer and navigation sections using appropriate semantic elements of HTML5. **Ex No: 2** Design a Sign-up page for a website which would accept only numerical values in the phone number field and password of minimum length 8 using HTML5 and JavaScript.		12
Unit II	**FRONT END FRAMEWORK: BOOTSTRAP**	
Introduction of Framework, Download Bootstrap, or Include Bootstrap through CDN links. Bootstrap Classes: Container Classes: .container, .container-fluid. 2.Grid Classes: row, col 3. Navigation Bars: navbar-default, navbar-inverse, Navbar-right. Advanced Plugin: Scrollspy.		4
Ex No: 3 Design a web page to demonstrate the bootstrap container and grid classes. **Ex No: 4** Design a web page with navigation bar using. navbar classes. **Ex No: 5** Design a web page to demonstrate the scroll spy plugin.		18
Unit III	**JAVASCRIPT FRAMEWORK: AngularJS**	
Introduction to AngularJS: AngularJS DOM, AngularJS Events, AngularJS Forms, AngularJS Validation. AngularJS application: Dynamic List Creation: adding elements in the List, removing elements from the List.		4

Ex No: 6 Display a list in a webpage in which list elements can be dynamically added using AngularJS. **Ex No: 7** Display a list in a webpage in which list elements can be dynamically removed using AngularJS.	12
Unit IV	**BACKEND FRAMEWORK DJANGO**
Introduction to Django Framework Concepts: Virtual Environment, Project, App,	
View, Template, Django Models. SQLite, Model Creation, Insertion, delete and update data in a Model.	4
Ex No 8: Create a Django App to display "Hello World." **Ex No 9:** Create and display a template in Django App. **EX No 10:** Create a Model in a Django app and insert data.	18

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.

Textbook for Reference:

- Jacob Lett, Bootstrap 4 Quick, First Edition, Bootstrap Creative, 2018.
- Ken Williamson, Learning AngularJS: A Guide to AngularJS Development, First Edition, O'Reilly,2015.
- Antonio Mele, Django 3 By Example: Build powerful and reliable Python web applications from scratch, Third Edition, Packt Publishing Limited,2020.

Website links for reference:

- https://www.w3schools.com/bootstrap/
- https://www.w3schools.com/django/

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers./ Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - Any Browser – Microsoft Edge/Chrome.
    - Editor – Notepad/ Notepad++
    - Server Software - WSGIServer.
    - Python IDLE /Spyder.

PRACTICAL EXAMINATION

PART – A

Ex No: 1 Design a webpage with header, footer and navigation sections using appropriate semantic elements of HTML5.

Ex No: 2 Design a Sign-up page for a website which would accept only numerical values in the phone number field and password of minimum length 8 using HTML5 and JavaScript.

Ex No: 3 Design a web page to demonstrate the bootstrap container and grid classes.

Ex No: 4 Design a web page with navigation bar using. Navbar classes.

Ex No: 5 Design a web page to demonstrate the scroll spy plugin.

PART – B

Ex No: 6 Display a list in a webpage in which list elements can be dynamically added using AngularJS.

Ex No: 7 Display a list in a webpage in which list elements can be dynamically removedusing AngularJS.

Ex No 8: Create a Django App to display “Hello World.”

Ex No 9: Create and display a template in Django App.

EX No 10: Create a Model in a Django app and insert data.

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 orPart–B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G235546	ROBOTIC PROCESS AUTOMATION	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Introduction

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

CO1: Download, install, and activate UiPath Studio, and gain proficiency in using thetool to develop RPA solutions.

CO2: Demonstrate a deep understanding of variables in UiPath, including their types and management best practices, allowing them to handle data effectively within

automation workflows.

CO3: Identify and apply Image, Text, and Data Tables Automation.

CO4: Handle User Events and various types of Exceptions effectively.

CO5: Deploy and maintain Robots efficiently.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	-	-	3	1
CO2	3	3	3	-	-	3	2
CO3	3	3	3	-	-	3	1
CO4	3	3	3	-	-	3	2
CO5	3	3	3	-	-	3	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.

4G235546	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Practicum		1	0	4	3

Unit I	RPA TOOL INTRODUCTION	
Theory Introduction to RPA Tools and User Interface - Overview of popular RPA tools and their features - Understanding the user interface of RPA tools. Variables: Types - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables- Naming Best Practices, and Management. **Practical** 1. Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA (Variables, arguments and Control flow etc.) 2. Write a program to empty the trash folder in Gmail.		15

Unit II	BASIC PROGRAMMING CONCEPTS	
Theory Control flow concepts - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity. **Practical** 3. Write a program in UIPath that utilizes the If activity and Switch activity to find the smallest and largest numbers in an array. 4. Write a program in UIPath 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.		15

Unit III	**ADVANCED AUTOMATION CONCEPTS & TECHNIQUES**	
Theory Recording Introduction – App / Web Recording – Table Extraction – Selectors - Excel Automation: Basics, Information Retrieval in Data Tables - Data Manipulation in excel – PDF Automation: Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF. **Practical** 5. Write a program to i) build a data table(static) ii) build a data table using data scraping (Dynamically). 6. Write a program to read an Excel file and creating a data table by using data from the Excel file. 7. Write a program to demonstrate the concept of dynamic elements in UIPath selectors.		21
Unit IV	**HANDLING USER EVENTS & EXCEPTION HANDLING**	
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 - Implementingerror-catching mechanisms in RPA workflows. **Practical** 8. Write a program to demonstrate email automation. (Note: use triggers and exception handling)		09
Unit V	**DEPLOYING AND MANAGING THE BOT:**	

Theory Orchestrator overview for Automation Developers – Working with Orchestrator Resources.Managing packages - Uploading packages - Deleting packages. **Practical** 9. Create an automation project in UiPath studio and publish and control the same using uipath orchestrator. 10. Write a program to demonstrate manage package, upload package and Deleting package for a reusable component.	15
TOTAL HOURS	**75**

Suggested List of Students Activity

- Presentation/Seminars by students to identify and analyze a manual process in a business environment suitable for automation.
- Assign bot development projects to students as a group activity to automate specific tasks or processes.
- Blended learning activities to explore advanced RPA techniques and capabilities.

Textbook for Reference:

- Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018
- Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation, Ist Edition2015.
- Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published, First Edition 2018.

Website links for reference:

- https://www.uipath.com/rpa/robotic-process-automation
- https://www.academy.uipath.com

Equipment / Facilities required to conduct the Practical Course

1. Desktop Computers.
2. UIPath Studio.

PRACTICAL EXAMINATION

PART - A

1. Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA (Variables, arguments and Control flow etc.)
2. Write a program to empty the trash folder in Gmail.
3. Write a program in UIPath that utilizes the If activity and Switch activity to find the smallest and largest numbers in an array.
4. Write a program in UIPath 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. Write a program to
   i) build a data table(static)
   ii) build a data table using data scraping (Dynamically).

PART - B

6. Write a program to read an Excel file and creating a data table by using data from the Excel file.
7. Write a program to demonstrate the concept of dynamic elements inUIPath selectors.
8. Write a program to demonstrate email automation. (Note: use triggers and exception handling)
9. Create an automation project in UiPath studio and publish and control the same using uipath orchestrator.
10. Write a program to demonstrate manage package, upload package and deleting package for a reusable component

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 orPart–B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G235640	INNOVATION AND STARTUP	L	T	P	C	End Exam
Practicum		1	0	3	2	Project

Introduction:

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 students

- 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

CO1: Differentiate between Innovation and Start-ups

CO2: Explain the importance of IPR, Patents and Copyrights.

CO3: Describe the methodology to be adopted for preparing the Business Plan

CO4: Gain practical experience by Industrial training and visiting the nearby industry

CO5: 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/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	1	-	2	3	3
CO2	-	-	1	-	2	3	3
CO3	-	-	1	-	2	3	3
CO4	-	-	1	-	2	3	3
CO5	-	-	1	-	2	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

4G235640	INNOVATION AND STARTUP	L	T	P	C
Practicum		1	0	2	2

Unit I	**INTRODUCTION TO INNOVATION**	
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		6
Unit II	**INCUBATION CLUBS, IPR, PATENTS AND COPYRIGHTS**	
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.		6
Unit III	**GOVERNMENT AND NON-GOVERNMENT FUNDING SCHEMES FOR START-UPS**	
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		6
Unit IV	**SEMINAR**	
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 6. Leadership and Innovation 7. Barriers to Innovation		9

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		
Unit V	**EXPOSURE TO INDUSTRY**	
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		18
TOTAL HOURS		**45**

4G235773	INDUSTRIALTRAINING	SUMMER VACATION	C
Project/ Internship			2

Introduction

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.

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 professional's 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 to potential 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

CO 1: Demonstrate proficiency in using industrial machinery, tools, and software.

CO 2: Able to identify, analyze, and solve engineering problems using industry-standard methods and practices.

CO 3: Gain a comprehensive understanding of industrial manufacturing processes, quality control, and safety practices.

CO 4: Exhibit improved communication, teamwork, and professional behavior in an industrial setting.

CO 5: Apply theoretical concepts learned in their coursework to practical engineering tasks and projects.

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 track performance 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 in developing 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 learn new 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 asrequired. 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, thechallenges 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 future career 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 prepare themselves 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 a record 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 is to 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 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.

TERM- VI

4G236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction:

Mathematics is essential for engineering students to understand core engineering subjects. It provides the framework for engineers to solve problems in engineering domains. This course is designed to bridge the gap between diploma mathematics and B.E/B.Tech mathematics in matrix algebra, differential calculus, vector calculus, differential equations, and Laplace transforms.

Course Objectives:

The objective of this course is to enable the students to

1. Understand the concepts of eigen-values and eigen-vectors of matrices.
2. Learn the notation of partial differentiation and determine the extremities offunctions of two variables.
3. Acquire knowledge in vector calculus which is significantly used to solve engineering problems.
4. Formulate and solve differential equations.
5. Understand Laplace transformation and its engineering applications.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Find eigenvalues and corresponding eigenvectors of a square matrix.

CO2: Apply the knowledge of partial differentiation to evaluate Jacobian and extremities of two variable functions.

CO3: Evaluate the gradient of a scalar field and the divergence and curl of vector fields.

CO4: Solve ordinary differential equations using various techniques.

CO5: Use Laplace transforms to solve first-order ordinary differential equations.

Pre-requisites: Matrices, Determinants, Differentiation, Integration and Vector Algebra.

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	3
CO2	3	3	2	1	1	1	3
CO3	3	3	2	1	1	1	3
CO4	3	3	2	1	1	1	3
CO5	3	3	2	1	1	1	3

Legend: 3 - High Correlation, 2 - Medium Correlation, 1 - Low Correlation

Instructional Strategy:

- A theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome-based.
- All demonstrations/Hands-on practices might be under a simulated environment.
- Use inducto-deductive approach to achieve the desired learning objectives.
- Use open-ended questions to nurture the problem-solving and reasoning skills among students.
- Support and guide the students for self-study.
- State the need for mathematics with engineering studies and provide real-life examples.

4G236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
Theory		3	0	0	3

Unit I	**EIGENVALUES AND EIGENVECTORS**	
	Characteristic equation – Eigen-values of 2x2 and 3x3 real matrices – Eigen-Vectors of 2x2 real matrices – Properties of eigen-values (excluding proof) – Cayley-Hamilton theorem (excluding proof) – Simple problems.	**7**
Unit II	**FUNCTIONS OF SEVERAL VARIABLES**	
	Partial derivatives of two variable and three variable functions (up to second order) – Homogeneous functions and Euler's theorem (excluding proof) – Jacobian matrix and determinant – Maxima and minima of functions of two Variables – Simple problems.	**7**
Unit III	**VECTOR CALCULUS**	
	Scalar filed and Vector field – Vector differential operator – Gradient of a scalar field – Directional derivative – Divergence and curl of a vector field (excluding Properties) – Solenoidal and irrotational vector fields – Simple problems.	**7**
Unit IV	**DIFFERENTIAL EQUATIONS**	
	Differential equation – Formation – Order and degree – Solution of a differential equation – Equations of first order and first degree – Variable separable method – Leibnitz's Linear equations – Second order equations of the form $(aD^2 + bD + c)y = e^{nx}$ where a, b, c and n are constants and the auxiliary equation $am^2 + bm + c = 0$ has only real roots) – Complementary function – Particular integral – General solution – Simple problems.	**7**
Unit V	**LAPLACE TRANSFORMS**	

	Definition of Laplace transform – Laplace transforms of standard functions - Linearity and change of scale property (excluding proofs) – First shifting property – Laplace transforms of derivatives – Properties (excluding proofs) – Inverse Laplace transforms – Properties (excluding proofs) – Solving first order Ordinary differential equation using Laplace transforms – Simple problems.	**7**
	TEST AND REVISION	**10**
	TOTAL	**45**

Suggested List of Students Activities:

- Demonstrate the applications of eigen-values in stability analysis, decouple of three-phase systems and vibration analysis.
- Demonstrate maxima and minima of two variable functions using GeoGebra graphing calculator.
- Demonstrate solenoidal vector field and irrotational vector field using engineering applications.
- Demonstrate the applications of differential equations in solving engineering problems.
- Presentation /Seminars by students.
- Quizzes.

Text Books for Reference:

1. John Bird, Higher Engineering Mathematics, Routledge, 9th Edition, 2021.
2. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
3. Arumugam, S., Thangapandi Isaac, A., & Somasundaram, A., Differential Equations and Applications, Yes Dee Publishing Pvt. Ltd., 2020.
4. Duraipandian, P., & Kayalal Pachaiyappa, Vector Analysis, S Chand and Company Limited, 2014.
5. Narayanan, S., & Manicavachagom Pillai T.K., Calculus Volume I and II, .Viswanathan Publishers Pvt. Ltd., 2007.

Website Links for Reference:

- www.khanacademy.org/math/
- https://www.mathportal.org/
- https://openstax.org/subjects/math
- www.mathhelp.com/
- https://www.geogebra.org/
- https://www.desmos.com/
- https://phet.colorado.edu/

4G236112	ENTREPRENEURSHIP	L	T	P	C	End Exam
Theory		3	0	0	3	Theory

Introduction

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio- economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

Course Objectives

After completing this subject, the student will be able to

- Acquire entrepreneurial spirit and resourcefulness
- Familiarize Acquire knowledge about the business idea and product selection
- Analyze the banking and financial institutions
- Understand the pricing policy and cost analysis
- Get knowledge about the business plan preparation

Course Outcomes

CO1: Understand the process of entrepreneurship

CO2: Analyse the importance of generation of ideas and product selection

CO3: Familiarization of various financial and non financial schemes

CO4: Acquire various cost components to arrive pricing of the product

CO5: Learn the preparation of project feasibility report

Pre-requisites

Knowledge of basics of Engineering and Industrial engineering

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	3	1	3
CO2	-	-	-	-	3	3	3
CO3	-	-	-	1	-	3	2
CO4	-	1	3	3	2	3	2
CO5	-	2	3	3	3	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and 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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

4G236112	ENTREPRENEURSHIP	L	T	P	C
Theory		3	0	0	3

UNIT I	ENTREPRENEURSHIP – INTRODUCTION AND PROCESS	
Concept of entrepreneurship - Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship, , Competencies and characteristics of an entrepreneur -, Ethical Entrepreneurship, Entrepreneurial Values and Attitudes, Creativity, Innovation and entrepreneurship- Entrepreneurs - as problem solvers, Mindset of an employee and an entrepreneur, - RiskTaking- Concepts		7
UNIT II	**BUSINESS IDEA**	
Types of Business: Manufacturing, Trading and Services, Stakeholders: sellers, vendors and consumers and Competitors, E- commerce Business Models, business idea generation -Types of Resources - Human, Capital and Entrepreneurial tools and resources, etc.,- setting business goals- Patent, copyright and Intellectual property rights, Customer Relations and Vendor Management, -Business Ideas vs. Business Opportunities, Opportunity – SWOT ANALYSIS of a business idea - Business Failure – causes and remedies.- Types of business risks,		7
UNIT III	**BANKING**	
Size and capital based classification of business enterprises- Role of financial institutions, Role of Government policy, Entrepreneurial support systems, Incentive schemes for state government, and Incentive schemes for Central governments.		7
UNIT IV	**PRICING AND COST ANALYSIS**	
Types of Costs - Variable - Fixed- Operational Costs - Break Even Analysis - for single product or service, -financial Business Case Study, Understand the meaning and concept of the term Cash Inflow and Cash Outflow- Pricing- Calculate Per Unit Cost of a single product, , Understand the importance and preparation of Income		7

Statement, Prepare a Cash Flow Projection- Factors affecting pricing.- GST.		
UNIT V	**BUSINESS PLAN PREPARATION**	
Feasibility Report – Technical analysis, financial analysis- Market Research - Concept, Importance and Process- tools for market research- Market Sensing andTesting, Marketing and Sales strategy, Digital marketing, Branding - Business name,logo, tag line, Promotion strategy, Business Plan Preparation, -Concept and Importance, , Execution of Business Plan		7
	Revision and Test	**10**
	TOTAL HOURS	**45**

Suggested list of Students Activity.

1. Students can explore app development or web design. They'll learn about technology, user experience, and marketing.
2. Hosting events, workshops, or conferences allows students to practice project management, networking, and marketing skills.
3. Encourage students to address social or environmental issues through innovative business solutions. This fosters empathy and creativity.
4. Part of entrepreneurship clubs or organizations provides networking opportunities, mentorship, and exposure to real-world challenges.
5. Competitions like business plan contests or pitch events allow students to showcase their ideas and receive feedback.
6. Students can create and sell handmade crafts, artwork, or other products. This teaches them about production, pricing, and customer relations.
7. Students can provide consulting services in areas they're knowledgeable about, such as social media marketing or financial planning.
8. Encourage students to create and manage their own small business or offer freelance services. This hands-on experience helps them understand various aspectsof entrepreneurship.

Text Books for References:

1. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra., 2019.
2. H.Nandan, Fundamentals of Entrepreneurship, Prentice Hall India Learning Private Limited, Third Edition, 2013.
3. R.K. Singal, Entrepreneurship Development & Management, S K Kataria and Sons, 2013.

Website Links for References:

- https://ocw.mit.edu/courses/15-390-new-enterprises-spring-2013/resources/lecture- 1/
- https://onlinecourses.nptel.ac.in/noc20_ge08/preview

4G236113	PROJECT MANAGEMENT	L	T	P	C
Theory		3	0	0	3

Introduction

Project management is the systematic application of knowledge, skills, tools, and techniques to project activities to meet specific project requirements. It involves planning, organizing, and managing resources to achieve project goals within defined scope, time, and budget constraints. Project management encompasses several key processes and phases, including initiation, planning, and execution, monitoring and controlling, and closing. It is essential across various industries to ensure projects are completed successfully, efficiently, and effectively, aligning with organizational objectives and stakeholder expectations. Project managers play a crucial role in leading teams, managing risks, ensuring quality, and communicating with stakeholders to drive project success.

Course Objectives

After completing this subject, the student will be able,

- To understand the concept, characteristics and elements of projects.
- To understand the stages in Project Life Cycle.
- To appreciate the need for Project Portfolio Management System.
- To know the considerations in choosing appropriate project management structure.
- To understand the components of techno-economic feasibility studies.
- To know about the detailed project report
- To learn about project constraints.
- To understand the techniques of evaluation.
- To get insight into the Social Cost Benefit Analysis Method.
- To know how to construct project networks using PERT and CPM.
- To learn how to crash project networks
- To understand the meaning of project appraisal.
- To understand the meaning of project audits.
- To know the qualities of an effective project manager.

- To understand the stages in Team Development model.

Course Outcomes

CO 1: Understand the Project Management Principles.

CO 2: Learn to create and manage project schedules.

CO 3: Create structure and manage the project commitments.

CO 4: Gain enterprise support.

CO 5: Prepare Detailed Project Report (DPR).

Pre-requisites: Basic Knowledge.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	-	-	-	2	2
CO2	2	2	1	-	1	3	2
CO3	3	2	3	3	1	3	3
CO4	3	2	2		1	3	2
CO5	3	2	3	3	1	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their curiosity to learn.
- Implement task-based learning activities where students work on specific tasks or projects.
- Incorporate technology tools and resources, such as online platforms, interactive multimedia, and virtual communication tools, to enhance engagement and provide additional practice opportunities.
- All demonstrations/Hand-on practices may be followed in the real environment as far as possible.

4G236113	PROJECT MANAGEMENT	L	T	P	C
Theory		3	0	0	3

UNIT I	**Project Management – An Overview, Project Portfolio Management System and Structure, Steps in Defining Project and Project Delays**	
Project – Classification – Importance of Project Management – An Integrated Approach – Project Portfolio Management System – The Need – Choosing the appropriate Project Management Structure: Organizational considerations and project considerations – steps in defining the project – project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints.		7
UNIT II	**Various Stages and Components of Project Feasibility Studies, Phases of a Project, Stages in Project Life Cycle and Project Constraints**	
Project feasibility studies - Opportunity studies, General opportunity studies, specific opportunity studies, pre-feasibility studies, functional studies or support studies, feasibility study – components of project feasibility studies – Managing Project resources flow – project planning to project completion: Pre-investment phase, Investment Phase and operational phase – Project Life Cycle – Project constraints.		7
UNIT III	**Project Evaluation under Certainty and Uncertainty, Project Evaluation, Commercial and Social Cost Benefit Analysis**	
Project Evaluation under certainty - Net Present Value (Problems - Case Study), Benefit Cost Ratio, Internal Rate of Return, Urgency, Payback Period, ARR – Project Evaluation under uncertainty – Methodology for project evaluation – Commercial vs.National Profitability – Social Cost Benefit Analysis, Commercial or National Profitability, social or national profitability.		7
UNIT IV	**Developing Project Network using PERT and CPM, Project Appraisal and Control Process.**	

Developing a Project Plan - Developing the Project Network – Constructing a Project Network (Problems) – PERT – CPM – Crashing of Project Network (Problems - Case Study) – Resource Leveling and Resource Allocation – how to avoid cost and time overruns – Steps in Project Appraisal Process – Project Control Process – Control Issues – Project Audits – the Project Audit Process – project closure – team, team member and project manager evaluations.		7
UNIT V	**Project Managing Versus Leading of Project, Qualities of Project Manager and Managing Project Teams, Team Building Models and**	
	Performance Teams and Team Pitfalls.	
Managing versus leading a project - managing project stakeholders – social network building (Including management by wandering around) – qualities of an effective project manager – managing project teams – Five Stage Team Development Model – Situational factors affecting team development – project team pitfalls.		7
Revision and Test		**10**
TOTAL HOURS		**45**

Suggested list of Students Activity,

Project Simulation and Role-Playing:

- Activity: Participate in simulated project scenarios where students take on different roles within a project team (e.g., project manager, team member, and stakeholder).
- Purpose: This helps students understand the dynamics of project management, including leadership, communication, and team collaboration.

Case Study Analysis:

- Activity: Analyze real-world case studies of successful and failed projects.
- Purpose: This activity enables students to apply theoretical knowledge to practical situations, identify best practices, and learn from the challenges and solutions implemented in real projects.

Project Plan Development:

- Activity: Develop a comprehensive project plan for a hypothetical or real project, including scope, schedule, budget, risk management, and quality management plans.
- Purpose: This allows students to practice creating detailed and structured project plans, honing their skills in planning and organizing project activities.

Group Project:

- Activity: Work in teams to manage a project from initiation to closure, simulating a real project environment.
- Purpose: Group projects help students learn how to work collaboratively, manage group dynamics, and apply project management tools and techniques in a team setting.

Project Management Software Training:

- Activity: Gain hands-on experience with project management software such as Microsoft Project, Asana, or Trello.
- Purpose: This activity equips students with practical skills in using technology to plan, track, and manage project tasks and resources efficiently.

Text Books for Reference:

1. Clifford F. Gray and Erik W. Larson, Project Management – The Managerial Process, Tata Mcgraw Hill.
2. Dragan Z. Milosevic, Project Management Toolbox: Tools And Techniques For The Practicing Project Manager,
3. Gopalakrishnan, P/ Ramamoorthy, V E, Textbook of Project Management, Macmillan India. Ltd.
4. Harold Kerzner, Project Management: A Systems Approach To Planning, Scheduling, And Controlling, Eighth Edition, John Wiley & Sons
5. Jason Charvat, Project Management Methodologies: Selecting, Implementing, And Supporting Methodologies And Processes For Projects, John Wiley & Sons
6. Kevin Forsberg, Ph.D, Hal Mooz, Visualizing Project Management: A Model For

Business And Technical Success, Second Edition, Pmp And Howard Cotterman, John Wiley & Sons.

Website Links for Reference:

https://youtu.be/pc9nvBsXsuM

NPTEL Courses

https://youtu.be/PqQqTAu_FiM

4G236114	FINANCE FUNDAMENTALS	L	T	P	C
Theory		3	0	0	3

Introduction

This course gives a deep insight into the finance fundamentals such as money management and the process of acquiring needed funds. It also encompasses the oversight, creation, and study of money, banking, credit, investments, assets, liabilities that make up financial systems and improves overall financial literacy.

Course Objectives

The objective of this course is to

1. Identify different ways to save money for future
2. Understand various techniques to raise capital
3. Get acquainted with the essential terminologies used in finance language
4. Get exposed to different types of budgeting
5. Instill the concept of costing and its impact on proftability

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Manage financial resources effectively to achieve personal goals

CO2: Ensure that the business has enough money to meet its obligations and that it can recover in the future

CO3: Exhibit financial literacy through the usage of different terminologies appropriate to the context

CO4: Differentiate different types of budgeting and allocate the resources

CO5: Apply the idea of marginal costing in decision making

Pre-requisites

Knowledge of basic mathematics

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	-	-	-	2	2
CO2	2	2	1	-	1	3	2
CO3	3	2	3	3	1	3	3
CO4	3	2	2		1	3	2
CO5	3	2	3	3	1	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their curiosity to learn.
- Implement task-based learning activities where students work on specific tasks or projects.
- Incorporate technology tools and resources, such as online platforms, interactive multimedia, and virtual communication tools, to enhance engagement and provide additional practice opportunities.
- All demonstrations/Hand-on practices may be followed in the real environment as far as possible.

4G236114	FINANCE FUNDAMENTALS	L	T	P	C
Theory		3	0	0	3

UNIT I	PERSONAL FINANCE	
Personal Finance – Meaning, Objectives and advantages – Individual Perspective – Family Perspective – Time Value of Money – Personal Savings: Meaning, Different modes of Saving – Bank Deposit, Online Investments, Insurance, Stocks, Gold, Real Estate – Returns Vs Risk – Financial Discipline – Setting Alerts for commitments (With Real time Examples)		7
UNIT II	**BUSINESS FUNDING**	
Sources: Personal Savings – Borrowings - Venture Capital – Venture Capital Process – Commercial Banks – Government Grants and Scheme.		7
UNIT III	**FINANCE LANGUAGE**	
Capital – Drawing – Income – Expenditure – Revenue Vs Capital Items – Assets – Fixed Assets – Current Assets – Fictitious Assets – Liabilities – Long-term Liabilities – Current Liabilities – Internal Liabilities – External Liabilities – Share holders fund: Equity Share capital, Preference Share Capital, Reserve & Surplus – Borrowings: Debentures, Bank Loan, Other Loan – Depreciation – Reserve Vs Provision.		7
UNIT IV	**BUDGETING**	
Budgetary Control – Meaning – Preparation of various budgets – Purchase budget – Sales Budget – Production budget – Cash Budget – Flexible budgets.(With Problems)		7
UNIT V	**MARGINAL COSTING**	
Marginal Costing – Meaning – Marginal Costing Vs Absorption Costing – Conceptsof Variable Cost, Fixed Cost and Contribution – PV Ratio – Break Even Point – Margin of Safety – Key Factor – Application of Marginal Costing in decision making – Make or Buy – Shutdown or Continue – Exploring New Markets (With Problems)		7
Revision and Test		**10**
TOTAL HOURS		**45**

Suggested list of Students Activity

Financial Statement Analysis:

- Activity: Analyze and interpret financial statements, including balance sheets, income statements, and cash flow statements of different companies.
- Purpose: This activity helps students understand the financial health and performance of organizations, developing skills in financial analysis and critical thinking.

Investment Portfolio Management:

- Activity: Create and manage a simulated investment portfolio, making decisions on asset allocation, stock selection, and diversification.
- Purpose: This allows students to apply theoretical concepts in a practical setting, learning how to evaluate investment opportunities and manage financial risk.

Case Study Analysis:

- Activity: Examine real-world case studies involving financial decisions made by companies, such as capital budgeting, mergers and acquisitions, and financial restructuring.
- Purpose: Case studies provide insights into the application of finance principles in business scenarios, enhancing problem-solving and decision-making skills.

Financial Modeling:

- Activity: Build financial models using spreadsheets to forecast future financial performance, conduct sensitivity analysis, and evaluate business projects.
- Purpose: Financial modeling is a critical skill in finance, enabling students to project financial outcomes and support strategic decision-making with quantitative analysis.

Classroom Discussions and Debates:

- Activity: Participate in discussions and debates on current financial issues, market trends, and economic policies.
- Purpose: Engaging in discussions helps students stay informed about the latest developments in finance, develop their communication skills, and form well-rounded

opinions on financial matters.

Text Books for Reference:

1. Banking Theory, Law & Practice - Dr.L.Natarajan, Margham Publications.
2. Corporate Accounting by T.S.Reddy and Dr.A.Murthy, Margham Publications.
3. Management Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.
4. Cost Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.

4G236115	5G TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

Introduction:

This course provides an in-depth understanding of 5G technology, covering foundational concepts, essential radio access technologies, core network architecture, protocols and standards, and emerging technologies in wireless communication.

Course Objectives:

The objective of this course is to enable the students to

- Understand the fundamental principles and evolution of wireless communicationsystems, including the transition from previous generations to 5G.
- Identify and explain the key features, requirements, and use cases of 5G networks invarious industries and applications.
- Analyze the architecture and components of 5G networks, including radio accesstechnologies, core network elements, and network slicing.
- Develop proficiency in radio access technologies such as OFDM, MIMO.
- Explore emerging technologies and applications in 5G, such as IoT, edge computing,and AI integration, and assess their impact on future communication systems.
- Gain hands-on experience in implementing and troubleshooting 5G networks through practical exercises and simulations.
- Understand the regulatory and standardization processes governing 5G deployment,ensuring compliance and interoperability with global standards.
- Analyze security protocols and mechanisms implemented in 5G networks to

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understanding 5G principles, features, and applications.

CO2: Proficiency in 5G radio access technologies.

CO3: Mastery of 5G core network architecture and protocols.

CO4: Knowledge of 5G protocol stack and interworking mechanisms.

CO5: Exploring emerging technologies and applications in 5G networks.

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Pre-requisites:

- Basic understanding of telecommunications and networking principles.
- Proficiency in mathematics, including algebra and trigonometry.
- Knowledge of computer architecture and programming concepts.
- Familiarity with wireless communication technologies and laboratory equipment.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	1	-	-	-	-
CO2	2	2	1	2	-	-	1
CO3	1	1	2	2	-	-	1
CO4	2	1	1	2	-	-	1
CO5	2	1	1	1	2	-	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

Real-world Applications: Integrate real-world examples and applications of digital logic design, such as binary arithmetic in computer architecture, digital communication systems, and control systems. Showing practical applications helps students understand the

relevance of the subject.

Interactive Lectures: Conduct interactive lectures with demonstrations, multimedia presentations, and interactive whiteboards to illustrate abstract concepts effectively. Encourage student participation through discussions, questions, and problem-solving exercises.

Use of Visual Aids: Utilize visual aids such as diagrams, charts, and animations to clarify Complex concepts like Boolean algebra, logic gates, and sequential logic circuits. Visual representations help reinforce learning and improve comprehension.

Flipped Classroom Approach: Implement a flipped classroom model where students review lecture materials and resources independently before class and use class time for hands-on activities, problem-solving, and discussions. This approach encourages active learning and fosters deeper understanding.

Formative Assessment: Use formative assessment techniques such as quizzes, concept mapping, and in-class exercises to gauge student understanding and provide timely feedback. Adjust teaching strategies based on assessment results to address areas of difficulty.

Self-directed Learning Resources: Provide self-directed learning resources such as textbooks, online tutorials, and supplementary materials to accommodate diverse learning styles and allow students to explore topics at their own pace.

4G236115	5G TECHNOLOGY	L	T	P	C
Theory		3	-	-	3

UNIT I	INTRODUCTION TO 5G TECHNOLOGY :	
Overview of wireless communication systems - Evolution from 1G to 5G - Key features and requirements of 5G networks - Comparison between 4G and 5G technologies - network latency and its importance in 5G - 5G spectrum bands and frequency ranges-Basics of network coverage and capacity in 5G - 5G enabled devices and their functionalities - role of AI and ML in enhancing 5G capabilities - network slicing and its benefits in 5G deployment - 5G architecture and network elements		9
UNIT II	**RADIO ACCESS TECHNOLOGIES IN 5G :**	
Introduction to radio access technologies (RATs) and their role in wireless communication - multiple access techniques (FDMA, TDMA, CDMA) and their evolution in 5G - orthogonal frequency-division multiplexing (OFDM) and its significance in 5G - multiple-input multiple-output (MIMO) and its application - beam forming techniques - small cell deployment - heterogeneous network (HetNet) Architecture.		9
Unit III	**Core Network in 5G:**	
Evolution of core network architecture from 4G to 5G (e.g., LTE to NGC) - Network slicing and virtualization in 5G core - Service-based architecture (SBA) and control plane/user plane separation (CUPS) - Network functions virtualization (NFV) and software-defined networking (SDN) - Edge computing and mobile edge computing (MEC) in 5G networks		9
Unit IV	**5G Protocols and Standards :**	

	Overview of 5G protocol stack (PHY, MAC, RLC, PDCP, RRC, etc.) - 3GPP standardization process and release versions - NR (New Radio) air interface protocol architecture - Signalling procedures and message flows in 5G networks - Interworking and coexistence with legacy networks (e.g., LTE, Wi-Fi).	9
Unit V	**Emerging Technologies and Applications in 5G :**	
	Internet of Things (IoT) and machine-to-machine (M2M) communications in 5G - Vehicle-to-everything (V2X) communication and smart transportation systems - Augmented reality (AR), virtual reality (VR), and immersive multimedia applications. Network security and privacy considerations in 5G networks - Future trends and Challenges in 5G technology development.	9
	TOTAL PERIODS	**45**

Suggested List of Students Activity:

The following student activities or similar activities can be assigned for assessing IA marks

- Students are tasked with conducting research on the evolution of wireless communication systems, spanning from the first-generation (1G) to the fifth-generation (5G) networks. They gather information on the technological advancements, key milestones, and the impact of each generation on society and industries
- Using simulation software such as OPNET or NS-3, students simulate a 5G network deployment scenario. They configure parameters such as base stations, user equipment, and traffic patterns to model realistic network conditions.
- Students analyze a real-world case study of a 5G network deployment project. They examine the challenges faced by the network operators, the design decisions made during the deployment process, and the outcomes achieved.
- Students conduct an in-depth analysis of the signalling protocols used in 5G networks. They examine protocols such as the Radio Resource Control (RRC) protocol, Session Management (SM) protocol, and User Plane Protocol (UPP),

studying their functionalities, message formats, and interactions.

- Each student selects an emerging technology relevant to 5G, such as Internet of Things (IoT), edge computing, or network slicing. They research the technology's principles, applications, and potential impact on 5G networks
- In the laboratory, students perform hands-on experiments related to radio access technologies or core network components. For example, students may configure and test a small-scale OFDM-MIMO system to understand its performance characteristics.
- Students collaborate in groups to design a 5G network architecture tailored to a specific use case or scenario. Each group conducts comprehensive research on network requirements, technology options, and deployment considerations. They develop a detailed network design proposal, considering factors such as coverage, capacity, scalability, and cost-effectiveness. Finally, groups present their design proposals to the class, showcasing their understanding of 5G network planning and their ability to address environmental and sustainability concerns.

Text Books for Reference:

- Afif Osseiran, Jose F Monserrat, Patrick Marsch, 5G Mobile and Wireless Communications Technology, 1st Edition, Cambridge University Press, 2016
- Erik Dahlman, 5G NR: The Next Generation Wireless Access Technology , 1st Edition, Elsevier, 2016.
- Jonathan Rodriguez , Fundamentals of 5G Mobile Networks, 1st Edition, Wiley, 2015
- HarriHolma, AnttiToskala, Takehiro Nakamura, “5G Technology 3GPP NEW RADIO”, John Wiley & Sons, 1/e, 2020.

Website Links for Reference:

NPTEL :https://nptel.ac.in/courses/108/105/108105134/

Udemy: https://www.udemy.com/course/5g-mobile-networksmodern-wireless-communication-technology/

4G236116	DEVOPS	L	T	P	C
Theory		3	0	0	3

Introduction

The DevOps is the combination of two words, one is Development and other is Operations. It is a culture to promote the development and operation process collectively. The DevOps course will help to learn DevOps basics and provide depth knowledge of various DevOps tools such as Git, Maven, Ansible, and Jenkins.

Course Objectives

The objective of this course is to enable the student to

- To understand basics of Devops.
- To illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems.
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment).
- To understand the version control tools like Git.
- To understand about configuration management using Ansible

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand basics of Devops.

CO2: Perform continuous integration and continuous testing and Continuous deployment using Jenkins by building and automating test case using Maven
.

CO3: Ability to perform automated continuous deployment.

CO4: Understand different actions performed through version control tools like Git.

CO5: Ability to do configuration management using Ansible.

Pre-requisites :Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	-	-	-
CO2	3	3	3	3	-	-	-
CO3	3	3	3	3	-	-	-
CO4	3	3	2	3	-	-	-
CO5	3	3	3	3	-	-	-

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G236116	DEVOPS	L	T	P	C
Theory		3	0	0	3

Unit I	**INTRODUCTION TO DEVOPS**	
Introduction to Devops – History of Devops – Devops Definition – Devops Main Objectives – Devops and Software Development Life Cycle – Waterfall Model – Agile Model.		8
Unit II	**COMPILE AND BUILD USING MAVEN**	
Introduction - Installation of Maven – Maven Build Requirements - Maven POM Builds (pom.xml), Maven Build lifecycle - Maven repositories (local, global) , Maven create and build Artifacts, Maven Dependencies – Maven Plugins.		10
Unit III	**CONTINUOUS INTEGRATION USING JENKINS**	
Introduction to Jenkins – Continuous Integration with Jenkins – Jenkins Management – Scheduling build jobs - Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace Management.		10
Unit IV	**VERSION CONTROL USING GIT**	
GIT Features – 3 – Tree Architecture – GIT Clone/Commit/Push – GIT Hub Projects – GIT Rebase & Merge – GIT Stash, Reset, Checkout – GIT Clone,Fetch, Pull.		10
Unit V	**CONFIGURATION MANAGEMENT USING ANSIBLE**	
Introduction to Ansible, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles.		7
TOTAL PERIODS		**45**

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:

1. Jennifer Davis, Ryn Daniels, "Effective DevOps", 1st edition, O'Reilly, 2017.
2. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, CreateSpace Independent Publishing Platform, 2016.
3. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the NewDeveloper", Second Edition, Apress, 2019.

Website Links for Reference:

1. https://www.jenkins.io/doc/tutorials/
2. https://maven.apache.org/index.html

4G236241	DATA SCIENCE	L	T	P	C
Practicum		1	0	4	3

Rationale:

Data science is like being a digital detective, utilizing tools and algorithms to unveil hidden patterns in raw data. This course on Data Science equips learners with the ability to understand the process of Data Science, manipulate structured and unstructured data through various tools, algorithms, and software. This course also gives the insights about statistical data analysis and python libraries for data wrangling and data visualization. Data science is often considered as the twenty-first century's most lucrative career pathwaythis course gains much attention. This course also introduce basic machine learning algorithms.

Course Objectives:

- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for data wrangling.
- To present and interpret data using visualization libraries in Python
- To know the basic machine learning models

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Define the data sciences and data science process CO2:

Perform statistical calculation on data using python. CO3:

Perform wrangling on data with python libraries

CO4: Create effective visualization of given data

CO5: Build data science applications with Support vector machines, Naive Bayes, Decision Trees and with Clustering algorithms.

Pre-requisites:-

Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	-	-	-	1
CO2	3	3	3	2	-	-	2
CO3	3	3	3	3	-	-	2
CO4	3	3	3	3	-	-	2
CO5	3	3	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in with built0in Models in data science
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

4G236241	DATA SCIENCE	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTIONTO DATA SCIENCE	
Theory: Data Science: Need, benefits and uses – facets of data -Data Science Process - Basics of Numpy Arrays.		3
Practical: **Ex No 1:** Create a Python List / tuple which stores the details of a student (rollno, name, dept, branch, percentage of mark) in Python and print the values. **Ex No 2**: Create the python list, convert the list and tuple as NumPy array and print its elements. Slice the NumPy array in to 3 slices and print all;		12
Unit II	**DESCRIBING DATA**	
Theory: Statistical Analysis: Mean Median, Mode, Standard Deviation, Range, Percentile. Missing value analysis - Numpy arrays : aggregations –computations on arrays, Introduction to Pandas		3
Practical: **Ex No 3:** Load your class Marklist data from a csv (comma-separated value) file into numpy array. Perform the following operations to inspect your array: Len (), ndim, size, dtype, shape, info (). **Ex No 4::** Load a data into a pandas dataframe and perform following functions on it : min(), max(), cumsum(), mean(), median(), corrcoef(), std().		12
Unit III	**PYTHON LIBRARIES FOR DATA WRANGLING**	
Theory: Data manipulation with Pandas: data indexing and selection –missing data; Data Transformation: Removing duplicates- Replacing values -aggregation and grouping.		3

Practical: **Ex No 5:** Load a data into a pandas data frame, list out number of missing values in each column and fill the missing values with suitable default value. **Ex No 6:** Load two csv file into two data frame(d1,d2), combine both the Data frame and find and remove duplicate rows and rename indexes.		12
Unit IV	**DATA VISUALIZATION**	
Theory: Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms - Visualization with Seaborn.		**3**
Practical: Iris Dataset is one of best know datasets in pattern recognition literature. This dataset contains 3 classes of 50 instances each, where each class refers to a typeof iris plant. One class is linearly separable from the other 2 the latter are NOT linearly separable from each other. **Attribute Information:** • Sepal Length in cm , Sepal Width in cm • Petal Length in cm, Petal Width in cm **Class:** • Iris Setosa • Iris Versicolour • Iris Virginica **Ex No 7:**Load the Iris dataset, where observations belong to either one of three iris flower classes and visualize the average value for each feature of the Setosa iris class using a barchart with suitable linewidth and color. **Ex No 8:** Load the Iris dataset; plot all the column's relationships using a pairplot for multivariate analysis. Save the plot as JPEG file.		12
Unit V	**MACHINE LEARNING ALGORITHMS**	

Theory: Basic Machine Learning Algorithms: Classification: Support vector machines-Naive Bayes- Decision Trees- Clustering- Confusion Matrix.	**3**
Practical: **Ex.no 9** : Implement the Machine learning model for clustering with Iris dataset and analyse Decision Tree. **Ex.no 10 :** Implement the Machine learning model for clustering with Iris dataset and analyse K-means Clustering.	12
TOTA PERIODS	**75**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments in data science.
- online quizzes
- Blended learning activities to explore the recent trends and developments in the field.
- Model Development

Textbook for Reference:

- Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools,, Manning Publications, 2016.
- Allen Downey, Think Stats: Exploratory Data Analysis in Python, Second Edition, O'Reilly, 2014.
- Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, , Second Edition, O'Reilly Media, 2019.

Website links for reference:

- NPTEL Course on Foundation of Data Science https://onlinecourses.swayam2.ac.in/imb24_mg31/preview
- NPTEL Course on Python for Data Science https://onlinecourses.nptel.ac.in/noc24_cs54/preview
- https://www.kaggle.com/code/doukanelik/missing-values

- https://www.kaggle.com/code/mahnazarjmand/clustring-model-on-iris-dataset/input
- https://www.kaggle.com/datasets/saurabh00007/iriscsv/code
- IBM Data Science Professional Certificate https://www.coursera.org/professional-certificates/ibm-data-science

Equipment / Facilities required to conduct the Practical Course

Hardware Required.

1. Desktop Computers/ Laptop

Software Required.

1. Python /google colab

PRACTICAL EXAMINATION

PART - A

Ex No 1: Create a Python List / tuple which stores the details of a student (rollno, name, dept, branch, percentage of mark) in Python and print the values.

Ex No 2: Create the python list, convert the list and tuple as NumPy array and print its elements. Slice the NumPy array in to 3 slices and print all.

Ex No 3: Load your class Marklist data from a csv (comma-separated value) file into numpy array. Perform the following operations to inspect your array: Len (), ndim, size, dtype, shape,info().

Ex No 4:: Load a data into a pandas dataframe and perform following functions on it : min(), max(), cumsum(), mean(), median(), corrcoef(), std().

Ex No 5: Load a data into a pandas data frame, list out number of missing values in each column and fill the missing values with suitable default value.

PART - B

Ex No 6: Load two csv file into two data frame(d1,d2), combine both the Data frame and find and remove duplicate rows and rename indexes.

Ex No 7: Load the Iris dataset, where observations belong to either one of three iris flower classes and visualize the average value for each feature of the Setosa iris class using a barchart with suitable linewidth and color.

Ex No 8: Load the Iris dataset; plot all the column's relationships using a pairplot for multivariate analysis. Save the plot as JPEG file.

Ex.no 9 : Implement the Machine learning model for clustering with Iris dataset and analyse Decision Tree.

Ex.no 10 : Implement the Machine learning model for clustering with Iris dataset andanalyse K-means Clustering.

SCHEME OF VALUATION		
SNO	**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	05
6	Total	100

4G236242	CLOUD PLATFORM	L	T	P	C
Practicum		1	0	4	3

Rationale

This course gives a comprehensive exposure to various commercial cloud Platforms Google, Amazon and Microsoft and Open source cloud platforms Eucalyptus and OpenStack. The course introduces the latest IoT technologies in Cloud. The focus of this course is to introduce students Machine Learning, a sub-field of Artificial Intelligence, and to Cloud applications of Machine Learning. This helps the students to combine these technologies to produce innovative business solutions.

Course Objectives

The objective of this course is

1. To provide an in-depth and comprehensive knowledge of various commercial and open source cloud platforms.
2. To comprehend and apply the services offered by various cloud platforms practically.
3. To understand and apply the concept of IoT in cloud.
4. To apply Machine learning in cloud.
5. To justify, adopt and combine various cloud technologies, applications, and services to effectively manage their transition into the IT function.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.

CO2: Use and Manage Virtual Machines on AWS, Google Cloud and Azure platforms.

CO3: Understand and apply the spectrum of Cloud computing capabilities to deploy virtual machines on Eucalyptus and Open Stack.

CO4: Learn about using hosting services, storage services, networking services, and machine learning services.

CO5: To Apply IoT in cloud and learn to combine them to cater to the practical needs of next-generation mobile devices and social media users

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	-	-	-	1
CO2	1	3	3	-	-	-	1
CO3	1	3	3	-	-	-	1
CO4	1	3	3	-	-	-	1
CO5	1	3	3	-	-	-	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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 necessaryto 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.

4G236242	CLOUD PLATFORM	L	T	P	C
Practicum		1	0	4	3

UNIT - 1	**AMAZON WEB SERVICES (AWS)**	
AWS - Introduction - Services-Architecture-AWS Regions - Availability zones- Working with AWS- EC2 Instances -Volumes on EC2 - Elastic Block Store (EBS) - Managing data in AWS S3- AWS VPC- working with Virtual Network -Cloud Watch.		3
Ex.No.	Name of the Experiment	
1	Set up an AWS free tier account , navigate the AWS Management Console and deploying a Virtual Server (EC2 Instance) on AWS.	6
2	Host a Static Website in AWS using Amazon S3	6
UNIT - 2	**GOOGLE CLOUD PLATFORM (GCP)**	
GCP-Introduction -Core Services and Products-GCP Global Infrastructure-Regions and Zones - GCP Security and Compliance-Working with Google compute engine- Managing data in Google Cloud Storage.		3
Ex.No.	Name of the Experiment	
3	Setup a GCP Account and project ,explore the GCP console and resource hierarchy and deploy a Virtual Machine (Compute Engine) on GCP.	6
4	Configure and Manage VPCs and Firewall Rules in GCP.	6
UNIT - 3	**MICROSOFT AZURE**	
Microsoft Azure Overview-Services and Solutions- Global Infrastructure and Data Centers-Identity and Access Management -Pricing and Cost Management- Working with Azure Virtual Machines and disks- Managing data in azure storage - Blob Storage -File Storage-Working with Virtual Networks.		3

Ex. No.	Name of the Experiment	
5	Create an Azure account and subscription and explore the Azure portal and resource groups. Deploy Virtual Machines (VMs) on Azure.	6
6	Implement Azure Storage Solutions: Blob Storage and File Storage.	6
UNIT - 4	**IOT CLOUD**	
IoT and Cloud - Architecture of IoT-Cloud - Local and Global Positioning Systems(GPS) - IoT Interactions with GPS, Clouds, and Smart Machines-Cloud services forIoT- IoT Cloud Platforms - AWS-IoT - Microsoft Azure IoT- Google IoT- Features-Working.		3
Ex. No.	Name of the Experiment	
7	Add a device to Google IoTcore and collect data in IoT core.	12
UNIT - 5	**OPEN SOURCE CLOUD AND MACHINE LEARNING FRAMEWORK**	
Open Source Cloud - OpenStack -Introduction-Features- Architecture-Components.Cloud-Based Machine Learning Frameworks - Introduction to machine learningconcepts- Azure Machine Learning Workspace - AWS Machine Learning Platform.		3
Ex. No.	Name of the Experiment	
8	Create an instance using OpenStack.	4
9	Create a Virtual Private network using openstack. Associate the Instance with the VPN created.	4
10	Use any Cloud based Machine learning framework to predict the employee salary based on experience.	4
	TOTAL PERIODS	**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developmentsbased on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application

Textbook for Reference:

1. Barrie Sosinsky, Cloud Computing Bible, First Edition, Wiley-India, 2011.
2. Mark Wilkins, Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud, First Edition, Pearson Education., 2019.
3. Praveen Kukreti, Google Cloud Platform All-In-One Guide: Get Familiar with a Portfolio of Cloud-based Services in GCP, First Edition, BPB Publications, 2023.
4. Michael Collier Robin Shahan, Fundamentals of Azure Second Edition, Microsoft Press, 2019.
5. Deepak Kumar Saxena, JitendraKumar Verma, Vicente Gonzalez-Prida Diaz , ViraShendryk , Cloud IoT: Concepts, Paradigms, and Applications, First Edition, Chapman & Hall, 2022.
6. Naresh K. Sehgal, Pramod Gupta ,Introduction to Machine Learning in the Cloud with Python: Concepts and Practices ,First Edition, Cham, Switzerland : Springer 2021.

Website links for reference:

1. https://docs.aws.amazon.com/
2. https://dtcenter.org/sites/default/files/communitycode/nwp_containers/Documentation/AMS_2020/01_intro_to_cloud_and_aws.pdf
3. https://aws.amazon.com/training/classroom/architecting-on-aws/
4. https://www.techrepublic.com/resource-library/ebooks/google-cloud-platform-an-insider-s-guide-free-pdf/https://cloud.google.com/docs

Equipment / Facilities required to conduct the Practical Course

Hardware Required.

1. Desktop Computers / LAPTOP with Internet Facility
2. Printers

PRACTICAL EXAMINATION

PART – A

Ex No 1: Set up an AWS free tier account, navigate the AWS Management Console and deploying a Virtual Server (EC2 Instance) on AWS.

Ex No 2: Host a Static Website in AWS using Amazon S3loop.

Ex No 3: Setup a GCP Account and project, explore the GCP console and resourcehierarchy and deploy a Virtual Machine (Compute Engine) on GCP.

Ex No 4: Configure and Manage VPCs and Firewall Rules in GCP.

Ex No 5: Create an Azure account and subscription and explore the Azure portal andresource groups. Deploy Virtual Machines (VMs) on Azure

PART – B

Ex No 6: Implement Azure Storage Solutions: Blob Storage and File Storage.

Ex No 7: Add a device to Google IoTcore and collect data in OT core.

Ex No 8: Create an instance using OpenStack.

Ex No 9: Create a Virtual Private network using openstack. Associate the instance with the VPN created.

Ex No 10: Use any Cloud based Machine learning framework to predict the employee salary based on experience.

SCHEME OF VALUATION		
SNO	**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	05
6	Total	100

4G236243	DATA VISUALIZATION	L	T	P	C
Practicum		1	0	4	3

Introduction:

Data visualization is one of the most powerful tools to explore, understand and communicate patterns in quantitative information. Therefore, this course is intended to introduce participants to key principles of analytic design and useful visualization techniques for the exploration and presentation of univariate and multivariate data. This course is highly applied in nature and emphasizes the practical aspects of data visualization in the data sciences. Students will learn how to evaluate data visualizations based on principles of data analytic, how to construct compelling visualizations using the free statistics software(s), and how to explore and present their data with visual methods.

Course Objectives:

- To evaluate data visualizations techniques based on principles of data analytic
- To explore and present their data with visual methods
- To understand which graphical formats are useful for which types of data
- To construct compelling visualizations using the free software
- To know about recent tools and advancements in data visualization

Course Outcomes:

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

CO1: Explain the principles of effective data visualization.

CO2: Gain proficiency in using data visualization tools.

CO3: Use techniques for designing and creating various types of visualizations.

CO4: Develop critical thinking skills for evaluating and improving visualizations.

CO5: Apply data visualization concepts to real-world datasets.

Pre-requisites: Basics of statistics

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	2	1	1	1
CO2	3	3	3	3	1	1	2
CO3	3	3	3	3	1	1	1
CO4	3	3	3	2	1	1	1
CO5	3	3	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.

4G236243	DATA VISUALIZATION	L	T	P	C
Practicum		1	0	4	3

UNIT I	INTRODUCTION TO DATA VISUALIZATION	
Fundamentals of Data Visualization: Importance of Data Visualization - Different Types of Data Visualization- Data Visualization Process/Workflow - Advantages and Disadvantages of Data Visualization – Applications of Data Visualization - Tools and Software for Data Visualization.		3
Ex. No. 1 Installing Python and Exploring Visualization Environment, Importing and Exporting Dataset Ex. No. 2 Explore your dataset using Dataframe, info, shape, head, tail, dtypes, describe, grouping of data in python		12
UNIT II	**DATA EXPLORATORY ANALYSIS AND DATA MANIPULATION**	
Exploratory Data Analysis (EDA): Significance of EDA – Basic Steps: Data Collection- Data Understanding- Data Cleaning-Analyze Relationship -Visualizing Results- Performing EDA Using Python		3
Ex. No. 3 Extract important variables and remove useless variables from the dataset **Ex. No. 4** Identify and fill missing values within the dataset		12
UNIT III	**BASIC PRINCIPLES OF VISUALIZATION AND TECHNIQUES**	
Basic Statistics behind Data Visualization: Measuring the Central Tendency of Data- Measuring Dispersion of Data- Skewness of Data-Graphic Displays of Basic Statistical Descriptions of Data. Visualizing Relationships: Scatter Plots, Line Charts. Visualizing Distributions: Histograms- Density Plots.		3
Ex. No. 5 Creating Scatter Plot, Bar Chart, Pie Chart, Pair Plot with Matplotlib **Ex. No. 6** Creating Density Plot and Histogram with ggplot		12
UNIT IV	**ADVANCED VISUALIZATION TECHNIQUES**	

Visualizing Categorical Data: Bar Chart-Box Plot -Frequency - Violin plot - Regression plot –Interactive Data Visualization: Plotly		3
Ex. No. 7. Plotting data using Heatmaps, Treemaps and Regression plot **Ex. No. 8.** Creating Violin Plot and Boxplot with Seaborn		12
UNIT V	**Recent Trends and Ethics in Visualization**	
Text Data Visualization - Visualizing Spatial Data–Time Series Data visualization. Common Mistakes in Visualization-Evaluating Visualizations.		3
Ex. No. 9. Visualization of Time Series Data. **Ex. No. 10** Visualization of Spatial Data.		12
TOTAL HOURS		**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Programming assignments to demonstrate visualization techniques on various domain like finance, healthcare etc.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Textbook for Reference:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysiswith Python”, First Edition, Packt Publishing, 2020.
2. Kieran Healy, “Data Visualization: A Practical Introduction”, First Edition, Princeton University Press, 2019.
3. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, 3rd Edition, Morgan Kaufmann Publishers, 2011.

Website links for reference:

- https://egyankosh.ac.in/

- https://www.kaggle.com/code/benhamner/python-data-visualizations
- https://www.datacamp.com/tutorial/data-visualisation-tableau
- https://www.geeksforgeeks.org/data-visualization-with-python/
- https://nptel.ac.in/courses/106106212
- https://nptel.ac.in/courses/106107220

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware(s) Requirement**
    - Desktop / Laptop
    - Printer
2. **Software(s) Requirement**
    - Windows
    - Python /Tableau / R/ Power BI
3. **Data Sources**
    - https://archive.ics.uci.edu/ml/index.php
    - https://www.kaggle.com
    - https://toolbox.google.com
    - https://data.gov.in/

Practical Examination

PART-A

1. Installing Python and Exploring Visualization Environment, Importing and Exporting Dataset
2. Explore your dataset using Dataframe, info, shape, head, tail, dtypes, describe, grouping of data in python
3. Extract important variables and remove useless variables from the dataset
4. Identify and fill missing values within the dataset
5. Creating Scatter Plot, Bar Chart, Pie Chart, Pair Plot with Matplotlib

PART-B

6. Creating Density Plot and Histogram with ggplot
7. Plotting data using Heatmaps, Treemaps and Regression plot
8. Creating Violin Plot and Boxplot with Seaborn
9. Visualization of Time Series Data
10. Visualization of Spatial Data.

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	05
6	Total	100

4G236244	ADVANCED DBMS	L	T	P	C
Practicum		1	0	4	3

Rationale

Advanced Database management systems contain comprehensive contents on various concepts related to Query optimization and structured, unstructured and semi structured databases. An in-depth knowledge of distributed and parallel databases is imparted during the course of study. The design and querying of spatial and temporal databases along with hands on experience is emphasized. This course includes study of XML database design and querying. Students will get a detailed introduction to the non relational databases like NoSQL and emerging databases like mobile, web and cloud databases. After learning this subject, students will be able to design and use Advanced Database Management Systems as a backend for developing realtime applications.

Course Objectives

The objective of this course is

1. To design conceptual and physical database tuning.
2. To comprehend and apply the concepts of Object, Distributed, Parallel, Spatial Temporal and XML databases.
3. To learn and apply the concepts of Multimedia and NoSql databases.
4. To understand and use the concepts of emerging database technologies like Web Mobile and Cloud Databases.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Analyze the basics of query optimization techniques and apply it to minimize the cost.

CO2: Design a Distributed database system and execute distributed queries.

CO3: Design Spatial and Temporal Database systems and implement it in correspondingapplications.

CO4: Design XML database systems and validate with XML schema

CO5: Apply NoSQL database systems and manipulate the data associated with it. Design a database system in Cloud and integrate it with application.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	-	-	-	3
CO2	3	3	3	-	-	-	1
CO3	3	3	3	-	-	-	1
CO4	3	3	3	-	-	-	1
CO5	3	3	3	-	-	-	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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 necessaryto 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.

4G236244	ADVANCED DBMS	L	T	P	C
Practicum		1	0	4	3

UNIT - 1	QUERY OPTIMIZATION AND OBJECT BASED DATABASE CONCEPTS	
	Theory: Query optimization –Basic steps in query optimization -Query processing.--Query evaluation plans. Transaction Management concepts - Properties of Transactions.. Object Oriented Database Management System(OODBMS) - The ODMG Data Model - Applications of an OODBMS- Object Relational DBMS- Object-Relational Database Model.	3
Ex.No.	Name of the Experiment	
1	Consider the SQL query select * from employee,department where employee.dept_id = department.dept_id What evaluation plan would a query optimizer likely choose to get the least estimated cost?	4
2	Design an ORDBMS for the following schema of a Library Database: BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name, Address) PUBLISHER (Name, Address, Phone) BOOK_COPIES(Book_id,Branch_id, No-of_Copies) BOOK_LENDING (Book_id, Branch_id,Card_No, Date_Out, Due_Date) . Write SQL queries to a) Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc. b) Get the particulars of borrowers who have borrowed more than	**8**

	3 books, but from Jan 2017 to Jun 2017. c) Delete a book in BOOK table. d) Update the contents of other tables to reflect this data manipulation operation.	
UNIT - 2	**DISTRIBUTED AND PARALLEL DATABASES**	
Distributed Database Management System (DDBMS)- Definition- DDBMS Architecture, Distributed database design, Allocation, Fragmentation, Replication, query processing, transaction processing, Parallel Databases-Architecture, Data partitioning strategy, Interquery and Intraquery Parallelism –Parallel query Evaluation.		3
Ex.No.	Name of the Experiment	
3	Consider a schema that contains the following table with the key underlined: Employee (Eno, Ename, Desg, and Dno). Assume that we horizontally fragment the table as follows: Employee1(Eno, Ename, Desg, Dno), where 1 <= Dno<=10, Employee2(Eno, Ename, Desg, Dno), where 11 <= Dno<=20, Employee3 (Eno, Ename, Desg, Dno), where 21 <= Dno<=30 .In addition, assume we have 4 sites that contain the following fragments: Site1 has Employee1, Site2 has Employee2, Site3 has Employee2 and Employee3, Site4 has Employee1. Add relations to the database as per your requirements. Perform the following operations: a) Create the above database. b) Insert values into the database. c) Create the specified fragments. d) Implement at least five suitable queries on Employeefragments	12

Unit - 3	Spatial Temporal and XML Databases	
Spatial Databases- Definition, Types of spatial data, Querying- spatial selection, spatial join, and other set operations. Temporal Databases- Introduction, Temporal data models. Semi structured Databases--XML Databases- – XML Hierarchical Data Model - XML Schema - DTD - XPath - XQuery.		3
Ex. No.	Name of the Experiment	
4	Create a spatial database of Tamilnadu and form the following queries a) Show a list of all the names of places adjoining your location..b) List the unique town names in your region. c) Find the restaurants close to your location.. d) Find the distance between any two places in Tamilnadu.	4
5	Create the employees table and form the following SQL queries: a) Find the number of employees hired each year. b) Find the number of employees hired each month. c) Find the number of employees hired each week. d) Find the 3 most recently hired employees and what department they work in.	4

6	Write a DTD for XML documents with student data: name, address and a student_id, one or more subjects (computer science, Mechanical, Electrical, Civil etc). Write an XML document containing student data conforming to the DTD, and check it for validity. a) Write a XQuery which returns The names of all students in ascending order. b) The students who study the same subjects. c) The subjects which are studied by more than 10 students.	4
UNIT - 4	**UNSTRUCTURED AND NON-RELATIONAL DATABASES**	
Multimedia databases-Multimedia sources, issues and applications. NoSQL databases - CAP Theorem – Sharding- Document based – MongoDB Operation– Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding– Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types.		3
Ex. No.	Name of the Experiment	
7	a) Consider a student database consisting of (Register_no, Fname, Lname, Address (Street, City, Pincode), Mobile Nos, Total Marks). as data. Design the database using MongoDB and perform the following operations: i. Create the above student database. ii. Insert values into the above database. iii. Find the Students who have got Total Marks greater than 450. iv. Update the Pincode of the students who belong to a particular City.Delete a particular student given the Register No.	6

8	Perform the above operations using Cassandra followed by the following operations: vi Insert additional mobile numbers for a particular student. vii. Delete the street name in the address given a particular city.	6
UNIT - 5	**EMERGING DATABASES**	
Web databases -Web search engines, web search architecture Inverted indexes for web search engines, web crawling, web search statistics. Mobile Databases- Concept -Mobile Database Architecture - Modes of Operationsof Mobile Database - Transaction Model in MDS Cloud Databases- Database options in Cloud, Changing role of the DBA in the Cloud- Moving your databases to the cloud.		3
Ex. No.	Name of the Experiment	
9	Provision a cloud database using AWS RDS service. Understand the Setup process, configurations, and common management tasks.	6
10	Integrate your application with the cloud database. Learn how to establish a connection, perform database operations, and handle Responses in your application.	6
	TOTAL PERIODS	**75**

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

Textbook for Reference:

1. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, SeventhEdition, Pearson Education, 2017.

2. Raghu Ramakrishnan, Database Management Systems, ,4th edition, Mcgraw-Hill,2015 .

3. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.

Website links for reference:

1. https://archive.nptel.ac.in/courses/106/105/106105175 2. https://link.springer.com/book/10.1007/3-540-57507-34.

Equipment / Facilities required to conduct the Practical Course

Hardware Required.

1. Desktop Computers/ Laptop
2. Printer

Software Required.

1. Java / Python
2. MySQL, MongoDB, Cassandra

PRACTICAL EXAMINATION

PART – A

Ex No 1: Consider the SQL query

select * from employee,department where employee.dept_id = department.dept_id

Whatevaluation plan would a query optimizer likely choose to get the least estimated cost?

Ex No 2: Write SQL queries to

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

b) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.

c) Delete a book in BOOK table.

d) Update the contents of other tables to reflect this data manipulation operation.

Ex No 3:

Consider a schema that contains the following table with the key underlined: Employee (Eno, Ename, Desg, and Dno). Assume that we horizontally fragment the table as follows:

Employee1 (Eno, Ename, Desg, Dno), where 1 <= Dno<=10, Employee2 (Eno, Ename, Desg, Dno), where 11 <= Dno<=20, Employee3 (Eno, Ename, Desg, Dno), where 21 <= Dno<=30 .In addition, assume we have 4 sites that contain the following fragments:

Site1 has Employee1, Site2 has Employee2, Site3 has Employee2 and Employee3, Site4 has Employee1. Add relations to the database as per your requirements. Perform the following operations:

a) Create the above database.

b) Insert values into the database.

c) Create the specified fragments. Implement at least five suitable queries on Employee fragments.

Ex No 4:

Create a spatial database of Tamilnadu and form the following queries

a) Show a list of all the names of places adjoining your location..b)

List the unique town names in your region.

c) Find the restaurants close to your location..

d) Find the distance between any two places in Tamilnadu.

Ex No 5:

Create the employees table and form the following SQL queries:

e) Find the number of employees hired each year.

f) Find the number of employees hired each month.

g) Find the number of employees hired each week.

Find the 3 most recently hired employees and what department they work in.

PART – B

Ex No 6:

Write a DTD for XML documents with student data: name, address and a student_id, one or more subjects (computer science, Mechanical, Electrical, Civil etc). Write an XML document containing student data conforming to the DTD, and check it for validity.

a) Write a XQuery which returns The names of all students in ascending order.

b) The students who study the same subjects.

c) The subjects which are studied by more than 10 students.

Ex No 7:

a) Consider a student database consisting of (Register_no, Fname, Lname, Address (Street,City, Pincode), Mobile Nos, Total Marks). as data. Design the database using MongoDB and perform the following operations:

i. Create the above student database.

ii. Insert values into the above database.

iii. Find the Students who have got Total Marks greater than 450.

iv. Update the Pincode of the students who belong to a particular City.

v. Delete a particular student given the Register No.

Ex No 8:

Perform the above operations using Cassandra followed by the following operations:vi Insert additional mobile numbers for a particular student.

vii. Delete the street name in the address given a particular city.

Ex No 9:

Provision a cloud database using AWS RDS service. Configure and setup the common management tasks.

Ex No 10:

Integrate an application with the cloud database. Establish a connection, perform database operations, and handle responses in your application.

DEPARTMENT OF COMPUTER ENGINEERING

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	05
6	Total	100

4G236245	MOBILE APPLICATION DEVELOPMENT	L	T	P	C	End Exam
Practicum		1	0	4	3	Practical

Rationale

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 software 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

CO1: Identify various concepts of mobile programming that make it unique from programming for other platform.

CO2: Critique mobile applications on their design pros and cons.

CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.

CO4: Test Android applications.

CO5: Deploy applications to the Android marketplace for distribution.

Pre-requisites : Nil.

CO/PO MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	-
CO2	3	3	2	1	1	1	-
CO3	3	3	2	1	1	1	-
CO4	3	3	2	1	1	1	-
CO5	3	3	2	1	1	1	-

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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 employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever 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.

4G236245	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT	
THEORY: Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building First Android application,		3
Ex.No	Name of the Experiment	
1	Implement "Hello World" Android example.	12
2	Develop an application that uses GUI components, Font and Colours.	
Unit II	**INTRODUCTION TO ANDRIOD**	
THEORY: Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Android Manifest File and its common settings.		3
Ex.No	Name of the Experiment	
3	Develop an application that uses Layout Managers and event listeners.	12
4	Write an application that draws basic graphical primitives on the screen.	
Unit III	**ANDROID USER INTERFACE DESIGN**	
THEORY: Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts.		3
Ex.No	Name of the Experiment	
5	Develop an application that makes use of Notification Manager.	12
6	Implement an application that writes data to the SD card.	
Unit IV	**TESTING AND MANAGING ANDROID APPLICATIONS**	

THEORY: Testing Android applications, Publishing Android application, Using Android preferences.		3
Ex.No	ame of the Experiment	
7	Develop a native application that uses GPS location information.	12
8	Develop an application for sending & receiving SMS.	
Unit V	**ANDROID APIs AND DEPLOYING ANDROID APPLICATION**	
THEORY: Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Using Android Networking APIs, Using Android Web and Telephony APIs, Deploying Android Application to the World.		3
Ex.No	Name of the Experiment	
9	Develop an application that makes use of SQLite databases.	12
10	Write an application that creates alarm clock.	
TOTAL PERIODS		**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

Textbook for Reference:

1. Dawn Griffiths, David Griffiths, “Head First Android Development: A Brain-FriendlyGuide”, 1st edition, O’Reilly, 2017.
2. John Horton, Android Programming for Beginners, 2nd edition, PacktPublishing, 2018.
3. Barry Burd, Android Application Development All-in-One For Dummies,

2nd edition, For Dummies, 2020.

Website links for reference:

1. https://developer.android.com/get-started/overview
2. https://developer.android.com/courses/

Practical Examination

PART-A

1. Implement "Hello World" Android example.
2. Develop an application that uses GUI components, Font and Colours.
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of Notification Manager.

PART-B

6. Implement an application that writes data to the SD card.
7. Develop a native application that uses GPS location information.
8. Develop an application for sending & receiving SMS.
9. Develop an application that makes use of SQLite databases.
10. Write an application that creates alarm clock.

SCHEME OF VALUATION		
SNO	**ALLOCATION**	**MARKS**
1	Writing program from Part – A	35
2	Writing program from Part – B	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

4G236246	UI AND UX DESIGN	L	T	P	C
Practicum		1	0	4	3

Introduction

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 objectives of this course are enabling the students

- 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

At the end of the course, students will be able

CO1: Demonstrate knowledge on UI and UX design concepts.

CO2: Develop and performing a competitive analysis in UX design**.**

CO3: Design user personas using persona UXPressia's online builder tool.

CO4: Develop interaction design and functional layout.

CO5: Creating web and mobile app applications using visual design tools.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	1	2
CO2	3	3	3	3	1	1	2
CO3	3	3	3	3	2	2	2
CO4	3	3	3	2	2	3	2
CO5	3	3	3	3	2	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

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.

4G236246	UI AND UX DESIGN	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO UI AND UX DESIGN	
Introduction to UI and UX Design and the Key Methodologies such as Product Design Life Cycle.		3
ExNo1: Identifying interface connectivity and establishing interface connectivity between two different program modules. **ExNo2**: Understand front end and backend interfacing and Implementation of both interfacing.		12
Unit II	**UX DESIGN**	
User Centred Design - Design Thinking - Activity Based Design - Agile Process.		3
Ex No 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. **Ex No 4:** Designing a Responsive layout for a societal application		12
Unit III	**USER RESEARCH**	
Stakeholder & User Interviews - Creating Personas - Empathy Mapping -Information Architecture - Building User Journey		3
Ex No 5: Hands on Design Thinking Process for a new product. **Ex No 6:** Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.		12
UNIT IV	**INTERACTION DESIGN**	
Ideation Methods - Interaction & Prototyping - Paper & Digital Prototyping - Designa Web / Mobile App.		3

Ex No 7: Identifying interaction design and functional layout. Practical implementation of interaction design and functional layout. **Ex No 8:** Exploring various UI Interaction Patterns.		12
UNIT V	**VISUAL DESIGN**	
Web & Mobile App Design - Grid Systems - Colors Theory and Palette -		3
Understanding Typography.		
Ex No 9: Create Social media advertisement using online tools and applications. **Ex No 10**: Design super market special offer sales poster using online tools and applications.		12
	TOTAL PERIODS	**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.

Textbook for Reference:

- Tom Green, Joseph Labrecque, A Guide to UX Design and Development: Developer's Journey Through the UX Process (Design Thinking), First Edition, APress, 2023
- Jon Yablonski, Laws of UX: Using Psychology to Design Better Products & Services, First Edition, O'Reilly, 2020.
- Donald Chesnut, Kevin P. Nichols, UX for Dummies, Frist Edition, Wiley, 2014.

Website links for reference:

- NPTEL User Interface Design: https://archive.nptel.ac.in/courses/124/107/124107008/
- MIT OpenCourseWare: https://ocw.mit.edu/courses/6-831-user-interface-design-

and-implementation-spring-2011/pages/lecture-notes/

1. **Hardware(s) Requirement:**
   - Desktop Computer /Laptop
   - Printer
2. **Software(s) Requirement:**
   - Windows / Linux Operating System

PRACTICAL EXAMINATION

PART – A

1. Identifying interface connectivity and establishing interface connectivity between two different program modules.
2. Understand front end and backend interfacing and implementation of both interfacing.
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.
4. Designing a Responsive layout for a societal application.
5. Hands on Design Thinking Process for a new product.

PART – B

6. Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.
7. Identifying interaction design and functional layout. Practical implementation of interaction design and functional layout.
8. Exploring various UI Interaction Patterns.
9. Create Social media advertisement using online tools and applications.
10. Design super market special offer sales poster using online tools and applications.

DEPARTMENT OF COMPUTER ENGINEERING

SCHEME OF VALUATION		
SNO	**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	05
6	Total	100

4G236351	INTERNSHIP	Periods	C
PROJECT		540	12

Introduction

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.

Objectives

After completing Internship, Interns will be able to,

- Apply the theoretical knowledge and skill during performance of the tasks assigned in 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 internship tasks 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, and career aspirations.
- Encourage sensitivity to the needs and backgrounds of different groups, promoting inclusive and equitable industrial practices.

Course Outcomes

CO 1: Demonstrate improved skills.

CO 2: Exhibit increased professional behavior.

CO 3: Apply theoretical knowledge and principles in real-world practices.

CO 4: Develop and utilize assessment tools to evaluate the learning and practices.

CO 5: Engage in reflective practice to continually improve their learning and professional growth.

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 opportunitiesfor 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 diary to 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 the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress 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.

4G236352	FELLOWSHIP	Periods	C
PROJECT		540	12

Introduction

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 and computer 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, critical thinking, 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.

Objectives

After completing students will be able to,

- Provide fellows with a solid foundation in core engineering principles and advanced technical 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 integration of 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

CO 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.

CO 2: Apply theoretical knowledge to practical scenarios, effectively solving engineering problems through hands-on projects, laboratory work, and internships.

CO 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.

CO 4: Understand and adhere to professional and ethical standards in engineering practice, demonstrating responsibility, integrity, and a commitment to sustainable and socially responsible engineering.

CO 5: Enhance strong communication skills, both written and verbal, and be capable of working effectively in teams, demonstrating leadership and collaborative abilities in diverse and multidisciplinary environments.

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 important technical 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 such as 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 strong reputation 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 Chairman Board 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 that enhance 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. Prioritize tasks 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 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 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, and 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 or study 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 you are receiving, if applicable. Some fellowships may also require a budget proposal for the 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 andsubmit 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 in the 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.

4G236374	IN HOUSE PROJECT	Periods	C
PROJECT		540	12

Introduction

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 submitted by the project group **of not exceeding four students**, and the viva voce by an external examiner.

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 by addressing complex engineering issues within a defined scope.
- **Project Management**: Gain experience in project planning, execution, andmanagement, 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

CO 1: Demonstrate the ability to apply theoretical concepts and principles learned in coursework to solve practical engineering problems encountered during the project.

CO 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.

CO 3: Apply critical thinking and problem-solving skills to identify, analyze, and propose solutions to engineering challenges encountered throughout the project lifecycle.

CO 4: Acquire project management skills by effectively planning, organizing, and executing project tasks within defined timelines and resource constraints.

CO 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.
- 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 giventimeframe, 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 facilitatinggrant 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.

15. ASSESSMENT METHODOLOGY

COURSE TYPE THEORY END EXAM THEORY

<table>
<tr><th>Assessment Method</th><th colspan="2">Assessment Marks</th><th>Converted Marks</th><th>Internal Marks</th><th>External Marks</th><th>Total Marks</th></tr>
<tr><td>Cycle Test – I (Unit – I & II) (2 Hours) (Written Test)</td><td>60 Marks</td><td rowspan="2">Best of CT–I and CT–II</td><td rowspan="2">10 Marks</td><td rowspan="7">40 Marks</td><td rowspan="8">60 Marks</td><td rowspan="8">100 Marks</td></tr>
<tr><td>Cycle Test – II (Unit – III &IV) (2 Hours) (Written Test)</td><td>60 Marks</td></tr>
<tr><td>Model Theory Examinations (AllUnits) (3 Hours)</td><td colspan="2">100 Marks</td><td>10 Marks</td></tr>
<tr><td>* Assignment – 2 Nos.(2 Nos. x 10 Marks)</td><td colspan="2">20 Marks</td><td>10 Marks</td></tr>
<tr><td>MCQ</td><td colspan="2">50 Marks</td><td>5 Marks</td></tr>
<tr><td>Attendance</td><td colspan="2">5 Marks</td><td>5 Marks</td></tr>
<tr><td>END THEORY EXAMINATIONS (3 Hours)</td><td colspan="2">100 Marks</td><td>60 Marks</td><td></td></tr>
<tr><td colspan="6">TOTAL</td></tr>
</table>

Cycle Test Question Pattern

Part A – 6 Questions x 2 marks = 12 Marks
Part B – 6 Questions x 8 marks = 48 Marks
Total Marks = 60 Marks

In Each Unit (6 Questions answer any 3) and Part – B (4 Questions answer any 3)

End Theory Examination Question Pattern

Part A – 10 Questions x 2 Marks = 20 Marks
Part B – 10 Questions x 8 Marks = 80 Marks
Total Marks = 100 Marks

In Each Unit (4 Questions answer any 2) and Part – B (4 Questions answer any 2)

Assignment :

- 2 Assignments covers all 5 Units 20 Marks converted to 10 Marks

MCQ :

- Each Unit 10 Questions - 50 Questions 50 Marks converted to 5 Marks

COURSE TYPE PRACTICUM END EXAM THEORY

<table>
<tr><th>Assessment Method</th><th colspan="2">AssessmentMarks</th><th>Converted Marks</th><th>Internal Marks</th><th>External Marks</th><th>Total Marks</th></tr>
<tr><td>Cycle Test – I (Unit – I & II)(2 Hours) (Written Test)</td><td>60 Marks</td><td rowspan="2">Best of CT–I and CT–II</td><td rowspan="2">10 Marks</td><td rowspan="7">40 Marks</td><td rowspan="8">60 Marks</td><td rowspan="9">100 Marks</td></tr>
<tr><td>Cycle Test – II (Unit – III &IV) (2 Hours) (Written Test)</td><td>60 Marks</td></tr>
<tr><td>Model Practical Examination (3 Hours)</td><td colspan="2">100 Marks</td><td>10 Marks</td></tr>
<tr><td>Model Theory Examinations (AllUnits) (3 Hours)</td><td colspan="2">100 Marks</td><td>10 Marks</td></tr>
<tr><td>Assignment -2 Nos.
2 x 10 Marks</td><td colspan="2">20 Marks</td><td>5 Marks</td></tr>
<tr><td>Attendance</td><td colspan="2">5 Marks</td><td>5 Marks</td></tr>
<tr><td>END THEORY EXAMINATIONS (3 Hours)</td><td colspan="2">100 Marks</td><td>60 Marks</td><td></td></tr>
<tr><td colspan="6">Total</td></tr>
</table>

Cycle Test Question Pattern

Part A – 6 Questions x 2 marks = 12 Marks
Part B – 6 Questions x 8 marks = 48 Marks
Total Marks = 60 Marks

In Each Unit (4 Questions answer any 3) and Part – B (4 Questions answer any 3)

End Theory Examination Question Pattern

Part A – 10 Questions x 2 Marks = 20 Marks
Part B – 10 Questions x 8 Marks = 80 Marks
Total Marks = 100 Marks

In Each Unit (4 Questions answer any 2) and Part – B (4 Questions answer any 2)

Assignment :

- 2 Assignments covers all 5 Units 20 Marks converted to 10 Marks

COURSE TYPE PRACTICAL END EXAM PRACTICAL

Assessment Method	Assessment Marks		Converted Marks	Internal Marks	External Marks	Total Marks
Cycle Test – I Practical Examinations PART A Exercises (2 Hours)	50 Marks	Best of CT –I and CT –II	10 Marks	**40 Marks**	**60 Marks**	**100 Marks**
Cycle Test – II Practical Examinations PART B Exercises (2 Hours)	50 Marks					
Model Practical Examinations All Exercises (3 Hours)	100 Marks		15 Marks			
Practical Document submission (Each Exercise / Experiment Drawing plate should be evaluated to 10 Marks	10 Marks		10 Marks			
Attendance	5 Marks		5 Marks			
END PRACTICAL EXAMINATIONS (3 Hours)	100 Marks		60 Marks			
TOTAL						

SCHEME OF EVALUATION

Cycle Test I & II

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
	Total	50

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

COURSE TYPE PRACTICUM END EXAM PRACTICAL

<table>
<tr><th>Assessment Method</th><th colspan="2">Assessment Marks</th><th>Converted Marks</th><th>Internal Marks</th><th>External Marks</th><th>Total Marks</th></tr>
<tr><td>Cycle Test – I Practical Examinations PART A Exercises (2 Hours)</td><td>50 Marks</td><td rowspan="2">Best of CY–I and CY–II</td><td rowspan="2">10 Marks</td><td rowspan="6">40 Marks</td><td rowspan="7">60 Marks</td><td rowspan="8">100 Marks</td></tr>
<tr><td>Cycle Test – II Practical Examinations PART B Exercises (2 Hours)</td><td>50 Marks</td></tr>
<tr><td>Model Theory Examinations (3 Hours)</td><td>100 Marks</td><td>15 Marks</td><td rowspan="2">15 Marks</td></tr>
<tr><td>Model Practical Examinations (3 Hours)</td><td>100 Marks</td><td>15 Marks</td></tr>
<tr><td>Practical Document/ Drawing Plate submission (Each Exercise / Experiment / Drawing plate should be evaluated to 10 Marks.</td><td colspan="2">10 Marks</td><td>10 Marks</td></tr>
<tr><td>Attendance</td><td colspan="2">5 Marks</td><td>5 Marks</td></tr>
<tr><td>END PRACTICAL EXAMINATIONS (3 Hours)</td><td colspan="2">100 Marks</td><td>60 Marks</td><td></td></tr>
<tr><td colspan="6">TOTAL</td></tr>
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SCHEME OF EVALUATION
CYCLE TEST I & II

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
	Total	50

SCHEME OF EVALUATION
Model Theory Examination

Part A – 10 Questions x 2 Marks = 20 Marks
Part B – 10 Questions x 8 Marks = 80 Marks
Total Marks= 100 Marks

In Each Unit Part - A (3 Questions answer any 2)
Part - B (3 Questions answer any 2)

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

COURSE TYPE PRACTICUM END EXAM PROJECT

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Cycle Test – I (Unit – I, II,III) (2 Hours) (Written Test)	60 Marks	10 Marks			
Cycle Test – II Seminar Presentations (Unit IV)	20 Marks	10 Marks			
Submission of Industry Visit Project Report (Unit V)	30 Marks	15 Marks			
Attendance	5 Marks		**40 Marks**		
END PRACTICAL (PROJECT) EXAMINATIONS (3 Hours)	100 Marks	60 Marks		**60 Marks**	**100 Marks**
TOTAL					

Cycle Test -1 Question Pattern

Part A – 6 Questions x 2 marks = 12 Marks
Part B – 6 Questions x 8 marks = 48 Marks
Total Marks = 60 Marks

In Each Unit (4 Questions answer any 3) and Part – B (4 Questions answer any 3)

Cycle Test -II

- Seminar Presentations (Unit IV)
- Seminar Presentations (20 marks - each topic carries 10 marks) - Unit IV
- Students should present any two topics with PPTs

Submission of Industry Visit Project Report

- Submission of Industry Visit Project Report - (30 marks) - Unit V

SCHEME OF EVALUATION
END SEMESTER EXAMINATION –PROJECT EXAM

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Autonomous Examinations.

Detailed Allocation of Marks

PART	DESCRIPTION	MARKS
Part A i) ii)	Written Examination – Unit –I,II & III Theory 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) ii)	Presentation of Industry Visit Project Report	25
	Interaction and Evaluation	30
	Total	100

COURSE TYPE PROJECT END EXAM PRACTICA L

Assessment Method	Assessment Marks		Converted Marks	Internal Marks	External Marks	Total Marks
Cycle Test – I Practical Examinations PART A Exercises (2 Hours)	50 Marks	Best of CT–I and CT–II	10 Marks	**40 Marks**	**60 Marks**	**100 Marks**
Cycle Test – II Practical Examinations PART B Exercises (2 Hours)	50 Marks					
Project Review 1 (2 Hours)	50 Marks	15 Marks	15 Marks			
Project Review 2 (2 Hours)	50 Marks	15 Marks				
Practical Document submission (Each Exercise should be evaluated to 10 Marks.	10 Marks		10 Marks			
Attendance	5 Marks		5 Marks			
END PRACTICAL EXAMINATIONS (3 Hours)	100 Marks		60 Marks			
TOTAL						

SCHEME OF EVALUATION
Cycle Test I & II

PART	DESCRIPTION	MARKS
1	Aim (5) & Program (30)	35
2	Execution & Output	15
	Total	50

SCHEME OF EVALUATION
Review I & II

PART	DESCRIPTION	MARKS
1	Presentation	20
2	Implementation	20
3	Viva Voce	10
	Total	50

COURSE TYPE PROJECT/ INTERNSHIP END EXAM PROJECT

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Punctuality and regularity. (Attendance)	**10 Marks**	**10 Marks**	**40 Marks**	**60 Marks**	**100 Marks**
Level / proficiency of practical skills acquired. Initiative in learning / working at site	**10 Marks**	**10 Marks**			
Self expression / communication skills. Interpersonal skills / Human Relation.	**10 Marks**	**10 Marks**			
Report and Presentation.	**10 Marks**	**10 Marks**			
END PROJECT EXAMINATION	**100 Marks**	**60 Marks**			
Total					

SCHEME OF EVALUATION
END SEMESTER EXAMINATION- PROJECT

PART	DESCRIPTION	MARKS
1	Daily Activity Report and Attendance certificate.	20
2	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
3	Presentation by the student at the end of the Internship.	30
	Viva Voce	20
	Total	100

16. MODEL QUESTION PAPERS

SESHASAYEEINSTITUTEOF TECHNOLOGY
(Autonomous)
TRICHY-10

Year: II Term : III		**Model Examination**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G233110**	**Course Name**	**DIGITAL LOGIC DESIGN**

PART-A (10 X 2 = 20 marks) Answer any 2 questions from 1,2, 3,4		**Unit**	**Bloom's Level**
1.	Convert the decimal number 75 into binary	1	An
2.	Perform 2's Compliment for +6	1	An
3.	Convert the decimal number $(1843)_{10}$ into BCD	1	An
4.	What does ASCII stand for, and what is its purpose?	1	U
Answer any 2 questions from 5, 6,7,8			
5.	Give the Truth table and Logic symbol for Ex-OR Gate	2	R
6.	Define Half adder	2	U
7.	Define Decoder	2	U
8.	What is De Morgan's theorem?	2	U
Answer any 2 questions from 9,10,11,12			
9.	What is edge triggering in Flip-flop?	3	U
10.	List the applications of Shift registers	3	R
11.	What is Counter? Give it types	3	U
12.	Describe the operation of a JK flip-flop.	3	U
Answer any 2 questions from 13,14,15,16			
13.	What is called Interfacing?	4	U
14.	What is TTL logic?	4	U
15.	Define DAC	4	U
16.	What is the purpose of a solenoid in digital interfacing?	4	U
Answer any 2 questions from 17,18,19,20			
17.	Give the difference between Flash ROM and NVRAM	5	U
18.	What is address line?	5	U
19.	Define access time	5	U
20.	Explain the term address lines.	5	U

PART-B (5 X 16 = 80marks) **Note : 1)Answer all the questions by choosing any 2 subdivision from each question** **2) Each question carries 8 Marks**		Unit	Bloom'sLevel
21. a)	Convert the decimal number 75 into Binary, Octal and Hexadecimal numbers	1	App
b)	Convert Octal no $(3574)_8$ into Decimal, Binary and Hexadecimal numbers	1	App
c)	Draw the symbol and truth table and the Boolean expression of AND gate, OR gate, NOT gate ,NAND gate and NOR gate	1	An
d)	Describe the various binary conversion methods.	1	U
22. a)	With the logic diagram prove the Demorgan's theorem	2	E
b)	Reduce the function f=∑(0,1,2,3,5,7) using K- map	2	App
c)	Explain the Full Adder circuit with logic diagram	2	U
d)	Discuss the working of a digital comparator.	2	U
23. a)	Explain the operation of JK Flip Flop with logic diagram	3	U
b)	Explain the Serial to parallel converter shift register with Block diagram	3	U
c)	Draw the logic diagram of synchronous down counter and explain the operation	3	An
d)	Explain the concept of registers in sequential logic design.	3	U
24. a)	Explain the successive approximate A/D convertor in detail	4	U
b)	Explain R-2R Ladder D/A converter	4	U
c)	Explain the sensors and it types	4	U
d)	Describe the interfacing of a motor in a digital system.	4	U
20. a)	Explain about PLA architecture	5	U
b)	Explain about different types of ROM and RAM	5	U
c)	Explain the operation of Pen drive and SD card	5	U
d)	Discuss the role of memory in embedded systems.	5	U

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TRICHY-10

Year: II Term : III		**Model Examination**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINEERING**	
Course Code	**4G233230**	**Course Name**	**RDBMS**

PART-A (10 X 2 = 20 Marks) **Answer any 2 questions from 1,2, 3,4**		**Unit**	**Bloom'sLevel**
1.	What is meant by Database?	1	U
2.	List out CODD's Rules.	1	R
3.	Write the use of DESC and SHOW commands.	1	A N
4.	Explain the structure of a database table.	1	U
Answer any 2 questions from 5, 6,7,8			
5.	Write and explain date and time data types.	2	U
6.	How would you delete a column from a table? Give example.	2	A N
7.	Explain arithmetic operators in MySQL with examples.	2	U
8.	Define Data Definition Commands (DDC).	2	U
Answer any 2 questions from 9,10,11,12			
9.	Explain the flow control statement LEAVE.	3	U
10.	Explain with example ORDER BY clause.	3	U
11.	List the advantages of views in Mysql.	3	R
12.	How does a correlated sub-query differ from a regular sub-query?	3	A N
Answer any 2 questions from 13,14,15,16			
13.	Explain creating the sequences with syntax.	4	U
14.	Explain LIMIT handling clause in UNION with example.	4	U
15.	How will you give GRANT and REVOKE permission for user?	4	An
16.	What is a natural join?	4	U
Answer any 2 questions from 17,18,19,20			
17.	How will you create stored procedures?	5	U
18.	What is meant by Cursor?	5	U
19.	Write the syntax for deleting the trigger.	5	U
20.	How do you delete a stored function in MySQL?	5	U

PART-B (5 X 16 = 80marks) Note : 1)Answer all the questions by choosing any 2 subdivision from eachquestion 2) Each question carries 8 Marks		Unit	Bloom'sLevel
21. a)	Explain about the following (i)Table Structure (ii)Record (iii)Field (iv)Column (v)Keys	1	U
b)	Explain MYSQL installation.	1	U
c)	(a) Explain in detail about domain integrity constraints with examples. (4) (b) Give the difference between SQL and MYSQL.(4)	1	U
d)	Explain a detailed overview of CODD's 12 rules.	1	U
22.a)	Explain Data Definition commands in detail.	2	U
b)	Explain String functions in detail.	2	U
c)	(ii)Consider a table employee_details created into the database with the followingdata. Use this table and Answer the following query.	2	An

ID	Name	City	Salary	Age
1	Priyanka Bagul	Nasik	26000	20
2	Riya Sharma	Mumbai	72000	28
3	Neha Verma	Varanasi	37000	19
4	Neeta Desai	Nasik	39500	21
5	Priya Wagh	Udaipur	60000	32

1. Write a query to display employee details in which name starts with 'Pr'.
2. Write a query to display employee details in which city name ends with 'i'.
3. Write a query to display employee details in which age number starts with 2.

d)	Discuss the role of error handling in MySQL.	2	U
23. a)	Explain flow control statement in MySQL	3	U
b)	Explain with example querying the table.	3	U
c)	Explain about creating, updating and deleting Views.	3	U
d)	How can views used to enhance security in MySQL?	3	A N
24.a)	Explain Simple and Compound Index with example.	4	U
b)	Explain types of outer JOIN with examples	4	U
c)	Explain Transaction Management commands with example.	4	U
d)	How do transactions enhance data integrity in MySQL?	4	A N
25. a)	Explain in, out and in out parameters in stored procedures.	5	U
b)	How to create and execute stored function? Explain with example.	5	U
c)	Explain in detail about BEFORE and AFTER trigger creation with example.	5	U
d)	Describe the use of cursors in handling complex queries in MySQL.	5	U

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TRICHY-10

Year: III Term : IV		**Model Examination**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G235215**	**Course Name**	**COMPUTER NETWORKS AND SECURITY**

PART-A (10 X 2 = 20 marks) Answer any 2 questions from 1,2, 3,4		**Unit**	**Bloom's Level**
1.	Define data communication and its main components.	1	U
2.	What is the difference between simplex and full-duplex data flow?	1	AN
3.	Name two advantages of a star topology	1	R
4.	What are point-to-point and multipoint connections? Give examples	2	R
Answer any 2 questions from 5,6,7,8			
5.	What is the main function of the OSI model?	2	AN
6.	What is CSMA/CD in the context of the 802.3 protocol?	2	AN
7.	Name any two types of Ethernet.	2	U
8.	Name the transport and network layer protocols in the TCP/IP model	2	R
Answer any 2 questions from 9,10,11,12			
9.	What is the purpose of ARP in network communication?	3	AN
10.	Differentiate between IPv4 and IPv6 in terms of addressing.	3	R
11.	What is the main function of the HTTP protocol?	3	AN
12.	How is an IP address represented in dotted decimal notation?	3	AN
Answer any 2 questions from 13,14,15,16			
13.	What is meant by network security?	4	AN
14.	Define symmetric encryption.	4	U
15.	What is a digital signature?	4	AN
16.	Define a software supply chain attack	4	R
Answer any 2 questions from 17,18,19,20			
17.	What is a Trojan Horse in the context of network security?	5	AN
18.	Name two types of firewalls.	5	U
19.	What is a honeypot?	5	AN
20.	What is a Trojan Horse in the context of malware?	5	R

PART-B (5 X 16 = 80marks) Note : 1)Answer all the questions by choosing any 2 subdivision from eachquestion 2) Each question carries 8 Marks		Unit	Bloom'sLevel
21. a)	Explain the different types of network topologies (Star, Bus, Ring, Mesh, Hybrid)with their advantages and disadvantages.	1	U
b)	Discuss the various types of networks (LAN, MAN, WAN, Internet, Intranet) andtheir applications.	1	AN
c)	Describe the functions of network devices such as switches, bridges, routers, andgateways.	1	AN
d)	Analyze the advantages and disadvantages of using a bus topology in a local area network (LAN) compared to a star topology	1	AN
22. a)	Explain the OSI model, detailing the function of each layer.	2	U
b)	Compare the 802.3 (CSMA/CD) and 802.5 (Token Ring) protocols in terms offunctionality and usage.	2	AN
c)	Describe the evolution of Ethernet from Fast Ethernet to 800GE, highlighting keyfeatures.	2	AN
d)	Explain the layered architecture of the OSI model, focusing on the role of the physical, data link, and transport layers	2	U
23. a)	Discuss the concept of IP addressing, including subnetting and supernetting with examples.	3	AN
b)	Explain the differences between TCP and UDP, focusing on their reliability and use cases.	3	U
c)	Describe the role of different application layer protocols such as FTP, HTTP, and Telnet.	3	AN
d)	Compare the role of TCP and UDP in data transmission. Provide examples where each protocol is most suitable	3	AN
24. a)	Explain the principles of network security and discuss various types of network attacks.	4	U
b)	Describe the working of symmetric block encryption algorithms, focusing on DES.	4	AN
c)	What is RSA, and how does it differ from symmetric encryption techniques?	4	AN
d)	Discuss the principles of cryptography, focusing on the differences between symmetric and public key encryption	4	U
25. a)	Discuss various historical and advanced hacking techniques, including examples ofeach.	5	AN
b)	Explain the different types of firewalls and their limitations in network security.	5	U
c)	Describe the concept of intrusion detection systems and classify different types of intruders.	5	AN
d)	Analyze the effectiveness of different intrusion detection systems (IDS) and explain how honeypots can be used as a tool to identify and classify intruders	5	AN

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TRICHY-10

Year: II Term : IV		**Model Question Paper**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G234230**	**Course Name**	**DATA STRUCTURE USING PYTHON**

	PART-A (10 X 2 = 20 marks) **Answer any 2 questions from 1,2, 3,4**	**Unit**	**Bloom's Level**
1.	What is the difference between primitive and non-primitive data structures?	1	An
2.	Define Abstract Data Type (ADT) with an example.	1	U
3.	What is Big-O notation in algorithm analysis?	1	U
4.	What is the need for data structures in programming?	1	U
Answer any 2 questions from 5,6,7,8			
5.	What is a node in a linked list?	2	R
6.	Differentiate between a singly linked list and a doubly linked list.	2	AN
7.	What is a null pointer in the context of linked lists?	2	R
8.	What are the key differences between a linear and circular linked list?	2	U
Answer any 2 questions from 9,10,11,12			
9.	What are the main operations of a stack?	3	U
10.	Define recursion with an example.	3	U
11.	What is a priority queue?	3	U
12.	What is the purpose of a circular queue?	3	U
Answer any 2 questions from 13,14,15,16			
13.	Define a binary tree.	4	U
14.	What is an in-order traversal?	4	U
15.	What is the height of a binary tree?	4	U
16.	Explain the purpose of binary tree traversals	4	U
Answer any 2 questions from 17,18,19,20			
17.	What is a bubble sort?	5	U
18.	Define linear search.	5	U
19.	What is the difference between binary search and linear search?	5	AN
20.	What is the key advantage of binary search over linear search?	5	U

PART-B (5 X 16 = 80marks) **Note : 1)Answer all the questions by choosing any 2 subdivision from each question** **2) Each question carries 8 Marks**		**Unit**	**Bloom' sLevel**
21. a)	Explain the classification of data structures with examples in Python.	1	U
b)	Discuss the concept of Abstract Data Types (ADT) and provide an example of defining and using an ADT in Python.	1	AN
c)	Describe the concepts of space and time complexity with relevant examples.	1	AN
d)	Explain how time complexity is used to evaluate algorithms	1	U
22. a)	Explain the operations of a singly linked list such as traversal, searching, and removing nodes.	2	U
b)	Compare the different types of linked lists: singly, doubly, and circular linked lists.	2	AN
c)	Describe the organization and operations of a circular linked list.	2	AN
d)	Why are linked lists more efficient than arrays for certain operations?	2	AN
23. a)	Discuss the implementation of a stack using a Python list and its applications.	3	AN
b)	Explain the concept of recursion and create a recursive function to calculate factorials.	3	U
c)	Compare circular queues and linear queues with their applications.	3	AN
d)	How are queues used in task scheduling systems?	3	U
24. a)	Explain the properties and operations of a Binary Search Tree (BST).	4	U
b)	Describe the different types of binary trees and their linear representations.	4	AN
c)	Discuss the different types of binary tree traversals with examples.	4	AN
d)	Compare the advantages of using a balanced binary tree over a standard binary search tree	4	AN
25. a)	Explain the different sorting techniques: Bubble Sort, Insertion Sort, Quick Sort, and Merge Sort.	5	U
b)	Describe the implementation of the binary search algorithm and its advantages over linear search.	5	AN
c)	Discuss the concepts and steps involved in Quick Sort and Merge Sort with examples.	5	AN
d)	Which sorting algorithm would you choose for a nearly sorted array and why?	5	E

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TRICHY-10

Year: III Term : V		**Model Question Paper**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G235130**	**Course Name**	**CLOUD COMPUTING**

PART-A (10 X 2 = 20 marks) **Answer any 2 questions from 1,2, 3,4**		**Unit**	**Bloom's Level**
1.	What are the key characteristics of cloud computing?	1	R
2.	Name the three primary cloud service models.	1	R
3.	What is the difference between IaaS and PaaS?	1	R
4.	What are the limitations of cloud computing?	1	U
Answer any 2 questions from 5,6,7,8			
5.	What is a hypervisor?	2	R
6.	Define full virtualization.	2	U
7.	What is hardware-assisted virtualization?	2	R
8.	What is the purpose of a hypervisor in virtualization?	2	U
Answer any 2 questions from 9,10,11,12			
9.	What are web services?	3	R
10.	Name two services provided by Amazon Web Services (AWS).	3	R
11.	What is Google App Engine used for?	3	R
12.	What are SOAP and REST in the context of web services?	3	R
Answer any 2 questions from 13,14,15,16			
13.	What is the CSA reference model?	4	R
14.	Name two cloud security challenges.	4	R
15.	Define virtualization security management.	4	U
16.	What are the main security challenges associated with cloud computing?	4	R
Answer any 2 questions from 17,18,19,20			
17.	What is Adobe Creative Cloud used for?	5	R
18.	What are the benefits of using GitHub?	5	R
19.	Define the concept of a column family in Google Bigtable.	5	U
20.	What is the purpose of Adobe Creative Cloud?	5	R

PART-B (5 X 16 = 80marks) **Note : 1)Answer all the questions by choosing any 2 subdivision from each question** **2) Each question carries 8 Marks**		Unit	Bloom's Level
21. a)	Compare the different cloud deployment models (public, private, hybrid, and community).	1	AN
b)	Discuss the benefits and limitations of cloud computing.	1	AN
c)	Explain the SPI (Software, Platform, and Infrastructure) model and how it compares to traditional IT models.	1	U
d)	Compare and contrast the benefits and challenges of using cloud computing for businesses	1	AN
22. a)	Explain the different types of hypervisors and their use cases.	2	U
b)	Discuss the advantages and disadvantages of Para virtualization.	2	AN
c)	Compare and contrast full virtualization and hybrid virtualization.	2	AN
d)	Discuss the differences between Para virtualization and full virtualization, including their advantages and use cases	2	AN
23. a)	Describe the various types of web services and their applications.	3	U
b)	Explain the features and benefits of Amazon Elastic Compute Cloud (EC2) and Amazon S3.	3	U
c)	Compare Google Compute Engine with Amazon EC2 in terms of features and use cases	3	AN
d)	Explain the features and benefits of Amazon Elastic Compute Cloud (EC2) and how it can be utilized in cloud applications.	3	U
24. a)	Discuss the security challenges associated with cloud storage location and tenancy.	4	AN
b)	Explain the importance of security policies and their implementation in cloud environments.	4	U
c)	Describe the key components of virtualization security management.	4	U
d)	Discuss the importance of security policies in cloud environments and the steps to implement them effectively	4	AN
25. a)	Explain the features and applications of Zoho Work Drive in cloud computing.	5	U
b)	Describe the storage concept of Google Big table and its advantages.	5	U
c)	Discuss the uses of LinkedIn for professional networking and career growth.	5	AN
d)	Describe the storage concepts in Google Big table and discuss its advantages for handling big data applications	5	U

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TRICHY-10

Year: III Term : V		**Model Question Paper**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G235212**	**Course Name**	**DATA WARE HOUSING & MINING**

	PART-A (10 X 2 = 20 marks) **Answer any 2 questions from 1,2, 3,4**	**Unit**	**Bloom's Level**
1.	Define data warehousing and its main purpose.	1	R
2.	What are fact and dimension tables in data warehouse design?	1	U
3.	List the steps involved in the ETL process.	1	R
4.	What are the key components of data warehouse architecture?	1	U
Answer any 2 questions from 5,6,7,8			
5.	What is metadata management in the context of data warehousing?	2	R
6.	Define OLAP and its significance in data analysis.	2	U
7.	Mention any two benefits of implementing data warehousing in cloud environments.	2	U
8.	What is the significance of data quality management in data warehousing?	2	R
Answer any 2 questions from 9,10,11,12			
9.	What is data mining, and why is it important?	3	U
10.	What is the purpose of data preprocessing in data mining?	3	U
11.	List two classification techniques used in data mining.	3	R
12.	What is the difference between supervised and unsupervised learning in datamining?	3	R
Answer any 2 questions from 13,14,15,16			
13.	What is supervised learning in the context of classification?	4	U
14.	What is the purpose of the pruning technique in decision trees?	4	U
15.	Name two distance metrics used in the k-Nearest Neighbors algorithm.	4	R
16.	What is the role of a classifier in data mining?	4	R
Answer any 2 questions from 17,18,19,20			
17.	What is the main objective of clustering in data analysis?	5	U
18.	What are the basic concepts of clustering?	5	R
19.	Differentiate between agglomerative and divisive hierarchical clustering.	5	U
20.	What are the advantages of using K-Means clustering compared to hierarchicalclustering?	5	R

PART-B (5 X 16 = 80marks) **Note : 1)Answer all the questions by choosing any 2 subdivision from each question** **2) Each question carries 8 Marks**		**Unit**	**Bloom's Level**
21. a)	Explain the architecture of a data warehouse and describe its main components.	1	U
b)	Discuss the process of dimensional modeling in data warehouse design. Include examples of fact and dimension tables.	1	APP
c)	Describe the ETL process in detail, covering data extraction, transformation, and loading with appropriate tools and technologies.	1	AN
d)	Explain the differences between operational databases and data warehouses. Discusshow these differences influence data storage, retrieval, and processing strategies in organizations.	1	U
22. a)	Explain the data warehouse lifecycle, detailing the planning, design, implementation, and maintenance stages.	2	U
b)	Discuss the role of data quality management in data warehousing. How does it affect data analysis and reporting?	2	AN
c)	Describe how OLAP works and explain its role in multidimensional data analysis. Provide examples of OLAP operations like slicing and dicing.	2	APP
d)	Explain the significance of metadata management in data warehousing and discuss its impact on data quality and data analysis	2	U
23. a)	Explain the main tasks and challenges associated with data mining. How do these challenges impact data analysis?	3	AN
b)	Discuss the process of data preprocessing, including data cleaning, integration, transformation, and reduction, with suitable examples.	3	APP
c)	Describe the decision tree algorithm and explain how it is used for classification. Include an example to illustrate the concept.	3	APP
d)	Discuss the different challenges associated with data mining and explain how these challenges can affect the data analysis process.	3	APP
24. a)	Describe the ID3, C4.5, and CART algorithms for decision tree classification. How do these algorithms handle overfitting?	4	AN
b)	Explain the Naive Bayes classifier and how it is used for text classification. Provide an example to support your explanation.	4	APP
c)	Discuss the k-Nearest Neighbors (KNN) algorithm. How are distance metrics and parameter selection important for the performance of KNN?	4	AN
d)	Explain the principles of Bayesian classification and discuss how the Naive Bayes classifier is applied in real-world scenarios, including advantages and limitations.	4	APP
25. a)	Describe the K-Means clustering method, including its algorithm and the steps involved. Provide an example to illustrate its working.	5	APP
b)	Explain the hierarchical clustering techniques, including agglomerative and divisive methods. Compare them with partitioning methods.	5	AN
c)	Discuss the advantages and disadvantages of partitioning and hierarchical clustering approaches in data analysis. Include real-world applications of each.	5	E
d)	Compare partitioning methods, such as K-Means clustering, with hierarchical clustering methods. Discuss their respective advantages and disadvantages in data analysis.	5	U

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TRICHY-10

Year: III Term : V		**Model Question Paper**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G235215**	**Course Name**	**ARTIFICIAL INTELLIGENCE**

	PART-A (10 X 2 = 20 marks) **Answer any 2 questions from 1,2, 3,4**	**Unit**	**Bloom's Level**
1.	What is Artificial Intelligence (AI)?	1	R
2.	Name two goals of AI.	1	U
3.	What is the difference between human intelligence and machine intelligence?	1	R
4.	What are the main components of an AI system?	1	R
Answer any 2 questions from 5,6,7,8			
5.	What is Breadth-First Search (BFS)?	2	R
6.	Define heuristic search.	2	U
7.	What is the purpose of A* Search?	2	R
8.	What is Uniform Cost Search, and how does it differ from other search strategies?	2	R
Answer any 2 questions from 9,10,11,12			
9.	What is propositional logic?	3	R
10.	Define ontological engineering.	3	U
11.	What is hill climbing in optimization?	3	R
12.	What is a knowledge-based agent?	3	R
Answer any 2 questions from 13,14,15,16			
13.	What is the Mini-Max search in game theory?	4	R
14.	Define constraint satisfaction problems (CSPs).	4	U
15.	What is backtracking in CSP?	4	R
16.	What is Alpha-Beta pruning, and why is it used in game playing?	4	R
Answer any 2 questions from 17,18,19,20			
17.	What is a knowledge-based agent?	5	R
18.	What is propositional model checking?	5	R
19.	Define agent communication.	5	U
20.	Define agent communication in the context of intelligent agents	5	U

PART-B (5 X 16 = 80marks) Note : 1)Answer all the questions by choosing any 2 subdivision from each question 2) Each question carries 8 Marks		Unit	Bloom's Level
21. a)	Describe the history and evolution of Artificial Intelligence.	1	U
b)	Explain the different types of AI and their applications.	1	U
c)	Discuss the structure of agents and the concept of rationality in AI.	1	AN
d)	Discuss the various applications of AI in different industries. Provide examples to illustrate their impact.	1	U
22. a)	Explain the differences between Depth-First Search (DFS) and Breadth-First Search (BFS).	2	U
b)	Describe the A* search algorithm and how it uses heuristics for problem-solving.	2	AN
c)	Compare the various search strategies: BFS, DFS, and Uniform Cost Search	2	AN
d)	Evaluate the effectiveness of heuristic search strategies in problem-solving. Discuss their advantages and disadvantages with examples	2	AN
23. a)	Explain knowledge-based agents and their role in AI systems.	3	U
b)	Describe the categories and objects approach to knowledge representation.	3	AN
c)	Discuss the Genetic Algorithm and its application in optimization problems.	3	AN
d)	Explain the importance of ontological engineering in knowledge representation. Discuss its role in AI applications with suitable examples	3	AN
24. a)	Explain the Alpha-Beta pruning technique in game playing.	4	U
b)	Describe the structure of constraint satisfaction problems and how constraints are managed.	4	AN
c)	Discuss local search strategies for solving CSPs.	4	AN
d)	Compare and contrast the Mini-Max algorithm and Alpha-Beta pruning in the context of game playing. Discuss how each technique improves the efficiency ofdecision-making in AI.	4	AN
25. a)	Explain the architecture of intelligent agents and their components.	5	U
b)	Discuss propositional logic and its use in AI for theorem proving.	5	AN
c)	Describe the different forms of communication and argumentation among agents.	5	AN
d)	Describe the role of argumentation among intelligent agents. Discuss how communication and negotiation among agents enhance their problem-solvingcapabilities.	5	U

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TRICHY-10

Year: III Term : VI		**Model Question Paper**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
Course Code	**4G236112**	**Course Name**	**ENTREPRENERSHIP**

	PART-A (10 X 2 = 20 marks) **Answer any 2 questions from 1,2, 3,4**	**Unit**	**Bloom's Level**
1.	What is entrepreneurship?	1	R
2.	List two pros and cons of being an entrepreneur.	1	U
3.	Define ethical entrepreneurship.	1	U
4.	What are the key competencies of a successful entrepreneur?	1	U
Answer any 2 questions from 5,6,7,8			
5.	What are the three main types of businesses?	2	R
6.	Define Intellectual Property Rights (IPR).	2	U
7.	What is SWOT analysis?	2	U
8.	Define e-commerce business models.	2	U
Answer any 2 questions from 9,10,11,12			
9.	What is the role of financial institutions in supporting Entrepreneurs?	3	R
10.	Name two incentive schemes provided by the central governmentFor entrepreneurs.	3	R
11.	How does government policy influence entrepreneurship?	3	AN
12	Define venture capital and its significance for startups.	3	U
Answer any 2 questions from 13,14,15,16			
13.	What is a fixed cost? Give an example.	4	R
14.	Define Break Even Analysis.	4	U
15.	What does cash inflow and cash outflow mean?	4	R
16.	Define operational costs and provide an example.	4	U
Answer any 2 questions from 17,18,19,20			
17.	What is a feasibility report?	5	U
18.	Why is market research important for a business?	5	U
19.	What is digital marketing?	5	U
20.	What are the key components of a business plan?	5	U

PART-B (5 X 16 = 80marks) Note : 1)Answer all the questions by choosing any 2 subdivision fromeach question 2) Each question carries 8 Marks		Unit	Bloom's Level
21.a)	Explain the process of entrepreneurship with its key stages.	1	U
b)	Discuss the characteristics and competencies of a successful entrepreneur.	1	AN
c)	Compare the mindset of an employee with that of an entrepreneur.	1	AN
d)	Analyze the role of creativity and innovation in entrepreneurship and How they contribute to problem-solving.	1	AN
22.a)	Explain the differences between a business idea and a business opportunity.	2	U
b)	Describe the main causes of business failure and suggest possible remedies.	2	AN
c)	Discuss how to conduct a SWOT analysis for a new business idea.	2	AN
d)	Discuss the significance of customer relations and vendor management in the success of a business.	2	AN
23.a)	Explain how to perform a Break Even Analysis for a single product.	3	U
b)	Describe the factors that affect the pricing of a product.	3	AN
c)	Discuss the importance of preparing an income statement and cash flow projection.	3	AN
d)	Evaluate the role of financial institutions in the growth of entrepreneurialventures.	3	E
24.a)	Explain how to perform a Break Even Analysis for a single product.	4	U
b)	Describe the factors that affect the pricing of a product.	4	AN
c)	Discuss the importance of preparing an income statement and cash flow projection.	4	AN
d)	Analyze the impact of GST (Goods and Services Tax) on pricing and profitability of businesses.	4	AN
25.a)	Explain the process of preparing a business plan and its key components.	5	U
b)	Describe the steps involved in conducting market research for a new business.	5	AN
c)	Discuss the importance of branding, including business name, logo, and promotion strategy.	5	AN
d)	Examine the role of digital marketing in modern business planning.	5	AN

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TRICHY-10

Year: III Term : VI		**Model Question Paper**	**Duration: 3Hrs**
Date:		**SESSION:**	**Max.marks:100**
Programme		**COMPUTER ENGINERING**	
CourseCode	**4G236115**	**CourseName**	**5G TECHNOLOGY**

	PART-A (10 X 2 = 20 marks) **Answer any 2 questions from 1,2, 3,4**	**Unit**	**Bloom's Level**
1.	What are the key features of 5G networks?	1	R
2.	How is 5G different from 4G in terms of speed and latency?	1	U
3.	What is the role of AI in enhancing 5G capabilities?	1	R
4.	What are the frequency ranges used in 5G networks?	1	U
Answer any 2 questions from 5,6,7,8			
5.	What is OFDM, and why is it important in 5G?	2	R
6.	What are the advantages of using MIMO in 5G networks?	2	R
7.	Define small cell deployment in 5G.	2	U
8	What are heterogeneous networks (HetNets) in 5G?	2	U
Answer any 2 questions from 9,10,11,12			
9.	What is network slicing in 5G?	3	R
10.	Define the Service-Based Architecture (SBA) in 5G core networks.	3	U
11.	What is the purpose of edge computing in 5G?	3	R
12.	What is the role of NFV (Network Functions Virtualization) in 5Gcore networks?	3	U
Answer any 2 questions from 13,14,15,16			
13.	What is the NR (New Radio) air interface in 5G?	4	R
14.	What is the role of 3GPP in 5G standardization?	4	R
15.	Define the Control Plane and User Plane Separation (CUPS) in 5G.	4	U
16.	Define the PHY layer in the context of 5G.	4	U
Answer any 2 questions from 17,18,19,20			
17.	What is V2X communication in 5G?	5	R
18.	Define IoT in the context of 5G.	5	U
19.	What are the security challenges in 5G networks?	5	R
20.	How does 5G support machine-to-machine (M2M) communication?	5	U

PART-B (5 X 16 = 80marks) Note : 1)Answer all the questions by choosing any 2 subdivision fromeach question 2) Each question carries 8 Marks		Unit	Bloom's Level
21.a)	Explain the evolution of wireless communication systems from 1G to 5G.	1	U
b)	Discuss the importance of network latency in 5G and how it affects performance.	1	AN
c)	Describe the 5G network architecture and its main elements	1	AN
d)	What are the functionalities of 5G-enabled devices, and how do they differ from 4G devices?	1	U
22.a)	Explain the different multiple access techniques (FDMA, TDMA, CDMA) used in wireless communication.	2	U
b)	Describe the role of beamforming techniques in 5G.	2	AN
c)	What is heterogeneous network (HetNet) architecture, and how is it used in 5G?	2	U
d)	Explain the concept of multiple-input multiple-output (MIMO) and its significance in 5G.	2	U
23.a)	Describe the evolution of core network architecture from 4G to 5G.	3	AN
b)	Explain the concepts of NFV and SDN in 5G networks.	3	U
c)	Discuss the importance of mobile edge computing (MEC) in 5G.	3	AN
d)	What is the significance of Control Plane and User Plane Separation (CUPS) in 5G core networks?	3	U
24.a)	Provide an overview of the 5G protocol stack and its main layers.	4	U
b)	Explain the signaling procedures and message flows in 5G networks.	4	U
c)	Discuss how 5G networks coexist and interwork with legacy networks like LTE and Wi-Fi.	4	AN
d)	What are the differences between 5G NR and LTE air interfaces?	4	U
25.a)	Describe the applications of 5G in smart transportation systems.	5	AN
b)	Explain the role of 5G in supporting AR and VR applications.	5	U
c)	Discuss the future trends and challenges in 5G technology development.	5	AN
d)	What are the key network security and privacy considerations in 5G networks?	5	U