DIPLOMA

IN

COMPUTER ENGINEERING

SYLLABUS

H- SCHEME

WITH EFFECT FROM JUNE 2025

175, DR.DHARMAMBAL GOVERNMENT POLYTECHNIC COLLEGE FOR WOMEN (AUTONOMOUS), THARAMANI, CHENNAI

Table of Contents

1	**Preamble**	1
2	**Structure of the Programme**	2
3	**Academic and Curriculum Flexibility**	11
4	**Integrated Learning Experience**	14
5	**Duration of the Programme**	17
6	**Attendance Requirements**	17
7	**Class committee**	18
8	**Assessment and Examinations**	20
9	**Pass requirement of award of Diploma**	21
10	**Award of grades**	22
11	**Award of Diploma**	24
12	**Classifications of Diploma awarded**	24
13	**Discipline**	25
14	**Revision of Regulation, Curriculum and Syllabi**	26

1. Preamble

Dr. Dharmambal Government Polytechnic College for Women, Chennai-113, was established in 1962. As many as 10 (Ten) diploma programmes are offered in this polytechnic college. Semester system is followed during the entire course of study. This institution contributes significantly to the state's talent pipeline, and it was initially started with the primary objective of producing women skilled technicians to support mass industrialization.

Today there is an evolving 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 institution envisions reimagining and redefining the diploma programme to make it relevant for the ever-changing economic, industrial, and regulatory landscapes of the new era. 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 programme is modelled to incorporate all these areas.

The challenges of the 21st century demand young women diploma Engineers/Architects to have a command over 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.

The rapid adoption of Advanced Technologies is changing the nature of work today. Technologies such as **advanced robotics, knowledge work automation, the internet of things, cloud computing, autonomous & near-autonomous vehicles, next-generation genomics, energy storage, 3D printing, advanced materials, additive manufacturing and renewable energy** are changing industries in an unprecedented manner. These technologies are making companies become leaner and more productive and also pave the way for future technologies to be invented. This makes companies constantly look for talent that can fit into the dynamic technological environment.

The objective of the new applied-to-learn track is to train a pool of graduates who are technically competent, professionally proficient and socially responsible in quality management, regulatory compliance and manufacturing processes in the respective sectors. This is followed by an iterative process of developing the learning outcomes, aligning the learning outcomes, designing the learning activities and applying the assessment methods of the modules offered on this track in an integrated manner to meet the industry's needs.

The programme 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 the diversified needs, dynamic contexts, and differentiated expectations in a learner-centric

environment. The crux of this programme lies in the way experiential learning, divergent thinking, problem-solving creativity and so on are integrated into one.

1 (a) - Objective

To retain and further strengthen the quality of the human capital produced by our institution at the diploma level as the force behind the state's social, cultural, and economic pre- eminence.

1 (b) - Admission

Candidates seeking admission to the first semester of the Diploma programme 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.

1 (c) - 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 programmes, 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.

1 (d) - Age limit:

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

1 (e) - Medium of Instruction:

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

2. Structure of the Programme

The redesigning and revamp of the Diploma programme in this institution 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.

2 (a) - Pathways for Progressive Learning Experience

The programme 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.

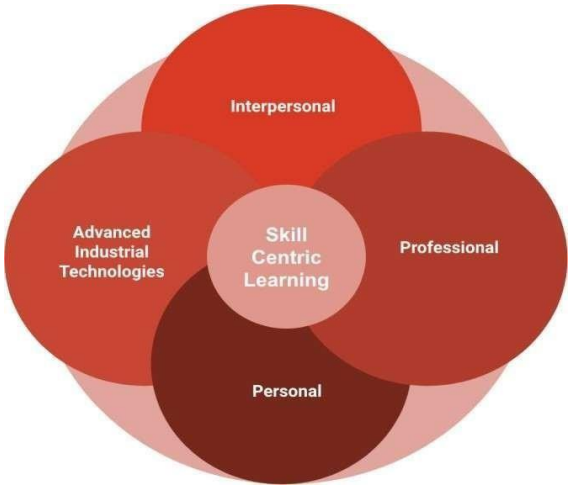
- **Entrepreneur:**
  Students who aspire to transform opportunity into reality, create social and economic value for themselves and for others.
- **Higher Education:**
  Students with aspirations of pursuing higher education to acquire higher-order skills and competencies in the domain of interest.
- **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.

2 (b) - 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 programme 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.



2 (c) - 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 programme. 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 programmes consist of various levels of courses, structured as Foundation (F), Concentration (C) and the 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 (C) | Year II:** Concentration courses shall deliver domain-specific knowledge and technological skills. They are offered as core and electives to provide the requisite mandatory working knowledge of the chosen domain.

- **Specialisation (S) | Year III:** Specialization courses are focused on a particular area of study leading to a specific pathway. Some of the courses can also be beyond the programme, leading to skills and competencies in emerging technology domains.

Course Types

Every diploma programme shall have a curriculum with syllabi comprising Theory, Practicum and Practical courses with well-defined Programme 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 programme shall have a distinct curriculum with syllabi consisting of courses broadly categorized under:

- **Core (C)/Elective (E)** - Core / Elective courses are offered to students of a particular programme to gain basic and specialized knowledge/skills in a selected field. Core courses are mandatory to complete the programme and shall not be exempted or provided with credit equivalence. Elective Courses may be grouped into different domains / streams / specialisations to enable the students to have at least 3 to 5 options. At least 20 students need to express their willingness, for the case of an elective course, to be offered.

- **Practicum (P) -** Integrated course taught in a hands-on learning environment. This may be offered wherever theoretical concepts are to be learned simultaneously with relevant practical sessions. Such courses shall be offered only if sufficient laboratory facilities are available to conduct such courses, and both laboratory and theory components shall be considered for continuous assessment. Final evaluation based on the proportion of the credit awarded for the respective component.

- **Lab (L) -** Practical Courses taught in a designated lab. This may be offered when conceptual learning has to be augmented by practical experiments and also to bring focus on acquiring skills through doing. Such courses shall be offered only if sufficient laboratory facilities are available to conduct such courses.

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

- **Certification (Cer)** - Industry-driven course shall be offered, jointly with an industry that would result in learning the emerging trends / employment potential topics / solving real-time problems. The contents of the course shall be jointly designed by an industry expert and a suitable faculty member, with relevant assessment and evaluation. Hybrid / Online learning options shall be available. Students are permitted to complete these courses through MOOCs / Professional Certification and credit equivalence (Programme Elective or Open Elective), to maximum of 6 credits.
- **In-House Projects (J)** - Capstone Project shall be offered once a student completes >95% of the core courses related to the Diploma programme. 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 by the students from the relevant Department for successful completion. Capstone Project may be offered in phases, i.e. Phase I and Phase II (single topic or two different topics). Students are encouraged to submit the softcopy of the complete report for evaluation and abstract in the printed form during the final presentation.

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

- **Boot Camp (B) -** 2 to 5 days 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 programme. 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 programme or may re-do the same course whenever offered.

- **Hackathon (H) -** 3 to 6 days of problem-solving and building a solution for real-world problems in an intensive / accelerated manner. It may be considered as one of the course types in situations where multiple solutions are expected to a problem or multiple problems are expected to be solved, in a particular industry / research laboratory. Such a course shall be essentially a Practicum and may be offered in a workshop mode. Credit allocation, Assessment and Evaluation shall be based on the respective syllabi designed for the same.

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

- **Audit Courses** are optionally registered by a student to understand certain basic / advanced concepts in his / her own discipline or other disciplines offered by the college. In this case, if a student 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".

2 (d) 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

2 (e) - Curriculum Structure

Every programme shall have a distinct curriculum with syllabi consisting of courses broadly categorized under Basic Sciences, Basic Engineering, Professional Core, Programme 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 Board of Studies.

Category	**Credit Range**
Humanities and Social Sciences	11
Basic Science Courses	17-20
Engineering Sciences	6-13
Programme Core	40-51
Programme Elective	9-12
Open Elective	10
Industrial Training / Project Work	14
Audit Course	0

Integrated Learning Experiences	
Induction Programme	Non-Credits Course
I&E / Club Activity / Community Initiatives	Non-Credits Course
Shop Floor Immersion	Non-Credits Course
Health & Wellness	Non-Credits Course
Student-Led Initiative	Non-Credits Course
Special Interest Groups (Placement Training)	Non-Credits Course
Emerging Technology Seminars	Non-Credits Course

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

1. **Basic Sciences:** This course is common to all programmes 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 programme, which are major courses of the discipline, are required to attain desired outcomes and to ignite critical thinking skills amongst students.

4. **Programme 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 programme of study or nurtures the student's proficiency / skill.

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 programme. 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.

2 (f) - 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 organised. Effective learning outcomes are student-centred, measurable, concise, meaningful, achievable and outcome-based (rather than task-based). To identify achievable learning goals and develop plans to meet them, revised Bloom's Taxonomy framework is introduced to allow educators to assess learning on an ongoing basis, encouraging students to reflect on their progress.

All the programmes 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 Programme Outcomes (POs) of the respective programme 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 programme 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 programme. They form the Programme 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 programme 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 programme 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 programmes 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 correlation respectively. This also ensures that every PO is covered across the courses offered as a part of the programme. The matrix will be adopted for all the courses run by the department.

9. The attainment of COs of any course can be assessed from the performance of the students through continuous and final assessments. The goal of continuous assessment is to understand / realise the critical information about student comprehension throughout the learning process and provides an opportunity for the facilitator to

   improve their pedagogical approach and for students to improve learning outcomes. The goal of the final assessment is to evaluate student learning outcomes at the end of the course instruction. According to the new regulation, 40% weightage is for the continuous assessment, and 60% weightage is for the final assessment.

10. The 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 as not to have the POs themselves as direct questions.

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

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

3. 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

3 (a) - Break of Study

If a student intends to take a break / temporarily discontinue the programme 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 programme in the next academic year, student shall intimate stating the reasons.

Break of study is permitted only once during the entire period of the dipolma programme for a maximum period of one year. The student is permitted to re-join the programme after the break and shall be governed by the rules and regulations in force, at the time of re-joining. 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.

3 (b) - Course Add / Drop

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

3 (c) - 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 programme elective / open elective – Global)

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

(iii) Credits accumulated through Capsule courses, One-Credit courses

Such courses and credits earned shall be presented in the Board comprising the Principal, the Head of the department and committee member along with the Equivalent Credit(s).

3 (d) - 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 programme electives) shall be considered as "Transferred Credits" (specified in the Grade Sheet) and considered for the calculation of CGPA.

3 (e) - 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 programme. 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 / Chairman 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 programme 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.

3 (f) - Fast-Track

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

(i) 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.

3 (g) - Flexi-Credit System

It offers a student to earn additional credits than that specified (minimum credits) to a programme 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.

3 (h) - Bridge Course

This is specifically designed for Lateral Entry (LE) students who join the Diploma Programme 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 programme specific to the department concerned.

4. Integrated Learning Experience

Integrated learning experiences encompasses 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' programme of study. It prioritizes the holistic development of students, fostering their growth and well roundedness.

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

4 (a) - Innovation Track

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

4 (b) - Peer to 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, understanding of societal needs, project management and life-long learning activities.

4 (c) - Growth Lab

Growth lab plays an integral role to stimulate and develop a student's personality & skills in various fields of life. It also teaches about a growth mind-set 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.

4 (d) - 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.

4 (e) - Health & Wellness

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

4 (f) - Induction Programme

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

4 (g) - 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.

4 (h) - 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

4 (i) - 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.

4 (j) - Emerging Technology 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.

4 (k) - 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.

4.(l) - 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.

A student is ordinarily expected to complete the Diploma programme in 6 semesters (for SSLC students) and four semesters (for Lateral Entry students) but in any case, not more than 12.

5. Duration of the Programme

Semesters for SSLC (or equivalent) students and not more than 10 semesters for Lateral Entry students.

- Each semester shall normally consist of 16 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 programme 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 dipolma. The minimum and maximum period of study shall be:

Diploma programme	Min. Period	Max. Period
Full Time	3 Years	6 Years
Full Time [Lateral Entry]	2 Years	5 Years

6. Attendance Requirements

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

- Ideally every student is expected to attend all classes of all the courses and secure 100% attendance.
- However, in order to make provision for certain unavoidable reasons such as medical / participation in sports, the student is expected to attend at least 75% of the classes.

- Therefore, the student shall secure not less than 75% (after rounding off to the nearest integer) of overall attendance for each semester.

- However, a student who secures overall attendance between 65% and 74% in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) / participation in sports events may be permitted to appear for the current semester examinations, subject to the condition that the student shall submit the medical certificate / sports participation certificate attested by the Head of the Institution.

- Students who secure less than 65% overall attendance shall not be permitted to write the end semester examination and not permitted to move to the next semester. They are required to repeat the incomplete semester in the next academic year, as per the norms prescribed.
- Students 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 programme of study. For such students by default, the classification of class shall be second class on successful passing of course.

7. Class Committee

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

- Solving problems experienced by students in the classroom and in the laboratories.
  Clarifying the regulations of the diploma programme 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.

7 (a) - 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).

8. Assessment and Examination

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

8(a) 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 programmes, no end semester examination shall be conducted, and final grade will be awarded based on continuous assessment for 100 marks.

8.(b) End Semester Examination [60%]:

- The End Semester Examination will be conducted for 100 marks and shall be converted to 60 marks in the final results.
- The End Semester Examinations (Theory, Practical, Project) of three hours duration will be conducted.
- For Practicum courses, the end semester examination will be conducted as a theory or a practical or a project examination based on the credits for each component, the decision on the mode of exam could be based on the recommendation by the internal committee duly forwarded and approved by Head of the Institute.
- Every practical exercise/experiment shall be evaluated based on conduct of exercise / experiment and records to be maintained, students shall submit a record work duly completed and signed by faculty in charge and the Head of the Department.
- For the project works, the Department will constitute a three-member faculty committee to monitor the progress of the project and conduct reviews regularly.
- If the projects are done in-house, the students must obtain the bonafide certificate for project work from the project guide and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the project Viva Voce examination.
- For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular Bonafide certificate mentioned above. For Industry related projects there must be one Mentor / Supervisor from Industry (External), this is in addition to the regular faculty supervision.
- The final examination for project work will be evaluated based on the final report submitted by the project group (of not exceeding four students), and the viva voce by an external examiner.

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

Internal Mark Split (40 Marks)			End Semester (60 Marks)		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 marks)	Record / report writing (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.

9. Pass Requirement for Award of Diploma

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

(i) No Minimum marks for continuous assessment (Internal). (ii) 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, fulfill 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 getting the copy of her manuscripts of semester examination (theory course only), as per the guidelines of the Autonomous Examinations cell (AE) on payment of a prescribed fee along with prescribed application through the Head of the Institution.

A student can apply for revaluation directly or after getting the copy of her manuscripts of semester examination (theory course only), as per the guidelines of the Autonomous Examinations cell (AE) on payment of a prescribed fee along with prescribed application through respective department and the Head of the Institution.

The AE cell will arrange for the revaluation process and the results will be intimated to the student concerned through Notice Board. Revaluation is not permitted for laboratory courses and projects.

10. Award of Grades

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

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

WH (withheld)	-	-
W (Withdrawal)	-	-
ABSEN (Absent)	-	-

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: 'S', 'A', 'B', 'C', 'D', 'E'.

'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 Institution. 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 Head of the respective departments and Chairman. The grades S, A, B, C, D, E 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.

10 (a) - 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.

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

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

11. 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 programme 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 autonomous examination council whenever the student is readmitted under Regulations 2024 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 Autonomous Examinations Council.

12. Classification of Diploma Awarded

12 (a) - 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 programme

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- year period (three years in the case of lateral entry) for award of First class with Distinction.

- The students should NOT have been prevented from writing the end semester examination due to lack of attendance in any semester.

12 (b) - 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 programme shall be extended upto 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.

12.(c) - SECOND CLASS: All other students who qualify for the award of the degree shall be declared to have passed the examination in Second Class.

13. Discipline

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

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

In case of any serious disciplinary action which leads to suspension or dismissal, then a committee shall be constituted. If a student indulges in malpractice in any of the end semester examinations, student shall be liable for punitive action as prescribed by the Autonomous Examination Council 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.

14. Revision of Regulation, Curriculum and Syllabi

The Autonomous board 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.

DIPLOMA
IN

COMPUTER ENGINEERING

SYLLABUS

H- SCHEME

WITH EFFECT FROM JUNE 2025

175, DR.DHARMAMBAL GOVERNMENT POLYTECHNIC COLLEGE
FOR WOMEN (AUTONOMOUS), THARAMANI, CHENNAI

H Scheme
Program Structure

Diploma in Computer Engineering

PROGRAM OUTCOMES (POs)

POs are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, analytical ability, attitude, and behavior that students acquire through the program.

The POs essentially indicate what the students can do from subject-wise knowledge acquired by them during the program. As such, POs define the professional profile of an engineering diploma graduate.

NBA has defined the following seven POs for an Engineering diploma graduate:

PO1: Basic and Discipline-specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and an engineering specialization to solve the engineering problems.

PO2: Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.

PO3: 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.

PO4: Engineering Tools, Experimentation, and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5: Engineering practices for society, sustainability and environment: Apply appropriate technology in the context of society, sustainability, environment and ethical practices.

PO6: Project Management: Use engineering management principles individually, as a team member or as a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7: Life-long learning: Ability to analyze individual needs and engage in updating in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Incorporate mathematical skills, data structures and algorithms, database management techniques along with programming paradigms to design and develop software Applications.

PSO2: Analyze and integrate appropriate hardware and operating system for the development of computing environments and platforms.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

After three years of Diploma in Computer Engineering, the student will be able to:

PEO 1: Pursuing careers in Computer Engineering, related industries, government sector and entrepreneurship.

PEO 2: Upgrade knowledge and technical skills through higher education or professional courses.

PEO 3: Contribute to society through professional and leadership skills.

Credit Distribution

Semester	No of Courses	Periods	Credits
III Semester	7	640	20
IV Semester	7	640	22
V Semester	8	640	20
VI Semester	3	640	18
		Total	**80**

DEPARTMENT OF COMPUTER ENGINEERING

III SEMESTER

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	CRH301	Digital Logic Design Circuits	3-0-0	45	3	Theory
2	Program Core	Practicum	CRH302	RDBMS	3-0-2	75	4	Theory
3	Program Core	Practicum	CRH371	C programming	1-0-4	75	3	Practical
4	Program Core	Practicum	CRH372	Web Designing	1-0-4	75	3	Practical
5	Program Core	Practicum	CRH373	Operating Systems	1-0-2	45	2	Practical
6	Program Core	Practical/Lab	CRH374	Digital Logic Design Lab	0-0-4	60	2	Practical
7	Open Elective	Advanced Skill Certification	ASH393	Advanced Skills Certification-3	1-0-3	60	2	NA
8	Humanities & Social Science	Integrated Learning Experience		Growth Lab	0-0-2	30	0	NA
9	Audit Course	Integrated Learning Experience		Induction Program–II	-	16	0	-
10	Audit Course	Integrated Learning Experience		I&E/ Club Activity / Community Initiatives	-	15	0	-
11	Audit Course	Integrated Learning Experience		Emerging Technology Seminars	-	8	0	-
12	Audit Course	Integrated Learning Experience		Shop floor Immersion	-	8	0	-
13	Audit Course	Integrated Learning Experience		Health & Wellness	-	30	1	-
14	Audit Course	Integrated Learning Experience		Student-Led Initiative	-	23	0	-
				Test &Revision		60		
				Library		15		
				Total		**640**	**20**	

Semester IV

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	CRH401	Computer Networks and Security	3-0-0	45	3	Theory
2	Program Core	Practicum	CRH402	Data Structures Using Python	3-0-2	75	4	Theory
3	Program Core	Practicum	CRH471	Java Programming	2-0-4	90	4	Practical
4	Program Core	Practicum	CRH472	Python Programming	1-0-4	75	3	Practical
5	Program Core	Practicum	CRH473	E-Publishing Tools	1-0-4	75	3	Practical
6	Program Core	Project	CRH474	Scripting Languages	0-0-6	90	3	Practical
7	Open Elective	Advanced Skill Certification	ASH494	Advanced Skills Certification–4	1-0-3	60	2	NA
8	Audit Course	Integrated Learning Experience		I&E/Club Activity/Community Initiatives	-	15	0	-
9	Audit Course	Integrated Learning Experience		Special Interest groups *(Placement training)*	-	8	0	-
10	Audit Course	Integrated Learning Experience		Emerging technology seminars	-	8	0	-
11	Audit Course	Integrated Learning Experience		Shop Floor Immersion	-	8	0	-
12	Audit Course	Integrated Learning Experience		Health & Wellness	-	15	0	-
13	Audit Course	Integrated Learning Experience		Student-Led Initiative	-	16	0	-
				Test & Revision		45		
				Library		15		
				Total		**640**	**22**	

Semester V

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	CRH58X	Elective-1	3-0-0	45	3	Theory
2	Program Core	Practicum	CRH501	Cloud Computing	2-0-2	60	3	Theory
3	Program Elective	Practicum	CRH571	Computer Hardware and Networking	1-0-4	75	3	Practical
5	Program Elective	Practicum	CRH58X	ELECTIVE II	1-0-4	75	3	Practical
6	Program Core	Practical/Lab	CRH572	Internet of Things &Digital Twins	0-0-4	60	2	Practical
8	Humanities & Social Science	Practicum	CRH573	Innovation and startup	1-0-2	45	2	Project
9	Project/Internship	Internship	CRH574	Internship (Summer vacation - 90 hours)	-	-	2	project
10	Open Elective	Practicum	ASH595	Advanced Skills Certification - 5	1-0-3	60	2	NA
11	Audit Course	Integrated Learning Experience		I&E/Club Activity/Community Initiatives	-	15	0	-
12	Audit Course	Integrated Learning Experience		Special Interest Groups	-	30	0	-
13	Audit Course	Integrated Learning Experience		Health & Wellness	-	30	0	-
14	Audit Course	Integrated Learning Experience		Student-Led Initiative	-	24	0	-
15	Audit Course	Integrated Learning Experience		Shop floor Immersion	-	8	0	-
16	Audit Course	Integrated Learning Experience		Emerging Technology Seminars	-	8	0	-
	Test & Revision/Seminar					90		
	Library					15		
	Total					**640**	**20**	

Note: ** Internship shall be offered in the summer break between 4th and 5th semester followed by a review and award of credits in the 5th semester*

Elective 1

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	CRH581	Machine Learning	3-0-0	45	3	Theory
2	Program Elective	Theory	CRH582	Data Warehousing and Data Mining	3-0-0	45	3	Theory
3	Program Elective	Theory	CRH583	Ethical Hacking	3-0-0	45	3	Theory
4	Program Elective	Theory	CRH584	Agile Product Development	3-0-0	45	3	Theory
5	Program Elective	Theory	CRH585	Artificial Intelligence	3-0-0	45	3	Theory

Elective 2

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Practicum	CRH586	Data Analytics	1-0-4	75	3	Practical
2	Program Elective	Practicum	CRH587	Mobile Computing	1-0-4	75	3	Practical
3	Program Elective	Practicum	CRH588	Component Based Technologies	1-0-4	75	3	Practical
4	Program Elective	Practicum	CRH589	Multimedia Systems	1-0-4	75	3	Practical
5	Program Elective	Practicum	CRH58A	Full Stack Developer	1-0-4	75	3	Practical
6	Program Elective	Practicum	CRH58B	Robotic Process Automation	1-0-4	75	3	Practical

Semester VI

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Open Elective	Theory	CRH68X	Elective 3 (Pathways)	3-0-0	45	3	Theory
2	Open Elective	Practicum	CRH68X	Elective-4 (Specialization)	1-0-4	75	3	Practical
3	Project / Internship	Project	CRH67X	Internship or Industrial Training / Fellowship / In-house Project	-	540	12	Project
				TOTAL		**660**	18	

Elective 3 (Pathway)

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective | Higher Education	Theory	CRH681	Advanced Engineering Mathematics	3-0-0	45	3	Theory
2	Elective | Entrepreneurship	Theory	CRH682	Entrepreneurship	3-0-0	45	3	Theory
3	Elective | Technocrats	Theory	CRH683	Project Management	3-0-0	45	3	Theory
4	Elective | Technocrats	Theory	CRH684	Finance Fundamentals	3-0-0	45	3	Theory
5	Elective | Technologists	Theory	CRH685	5G Technology	3-0-0	45	3	Theory
6	Elective | Technologists	Theory	CRH686	DevOps	3-0-0	45	3	Theory

Elective 4 (Specialization)

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective	Practicum	CRH687	Data Science	1-0-4	75	3	Practical
2	Elective	Practicum	CRH688	Cloud Platform	1-0-4	75	3	Practical
3	Elective	Practicum	CRH689	Data Visualization	1-0-4	75	3	Practical
4	Elective	Practicum	CRH68A	Advance DBMS	1-0-4	75	3	Practical
5	Elective	Practicum	CRH68B	Mobile Application Development	1-0-4	75	3	Practical
6	Elective	Practicum	CRH68C	UI & UX Design	1-0-4	75	3	Practical

Project / Internship

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Project /Internship	Project / Internship	CRH671	In-house Project	-	540	12	Project
2	Project /Internship	Project / Internship	CRH672	Internship or Industrial Training	-	540	12	Project
3	Project /Internship	Project / Internship	CRH673	Fellowship	-	540	12	Project

ANNEXURE - 1

		Internal Assessment (40 marks)				End Examination (60 marks)
		CA1	CA2	CA3	Total	
When to be conducted		After 4 Weeks	After 10 Weeks	After 12 Weeks		
Exam Marks		30	30	20		
Converted to		15	15	10	40	60

Assessment	Mode	Portions	Duration	Exam Marks	Converted to	Mark Split-up		
						Theory		
						MCQ (1 mark)	Short answer(2 marks)	Total
CAI	Written Test	Unit I & II	2 periods	30	I5	20 marks	10 marks	30 marks
						Theorv		
						MCQ(1 mark)	Short answer(2 marks)	Total
CA2	Written Test	Unit III & IV	2 periods	30	I5	20 marks	10 marks	30 marks
						Theorv		
						MCQ(1 mark)	Short answer(2 marks)	Total
CA3	Written Test	Unit V	1 period	20	10	10 marks	10 marks	20 marks
						Theorv		
						MCO	MCO (2 marks)	Total
End Exam	Written Test	Entire Syllabus	3 Hours	60	60 (No Conversion)	40 marks	20 marks	60 marks

CONTINUOUS ASSESSMENT – 1 (CA1)
UNIT I & II

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

CONTINUOUS ASSESSMENT – 2 (CA2)
UNIT III & IV

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

CONTINUOUS ASSESSMENT – 3 (CA3)
UNIT V

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

END EXAMINATION
ENTIRE SYLLABUS (i.e. 5 UNITS)

PART - A			**Part B**			**Total Marks**
MCQ Questions (Understand, Apply levels)			**MCQ Questions (Apply, Analyze, Evaluate and Create levels)**			
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	
40	1	40	10	2	20	**60**
• 8 questions from the unit • All questions are compulsory			• 3 questions from each unit. • Out of 15 questions, 10 questions to be answered			

ANNEXURE – II

	Internal Assessment (40 marks)				End Examination (60 marks)
	CA1	CA2	CA3	Total	
When to be conducted	After 4 Weeks	After 10 Weeks	After 12 Weeks	40	60
Exam Marks	50	50	25		
Converted to	15	15	10		

Assessment	Mode	Portions	Duration	Exam Marks	Converted to	Mark Split-up				
CA1	Integrated Test (Theory + Practical)	Unit I & II	2 periods	50	15	Theory				Practical
						MCQ	2 mark Questions	3 mark Questions	Total	1 Task
						10 marks	8 marks	12 marks	30 marks	20 marks
CA2	Integrated Test (Theory + Practical)	Unit III & IV	2 periods	50	15	Theory				Practical
						MCQ	2 mark Questions	3 mark Questions	Total	1 Task
						10 marks	8 marks	12 marks	30 marks	20 marks
CA3	Integrated Test (Theory + Practical)	Unit V	1 period	25	10	Theory				Practical
						MCQ	2 mark Questions	3 mark Questions	Total	1 Task
						5 marks	4 marks	6 marks	15 marks	10 marks
End Exam	Integrated Final Examination (Theory + Practical)	Entire Syllabus	3 Hours	100	60	Theory				Practical
						MCQ	2 mark Questions	3 mark Questions	Total	1 Task
						25 marks	10 marks	15 marks	50 marks	50 marks

CONTINUOUS ASSESSMENT – 1 (CA1)
UNIT I & II

PART - A			PART – B			PART – C			PART – D	Total Marks
MCQ Questions			Short Answer Questions			Long Answer Questions			Practical Activity	
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks		
10	1	10	4	2	8	4	3	12	20 marks	50
• 5 questions from each unit • All questions are compulsory			• 2 questions from each unit • All questions are compulsory			• 4 questions from each unit • Out of 8 questions, 4 questions to be answered by selecting two questions from each unit			• Lab activity • Demonstration • Execution • Viva-voce	

CONTINUOUS ASSESSMENT – 2(CA2)
UNIT III & IV

PART - A			PART – B			PART – C			PART – D	Total Marks
MCQ Questions			Short Answer Questions			Long Answer Questions			Practical Activity	
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks		
10	1	10	4	2	8	4	3	12	20 marks	50
• 5 questions from each unit • All questions are compulsory			• 2 questions from each unit • All questions are compulsory			• 4 questions from each unit • Out of 8 questions, 4 questions to be answered by selecting two questions from each unit			• Lab activity • Demonstration • Execution • Viva-voce	

CONTINUOUS ASSESSMENT – 3 (CA3)
UNIT V

PART - A			PART – B			PART – C			PART – D	Total Marks
MCQ Questions			Short Answer Questions			Long Answer Questions			Practical Activity	
No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	No. of Questions	Marks for Each Question	Total Marks	10 marks	25
5	1	5	2	2	4	2	3	6		
• 5 questions from the unit • All questions are compulsory			• 2 question from the unit • All questions are compulsory			• 4 questions from the unit • Out of 4 questions, 2 questionto be answered			• Lab activity • Demonstration • Execution • Viva-voce	

END EXAMINATION
ENTIRE SYLLABUS (i.e. 5 UNITS)

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

Question Paper Pattern (Theory)

Course Code & Name: **Max Marks: 60**
Time: 3 Hours

PART A – Multiple Choice Questions (1 Mark Each)
(Answer All Questions) **40 × 1 = 40 Marks**

1	**2**	**3**	**4**
5	**6**	**7**	**8**
9	**10**	**11**	**12**
13	**14**	**15**	**16**
17	**18**	**19**	**20**
21	**22**	**23**	**24**
25	**26**	**27**	**28**
29	**30**	**31**	**32**
33	**34**	**35**	**36**
37	**38**	**39**	**40**

PART B – Short Answer Questions (2 Marks Each)
(Answer All Questions) **10 × 2 = 20 Marks**

41
42
43
44
45
46
47
48
49
50

SEMESTER 3

CRH301	DIGITAL LOGIC DESIGN	L	T	P	C
Theory		3	0	0	3

Introduction:

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

Course Objectives:

The objective of this course is to enable the students to

1. Provide comprehensive understanding of digital systems and their fundamental components, applications.
2. Simplify and optimize digital logic circuits while gaining practical insights into its applications through Boolean algebra.
3. Learn how to design sequential logic circuits using various components and techniques.
4. Learn about digital sensor interfaces and their role in digital systems.
5. Understand the principles and operation of various Analog-to-Digital Converters (ADC) and Digital-to-Analog Converters (DAC).
6. Gain knowledge of different types of memory and their characteristics.
7. Understand Programmable Logic Devices (PLDs) and their applications in digital system design.
8. 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: Design logic circuits using basic logic gates and universal gates by applying binary codes.

CO2: Simplification of logic functions by using Boolean algebra and Karnaugh Maps.

CO3: Design and analyze combinational logic circuits.

CO4: Create sustainable logic circuits using gates and digital logic concepts.

CO5: plan, design, and implement application oriented digital electronic circuits and present as seminar.

Pre-requisites: Nil

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	3
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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, 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.

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 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.

CRH301	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 and NVRAM, 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

- Collect the information about the different types of display devices used in digital circuits and carry out a seminar.
- Prepare a note on E-waste and disposal of PCBs and ICs, carry out a seminar.
- 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.
- Provide industrial sensor datasheets or specifications for commonly used sensors in manufacturing processes (e.g., temperature sensors, pressure sensors, proximity sensors).
- Ask students to design and implement digital sensor interfaces or ADC/DAC circuits to interface with these sensors and provide digital or analog measurements.
- 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 platforms commonly used in industrial automation.

- 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 interest of the students.

Text Books:

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

Web-based/Online Resources:

- https://nptel.ac.in/
- https://www.nptelvideos.com/course.php?id=562
- http://www.vlab.co.in

CRH302	RDBMS	L	T	P	C
Practicum		**3**	**0**	**2**	**4**

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 or redundancy 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**:** Apply relational database concepts including tables, keys, and constraints to design structured databases using MySQL.

CO2: Analyze data using SQL queries with WHERE, GROUP BY, HAVING, and sub-queries to solve real-world data problems.

CO3: Design the database using views, joins, indexes, and sequences in MySQL.

CO4: Create and manage databases and tables using MySQL Workbench and command line tools, including backup and restore operations.

CO5: Plan, design, and execute a database project using MySQL

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

CRH302	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 – Pattern Matching- 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 and employee with the fields as you like. Ex No 4: create a table 'student' with marks field for 10 students. Apply built in functions to do calculations.		**6**
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 some transactions 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 PERFORMANCE 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. Union types : union , Union All, Union Distinct- order by and limit handling **User and transaction management :** Creating – deleting – renaming users grant 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 and deleting 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 PERIODS	**75**

TEXT BOOKS

1. Adam Aspin, Querying MySQL: Make your MySQL database analytics accessible with SQL operations, data extraction, and custom queries, 1st Edition, BPB Publication ,2022
2. Vikram Vaswani, MySQL: The Complete Reference (Osborne Complete Reference Series), 1st edition, McGraw Hill Education,2017
3. George Reese, MySQL Pocket Reference, 2nd Edition, O'Reilly Media 2007
4. 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 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 - 30 Nos
- Printer – 1 No

2. Software Requirement:

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

CRH374	DIGITAL LOGIC DESIGN LAB	L	T	P	C
Practical		**0**	**0**	**4**	**2**

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

1. To familiarize students with digital logic devices and circuits about logic gates.
2. To enable students to understand the concepts on decoder and encoder.
3. To provide hands-on experience about the flip flops
4. To introduce students to understand about counters.
5. To develop students' skills in designing and troubleshooting digital circuits through simulation and practical experimentation.

Course Outcomes

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

CO1: Apply logical gate principles to construct and verify truth tables for basic logic gates

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

CO3: Design digital interfaces for LED, motor; DAC/ADC connection.

CO4: To design, test, and analyze digital circuits using digital simulation tools and hardware kits

CO5: Plan, design and simulate the functionality of digital logic circuits as mini-project.

Pre-requisites :

- Students should have knowledge of basic logic gate operations, Boolean algebra, and digital circuit design principles.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	**3**	-	-	-	-	-	-	-	2
CO2	-	**3**	-	-	-	-	-		
CO3	-	-	**2**	-	-	-	-		
CO4	-	-	-	**2**	-	-	-		
CO5	-	-	-	-	-	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 to material 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.

Assessment Methodology

	Continuous Assessment (40 marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Practical Document	Practical Test	Practical Examination
Portion	Part A Exercises	Part B Exercises	All Exercises	All Exercises	All Exercises
Duration	2 Periods	2 Periods	Regularly	3 Hours	3 Hours
Exam Marks	50	50	Each Practical 10 Marks	100	100
Converted to	10	10	10	20	60
Marks	10		10	20	60
Internal Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

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

Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Circuit diagram	35
2	Execution and Result	15
TOTAL		50

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

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

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

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH374	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 demultiplexer	
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 the 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:

- 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.
- 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.
- 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.
- 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 seminar to raise awareness about E-waste management practices.
- Design and simulate the functionality of a simple logic circuit using a modern software tool such as Logisim, Proteus, or LTspice.

Execution Guidelines:

- Limit each batch to a maximum of three students per activity.
- Assign activity No. 5 (logic circuit simulation) as mandatory for all batches.
- Assign any one activity from Nos. 1 to 5 or propose similar activities based on student interest and teacher discretion.

Textbook:

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

Web-based/Online Resources

- 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:

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

BOARD 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 the 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 the decade counter.
9. Design a 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**

CRH371	C PROGRAMMING	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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

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

Course Outcomes

At the end of the course, students will be able

CO1: Apply structured programming constructs to solve problems involving number generation, pattern matching, and logic-based operations.

CO2: Analyze memory consumption for C programming constructs.

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

CO4: Apply programming tools and techniques to design, implement, and test any application.

CO5: Plan, design and execute real world applications through presentation.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

Assessment Methodology

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

Note:

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

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

test as per the scheme of evaluation as below.

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

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

SCHEME OF EVALUATION

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

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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

CRH371	**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:		3			

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.		
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. User-Defined Functions: Need for Functions -Elements of User Defined Functions –Functions Types – Call by Value-Call by Reference-Passing Arrays to Functions-Recursion		3
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		12
Unit IV	**STRINGS AND POINTERS**	
Strings: Declaring and Initializing String Variables –String Built-in Functions. Pointer: Declaring, Initialization and Accessing a pointer Variable-Pointer Expressions – Pointer Arithmetic – Pointer to Pointer - Pointer to an Array.		**3**
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 9 : 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**

TEXT BOOKS

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2015.

2. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
3. E.Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill, Third Edition Edition,2012.

WEB-BASED/ONLINE RESOURCES

- 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 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

Hardware(s) Requirement:

- Desktop / Laptop – 30 Nos
- Printer – 1 No

Software(s) Requirement:

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

BOARD 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 preprocessing directory 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 the 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 a pointer to an array.
9. Write a C program to collect and print students details like name, marks, etc. and then calculate total and average marks 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

CRH372	**WEB DESIGNING**	**L**	**T**	**P**	**C**

Practicum		**1**	**0**	**4**	**3**

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 various aspects of web design through basic coding languages such as HTML, CSS and client-side scripting language like JavaScript.

Course Objectives:

1. Learn the syntax, structure, and basic elements of HTML, including tags, attributes, and semantic markup.
2. Gain proficiency in creating and organizing content using HTML elements such as headings, paragraphs, lists, and links and media elements.
3. Explore CSS syntax, selectors, properties, and values for styling HTML elements.
4. Learn how to apply CSS styling to text, backgrounds, borders, and other page elements.
5. Understand the role and importance of client-side scripting in web development.
6. Gain proficiency in JavaScript syntax, data types, and operators.
7. Learn how to manipulate the Document Object Model (DOM) using JavaScript.
8. Explore various techniques for handling user interactions and events on web pages.
9. 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: Apply Html tags and style sheets to design web pages.

CO2: Analyze the structure and layout of a web page to effectively organize content using HTML layout tags and CSS properties like borders, margins, and backgrounds.

CO3: Design dynamic web pages using java script.

CO4: Use modern web development tools and frameworks to design, implement, and test responsive web applications

CO5: Plan, design and create web page for any real time application and present it through seminar.

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

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	1		

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

Instructional Strategy:

- 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.
- Conduct interactive demos to help students learn specific techniques and tools. Provide step-by-step guidance and encourage questions and participation.
- 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.

Assessment Methodology:

<table>
<tr><td></td><td colspan="4">Continuous Assessment (40 marks)</td><td rowspan="2">End Semester Examination (60 marks)</td></tr>
<tr><td></td><td>CA1</td><td>CA2</td><td>CA3</td><td>CA4</td></tr>
<tr><td>Mode</td><td>Practical Test</td><td>Practical Test</td><td>Written Test Theory</td><td>Practical Test</td><td>Practical Examination</td></tr>
<tr><td>Portion</td><td>PART A Exercises</td><td>PART B Exercises</td><td>All Units</td><td>All Exercises</td><td>All Exercises</td></tr>
<tr><td>Duration</td><td>2 Periods</td><td>2 Periods</td><td>3 Hours</td><td>3 Hours</td><td>3 Hours</td></tr>
<tr><td>Exam Marks</td><td>60</td><td>60</td><td>100</td><td>100</td><td>100</td></tr>
<tr><td>Converted to Marks</td><td>10</td><td>10</td><td>15</td><td>15</td><td>60</td></tr>
<tr><td>Marks</td><td colspan="2">10</td><td>15</td><td>15</td><td rowspan="2">60</td></tr>
<tr><td>Internal Marks</td><td colspan="4">40</td></tr>
<tr><td>Tentative Schedule</td><td>7th Week</td><td>14th Week</td><td>15th Week</td><td>16th Week</td><td></td></tr>
</table>

Note:

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

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

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

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

SCHEME OF EVALUATION

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

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF VALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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

CRH372	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
Ex.No.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)**	**6**
Ex.No 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. CSS background properties- Border properties- margin properties- padding properties- height, width properties- CSS Text properties- CSS Fonts properties	**4**
Ex.No.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**
Ex.No.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**
Ex.No.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**
Ex.No.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**
Ex.No.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**
Ex.No.8. Write a JavaScript program to change the color of a web page to the color typed by the user in the text box. **(DOM)**	**6**
Ex.No.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 two text boxes, buttons for operations and display the result in the third text box. **(Event Handling)**	**6**
Ex.No.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:

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

Website Links 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.

BOARD 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 page describing the components of computers. **(Images and link tags)**
4. Develop a web page using CSS to create a timetable for the class using different border style. **(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. (Do not 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 the user in the text box**. (DOM)**
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 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 button and perform form validation such as username must not be less than 8 characters, mail id should contain @ symbol, password andretype 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

CRH373	OPERATING SYSTEMS	L	T	P	C
Practicum		**1**	**0**	**2**	**2**

Introduction

Students have to be conversant with the 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 with requests 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

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

Course Outcomes

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

CO1: Apply the knowledge of different classes and structure of operating system and requirement of system protection.

CO2: Analyze the scheduling, page replacement policies for the process requirement, memory management in an operating system.

CO3: design and develop shell scripts to automate tasks involving arithmetic operations, string manipulations, and file operations.

CO4: Ability to conduct experiments on file system.

CO5: Plan, Design and implement process scheduling algorithms through presentation (seminar).

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	3
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

Assessment Methodology

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

Note:

CA1 and CA2: All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test.

The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

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

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

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

SCHEME OF EVALUATION

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

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below.

After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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

CRH373	OPERATING SYSTEMS	L	T	P	C
Practicum		**1**	**0**	**2**	**2**
PART A	**INTRODUCTION TO OS**				
Introduction to operating system: Basics of Operating system- types of operating system- operating system services – operating system structures – Process Management – Process scheduling Process synchronization, critical section, Deadlocks. Memory Management : swapping, Contiguous memory allocation, paging, Virtual Memory , Page Replacement Algorithms. 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					8
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 grep, egrep, fgrep, write and wall					15
PART B	**SHELL SCRIPTS**				
File operations (New, Open, Close, Save, Save and Exit, Print) – Text Editing operations (inserting ,deleting ,finding, replacing, copying and moving)- 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 .					7
Ex No 5: Write a shell script that accepts a numerical value N and finds the sum. Ex No 6: Write a shell script to find the factorial of the given number. Ex No 7: Write a shell script to perform an arithmetic calculator using a case statement. Ex No 8: Write a shell script using command line arguments and reports on whether it is a directory, file or something else.					15
TOTAL HOURS					**45**

TEXT BOOKS:

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

WEB REFERENCES:

- 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 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 – 30 Nos
   - Printer – 1 No

2. Software Requirement:
   - Linux Operating System

BOARD 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, grep , egrep, fgrep, write and wall

PART – B

Ex No 5: Write a shell script that accepts a numerical value N and finds the sum .

Ex No 6: Write a shell script to find the factorial of the given number .

Ex No 7: Write a shell script to perform an arithmetic calculator using a case.

Ex No 8: Write a shell script using command line arguments and reports on whether it is a directory, file or something else.

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

SEMESTER 4

CRH401	Computer Networks and Security	L	T	P	C
Theory		3	0	0	3

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, Inter-networking technology/protocols and Computer Security is covered and this will help to 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

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

Course Outcomes

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

CO1: Apply the foundational concepts of data communication, network models, addressing techniques, security principles, and threat mechanisms to basic networking scenarios.

CO2: Analyze the functions and interactions of network components, communication Models, IP schemes, and security layers across modern networking systems.

CO3: Evaluate network configurations by integrating topology design, protocol selection, addressing strategies, encryption standards, and threat detection mechanisms.

CO4: Create sustainable and energy efficient network designs incorporating data flow, and cryptographic solutions,

CO5: Analyze common network attacks, security tools and present as seminar.

Pre-requisites: Nil

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	2
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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.
- 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.

CRH401	Computer Networks and Security	L	T	P	C
Theory		3	0	0	3

Unit I	**DATA COMMUNICATIONS**	
Data Communication: Components of a data communication– Data flow: Simplex - Half duplex - Full duplex; Networks- Network Criteria – Types of Connections: Point to Point – Multipoint; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology. **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;		9
Unit II	**OSI MODEL AND 802.X PRTOCOLS**	
Network Models: OSI Model – Layered Architecture – Function of Layers – TCP/IP Protocol 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		9
Unit III	**NETWORK,TRANSPORT AND APPLICATION LAYER PROTOCOLS**	
Network Layer Protocol: IP – Interior Gateway Protocols: ARP, RARP (concepts only) IP Addressing: Dotted Decimal Notation – Subnetting and Supernetting – Ipv4 – Ipv6 **Overview of TCP/IP -** Transport Layer Protocols: Stop and wait protocol-Connection Oriented and Connectionless Service – Sockets – TCP and UDP **Application Layer Protocols:** FTP – HTTP – Telnet		9
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 – Bad Passwords – 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**

Text Books and References

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

- https://www.pynetlabs.com/network-devices-and-its-various-types/
- https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket-services
- 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 Assessments conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

CRH402	Data Structures Using Python	L	T	P	C
Practicum		3	0	2	4

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:Apply fundamental concepts of data structures including their classification, abstract data types, and analyze time and space complexities;

CO2: Analyze the operations and behavior of both linear (linked lists, stacks, queues) and non-linear (trees) data structures.

CO3: Evaluate the efficiency of various data structures, different sorting and searching techniques.

CO4: Create python-based solutions by implementing operations on abstract, linear, non-linear data structures, sorting and searching techniques using modern editors.

CO5: Present applications of data structures through seminars.

Pre-requisites : Knowledge in C and python programming.

CO / PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

CRH402	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, Implementing the ADT. **Algorithm Analysis** – space complexity, time complexity, Asymptomatic notations: Big-O notation.		**9**
Ex No 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 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 (concepts only)		**10**
Ex No 3: Write a python program to implement stack **Ex No 4:** Write a python program to implement queue		**8**
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 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 6 : Write a python program to implement bubble sort **Ex No 7:** Write a python program to implement linear search **Ex No 8:** Write a python program to implement binary search		**12**
TOTAL PERIODS		**75**

Textbook

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

- https://www.pynetlabs.com/network-devices-and-its-various-types/
- https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket-services
- 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 – 30 Nos
   - Printer – 1 No

2. **Software Requirement:**
   - Windows / Linux Operating System
   - Python IDLE / Spyder.

CRH471	**JAVA PROGRAMMING**	L	T	P	C
Practicum		2	0	4	4

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

1. To understand the concepts of Object Oriented Programming.
2. To learn about the control structures, class with attributes and methods used in Java.
3. To gain knowledge of arrays and strings.
4. To understand the concept of exception handling mechanism.
5. 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

CO1: Apply knowledge of java constructs for developing different programs/applications.

CO2: Analyse the given java program to identify bugs and to write correct code.

CO3: Design java program/ applications for a given requirement.

CO4: Conduct experiment to demonstrate features of java using eclipse.

CO5: Develop a project using java for real world applications and present as seminar.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.
- **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.

Assessment Methodology

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

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH471	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 into Fahrenheit. **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		**90**

TEXT BOOKS

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

WEB BASED/ONLINE RESOURCES

- 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 – 30 Nos
   - Printer – 1 No

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

Board 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.

PART – B

5. Write a Java Program to sort 10 student names in alphabetical order using bubble sort.
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

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

CRH472	**PYTHON PROGRAMMING**	L	T	P	C
Practicum		1	0	4	3

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, 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: apply the knowledge of Python programming to develop different applications.
CO2: Analyze the given python program to identify bugs and to rectify it.
CO3: Ability to design GUI and Graphics applications for a given requirement using python programming.
CO4: Conduct practical experiments for given requirements using python.
CO5: Plan, Design and execute application using python for a given requirement and make effective Oral Presentation.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.
- **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.

Assessment Methodology

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

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH472	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, 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 (), concatenate (), where (). Arithmetic operations in NumPy, Aggregation functions in NumPy.		**4**
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.		**16**
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 and import 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**

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

1. AI Sweigart, Automate the Boring Stuff with Python, Second Edition, No Starch Press,2019.
2. Jake Vanderplas, Python Data Science Handbook, Essential tool for working with data, First Edition, O'Reilly Media, Inc,2017.

3. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy and Ipython, Wes McKinney, Second Edition, O'REILLY, 2017.

4. Python for Data Analysis: Data Wrangling with Pandas, NumPy and Ipython, Wes McKinney, O'REILLY, Third Edition,2023

Web-based/Online Resources

- NumPy : https://www.w3schools.com/python/numpy/
- File Handling in Python: https://www.geeksforgeeks.org/file-handling-python/
- Working with Excel files using Pandas: https://www.geeksforgeeks.org/working-with-excel-files-using-pandas/

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
   - Desktop Computers / Laptop – 30 Nos
   - Printer – 1 No

2. **Software Requirement:**
   - Windows / Linux Operating System
   - Python IDLE /Spyder.

BOARD 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.

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

CRH473	**E-PUBLISHING TOOLS**	L	T	P	C
Practicum		1	0	4	3

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, 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: Apply essential tools and techniques from vector drawing, page layout, and image editing, to create structured and visually appealing e-publications.

CO2: Analyze the functionalities of diverse graphic design tools including vector applications, layout software, bitmapped editors.

CO3: Design a multimedia application by utilizing vector illustrations, layout structures, image enhancements..

CO4: Create digital designs by synthesizing features from vector drawing, page layout, image editing, and web-based graphic tools.

CO5: Present e-publishing applications or digital design concepts through a seminar.

Pre-requisites

Basic Knowledge about computer and multimedia elements.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	1		

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

Instructional Strategy

- It is advised to assign assign hands-on projects to students create digital publications using e-publishing tools such as Adobe Photoshop, CorelDraw, Adobe PageMaker 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.

Assessment Methodology

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

Note:

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)
Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH473	**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**
Ex No 1: Create a business card with a logo using various text styles, rectangle tool,and ellipse tool.					**6**
Ex No 2: Design a notebook wrapper using fountain filling and pattern filling tools.					**6**
Ex No 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 Scribus- 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**
Ex No 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				
Image editing application- Opening, moving, editing, saving images- Essential Keyboards Shortcuts- Workspace- panels- Selection tools- Crop and slice tools- Colour selection and measuring tools- Text tools- Navigation tools- Retouching tools- Painting tools- Drawing tools- Customizing Toolbars- Layers - Layer Mask- Blending modes- Filters.					**4**
Ex No 5: Create a design by using various selection tools, cutting and pasting the images.					**6**
Ex No 6: Create a passport size photo by removing the background of a photo and change it to blue color.					**6**
Ex No 7: Change the image looks by applying various filters and blending modes. (any one among Pencil sketch, Water Color, Blurred Background)					**6**
Ex No 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 Canva- 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**
Ex No 9: Design a multipage document like a tri-fold brochure using various elements for the college workshop.					**5**
Ex No 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 design software)					**5**
TOTAL PERIODS					**75**

Text and Reference Books:

1. "Gary David Bouton" "CorelDraw X7: The Official Guide- 11th Edition", O'Reilly Media.
2. "Conrad Chavez, Andrew Faulkner" "Adobe photoshop classroom in a book" Adobe Press.
3. Latheefah Raji, Design with Canva: A complete guide on how to use Canva, 1st edition, 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/

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 – 30 Nos
- Laser printer – 1 No
- Scanner – 1 No

SOFTWARE REQUIREMENTS

- Any Open Source Software , GIMP , Scribus , Inkscape ,Adobe Photoshop ,CorelDraw

BOARD 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 color.
7. Change the image looks by applying various filters and blending modes. (any one among Pencil sketch, Water Color, 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 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

CRH474	**SCRIPTING LANGUAGES**	L	T	P	C
Project		0	0	6	2

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: Apply server-side scripting concepts using PHP, database integration, AJAX, and modern frameworks to develop dynamic and responsive web applications.

CO2: Analyze and implement structured web development techniques using PHP programming, database operations.

CO3: Evaluate and integrate front-end and back-end components such as PHP forms, MySQL queries, client-side scripting, and framework features to enhance web application performance.

CO4: Create functional and interactive web based applications by combining server-side logic, database connectivity, AJAX-enhanced interfaces, and framework-based development practices using web server and server side scripting tools.

CO5: Develop a project scripting-based web applications or development frameworks and make effective Oral Presentation and documentation.

Pre-requisites:- Web Designing Course

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	1		

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

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 honestly assess experiment outcomes and analyze potential sources of error in case 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

Assessment Methodology:

<table>
<tr><td rowspan="2"></td><td colspan="4">Continuous Assessment (40 marks)</td><td rowspan="2">End Semester Examination (60 marks)</td></tr>
<tr><td>CA1</td><td>CA2</td><td>CA3</td><td>CA4</td></tr>
<tr><td>Mode</td><td>Practical Test</td><td>Practical Test</td><td>Review -1</td><td>Review -2</td><td>Practical Examination</td></tr>
<tr><td>Portion</td><td>PART A Exercises</td><td>PART B Exercises</td><td>Project</td><td>Project</td><td>Project</td></tr>
<tr><td>Duration</td><td>2 hours</td><td>2 hours</td><td>2 hours</td><td>2 hours</td><td>3 hours</td></tr>
<tr><td>Exam Marks</td><td>60</td><td>60</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Converted to Marks</td><td>10</td><td>10</td><td>15</td><td>15</td><td>60</td></tr>
<tr><td>Marks</td><td colspan="2">10</td><td>15</td><td>15</td><td rowspan="2">60</td></tr>
<tr><td>Internal Marks</td><td colspan="4">40</td></tr>
<tr><td>Tentative Schedule</td><td>7th Week</td><td>10th Week</td><td>11th Week</td><td>15th Week</td><td></td></tr>
</table>

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3 and CA 4: Two reviews should be conducted, each for 50 Marks. The marks awarded should be converted to 15 Marks for the internal assessment.

The sum of both the review marks is considered for CA3. Proper records should be maintained for the two Project Reviews. Each review is evaluated as per the following guidelines:

Details of Mark allocation	Max. Marks
Presentation	20
Implementation	20
Viva Voce	10
Total	50

END SEMESTER PRACTICAL EXAMINATION:

SCHEME OF VALUATION		
S. NO	ALLOCATION	MARKS
1	Implementation / Demo	50
2	Report	30
3	Viva Voce	20
4	Total	100

CRH474	SCRIPTING LANGUAGES	L	T	P	C
Project		**0**	**0**	**6**	**2**

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.phpfile 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 XMLHttpRequest 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):

- College Management Software
- Livestock Management software
- Online Student Attendance and Biodata Management Software
- Online Employee Management Software
- Online Event Management Software
- Online Transport Management Software
- Online Library Management Software
- Online Blood Bank

- Online Shopping / Billing Software
- Online Book / Music Store

Suggested List of Students Activity:

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

Text Books:

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

Equipment / Facilities required conducting the Practical Course / Project
Hardware Required.

- Desktop / Laptop Computers – 30 Nos

Software Required.

- Apache / Httpd / Wamp/ Xamp Webserver
- MySQL
- Any Web browser

SEMESTER 5

CRH501	CLOUD COMPUTING	L	T	P	C
Practicum		**2**	**0**	**2**	**3**

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

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

Course Outcomes

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

CO1: Apply the knowledge of cloud technology to demonstrate the working principles of Cloud.

CO2: Analyse cloud services extended by various cloud providers to build a cloud.

CO3: Design cloud-based solutions and virtualized environments for well-defined technical problems

CO4: Conduct practical experiments for demonstrating the features of cloud computing Services.

CO5: Present and document current trends and issues in Cloud Computing technology.

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	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	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 necessary to achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entire class can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform a teacher guided image into several others of their own creation.

CRH501	**CLOUD COMPUTING**	**L**	**T**	**P**	**C**
Practicum		**2**	**0**	**2**	**3**
Unit I	**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 II	**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 III	**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 IV	**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 V	**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

CRH581	MACHINE LEARNING	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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, covering fundamental concepts, algorithms, and applications. It provides a set of techniques that can automatically detect patterns in data which can then be utilized for predictions and for developing models.

Course Objectives:

1. To learn the basic concepts of machine learning.
2. To gain knowledge on supervised learning concepts and their applications.
3. To understand unsupervised learning models and their applications.
4. To evaluate the algorithms based on corresponding metrics identified
5. 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: Apply fundamental Machine Learning concepts and mathematical techniques such as descriptive statistics and data transformation to implement algorithms like Linear Regression, K-Means, and Apriori for solving computing problems.

CO2: Identify and analyze data-driven problems using algorithms such as Logistic Regression, Decision Tree, and K-Nearest Neighbors, evaluate model performance with metrics like accuracy, precision, recall, while applying foundational ML concepts and data analysis techniques.

CO3: Design and develop machine learning solutions for real-world applications using Naive Bayes classification, Agglomerative Clustering, ensemble methods like Bagging and Boosting, and apply predictive modeling and data preprocessing techniques.

CO4: Explain responsible technology use, data privacy, algorithmic fairness, and sustainability through seminars on ethical considerations and environmental impacts of Machine Learning applications.

CO5: Conduct quiz for Machine Learning Techniques and models.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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 analyse potential sources of error in case of discrepancies.

CRH581	MACHINE LEARNING	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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 Machine Learning- Tools for Machine Learning.		9
TOTAL PERIODS		**45**

Textbook for Reference:

1. Ethem Alpaydin, "Introduction to Machine Learning", Fourth Edition, MIT Press ,2020.
2. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Morgan,3rd Edition, Kaufmann Publishers, 2011.
3. 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/

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

CRH582	DATA WAREHOUSING AND DATA MINING	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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 Data Mining, 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

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

Course Outcomes:

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

CO1: Apply the Concepts of data warehousing, pre-processing, classification and clustering for data extraction.

CO2: Arrive at valid predictions by analysing proximity measures, OLAP and multidimensionality.

CO3: Design and develop data-driven solutions by applying data warehouse architecture, metadata management, classification and clustering methods, including K-Means and Agglomerative clustering, and tools for implementing data mining workflows.

CO4: Explain responsible technology use, data privacy, algorithmic fairness, and sustainability through seminar on ethical considerations and environmental impacts of Machine Learning applications.

CO5: Apply Machine Learning concept to solve a problem through a quiz involving workflow, model evaluation metric, ensemble method, text mining, web mining, and time series analysis.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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.
- **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.

CRH582	DATA WAREHOUSING AND DATA MINING	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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): KNN algorithm, 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**

Textbook for Reference:

1. C.S.R.Prabhu , DATA WAREHOUSING Concepts, Techniques, Products and Applications ,Third Edition, PHI Learning,2008
2. Robert Wrembel ,Data Warehouses and OLAP Concepts, Architectures, and Solutions,1st Edition IRM Press,2007
3. Mehmed Kantardzic ,Data Mining Concepts, Models, Methods, and Algorithms2nd Edition, 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.htm

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.

CRH583	ETHICAL HACKING	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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:

The objective of this course is to enable the student to

1. Learn the fundamentals of ethical hacking principles, methodologies, and terminology, distinguishing between ethical and malicious hacking practices.
2. Learn to identify and assess vulnerabilities and weaknesses in computer systems, networks, and applications through various reconnaissance techniques.
3. Explore various hacking tools and techniques used by ethical hackers.
4. Learn network scanning and penetration testing to identify security flaws and assess the effectiveness of defense mechanisms.
5. Understand key information security concepts and their relevance to ethical hacking.
6. Explore common attack vectors and learn how to defend against them.
7. 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: Apply fundamental concepts of ethical hacking including types of hacking, reconnaissance and footprinting techniques, scanning and sniffing methods, enumeration and vulnerability assessment, and social engineering and web application security to identify security risks.

CO2:Analyze hacking phases, ethical hacking laws, fingerprinting methods, network scanning and sniffing attacks, password and malware threats, and DoS/DDoS and pen testing techniques to evaluate system vulnerabilities.

CO3:Design and implement security measures by integrating ethical hacking tools, footprinting and scanning techniques, vulnerability analysis, malware countermeasures, and strategies to prevent social engineering, DoS/DDoS, and web application attacks.

CO4: Explain ethical considerations, responsible use of hacking tools, and the impact of security breaches through seminars focusing on laws, privacy, and security awareness.

CO5:Apply ethical hacking concepts through a quiz covering reconnaissance, scanning, sniffing vulnerability analysis, social engineering, and web application security techniques.

Pre-requisites: Basic Knowledge of Computers and networking fundamentals

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	1	1		

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.

CRH583	ETHICAL HACKING	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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- Laws of the Land. Information Security Overview- CIA triad (Confidentiality, Integrity, Availability)- The Indian IT Act 2000 and Amendments to the Indian IT Act(2008).		9
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.		9
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.		7
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**

Textbook for Reference:

1. Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy, 2nd Edition, Syngress, 2013.
2. William Stallings, Lawrie Brown, Computer Security Principles and Practice, Fourth Edition, Pearson Education, 2017.
3. 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.

CRH584	AGILE PRODUCT DEVELOPMENT	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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: Apply fundamental software engineering concepts including software characteristics, SDLC models, Agile methodologies, Agile processes like Scrum and Extreme Programming, knowledge management, and requirements engineering to solve software development problems.

CO2: Analyze Agile principles, project management, team interactions, Agile documentation, knowledge evolution cycles, and quality assurance metrics to evaluate software development effectiveness and adaptability.

CO3: Design and implement Agile software solutions by integrating Agile frameworks, decision-making models, knowledge management strategies, requirements elicitation, prioritization, and quality assurance practices.

CO4: Explain ethical practices in Agile teams and the impact of Agile methodologies on software engineering through seminars focusing on team ethics, collaboration, and process improvements.

CO5: Apply Agile software engineering concepts through a quiz covering SDLC models, Agile principles, Scrum, knowledge management, requirements engineering, and quality assurance.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	1
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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.

CRH584	AGILE PRODUCT DEVELOPMENT	L	T	P	C
Theory		**3**	**0**	**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**

Textbook for Reference:

1. Roger S. Pressman, Software Engineering – A Practitioner's Approach, Seventh Edition, McGrawHill International Edition, 2010 .
2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, International Edition, Pearson.
3. 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

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

CRH585	ARTIFICIAL INTELLIGENCE	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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:

The student should be made to

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

Course Outcomes:

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

CO1: Apply AI ideas in various applications, manipulation and conversion of WFFs and adopting Uncertainty Reasoning mechanisms.

CO2:Analyze WFFs and manipulating them to handle common sense Reasoning mechanisms, Expert Systems, GA and also machine learning system.

CO3: Design and develop AI applications using agents and environments, various search algorithms, propositional logic and optimization algorithms, game playing techniques and constraint satisfaction methods, and architectures for intelligent agents with communication mechanisms.

CO4: Explain ethical considerations, sustainability, and responsible use of AI technologies through seminar discussions focusing on the impact of AI in society and environment.

CO5: Apply AI concepts through quiz activities involving agent architectures, search algorithms, knowledge representation, game playing, constraint satisfaction problems, and intelligent agent communication.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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.
- **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.

CRH585	ARTIFICIAL INTELLIGENCE	L	T	P	C
Theory		**3**	**0**	**0**	**3**
Unit I	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**				
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					9
Unit II	**PROBLEM SOLVING USING SEARCH TEHNIQUES**				
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					9
Unit III	**KNOWLEDGE REPRESENTATION AND OPTIMIZATION TECHNIQUES**				
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					9
Unit IV	**GAME PLAYING AND CONSTRAINT SATISFACTION PROBLEMS**				
Game Theory: The Mini-Max search – Alpha-Beta Search- Introduction to CSPs Constraint Networks - Binary and Non-Binary Constraints –Constraint Propagation –Backtracking Search for CSP–Local Search for CSP–Structure of CSP.					9
Unit V	**INTELLIGENT AGENTS**				
Knowledge-Based Agents –Propositional Logic – Propositional Theorem Proving – Propositional Model Checking – Agents Based on Propositional Logic. Architecture for Intelligent Agents—Agent communication— Argumentation among Agents.					9
TOTAL PERIODS					**45**

Textbook for Reference:

1. Stuart Russel, Peter Norvig, Artificial intelligence, A modern Approach, 2nd edition , Prentice Hall,2007
2. Rich, Kevin Knight, Shiv Shankar B Nair , Artificial Intelligence, 3rd Edition, , TMH ,2009
3. 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 in Software Development.
- Blended learning activities to explore the recent trends and developments in the field.
- Periodic class Assessments conducted based on the course.

CRH572	INTERNET OF THINGS AND DIGITAL TWINS	L	T	P	C
Practical		**0**	**0**	**4**	**2**

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 student should be made 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:

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

CO1: Apply various protocols, device discovery and cloud services in resource constraint network for IoT applications

CO2: Analyse the various IoT architectural components.

CO3: Develop IOT systems using with Arduino development board by interfacing sensors, communication modules and actuators

CO4: Conduct experiments to demonstrate the working of sensors, actuators, communication modules using Arduino IDE.

CO5: Perform in a team to design and develop IoT applications that address various real time Problems as mini project.

Pre-requisites: The student should have taken up Computer Networks .

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	3
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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 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.

Assessment Methodology

	Continuous Assessment (40 marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Practical Document	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Exercises	All Exercises	All Exercises
Duration	2 Periods	2 Periods	Regularly	3 hours	3 hours
Exam Marks	50	50	Each Practical 10 Marks	100	100
Converted to	10	10	10	20	60
Marks	10		10	20	60
Internal Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50

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

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

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

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded should be converted to 20 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH572	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 PERIODS					**60**

Textbook for Reference:

1. Arsheep Bahga, Vijay Madisetti, Internet of Things - A Hands-On Approach, First Edition, Universities Press, 2015.
2. Raj Kamal, Internet of Things, First Edition, McGraw Hill Education, 2017.
3. 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/

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

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

BOARD PRACTICAL EXAMINATION

PART - A

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

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.

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

CRH571	COMPUTER HARDWARE AND NETWORKING	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 student should be made 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, SMTP Server.

Course Outcomes:

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

CO1: Identify and explain computer hardware components, including motherboards, processors, memory types, storage devices, and input/output peripherals, and perform assembly, disassembly, and basic troubleshooting.

CO2: Install, configure, and manage operating systems and peripheral devices, including device driver updates and server OS installation.

CO3: Configure and administer Windows Server services such as Active Directory, DNS, DHCP, FTP, SMTP, and IIS web server to support network operations.

CO4: Design and implement network infrastructure including cabling, switches, routers, IP addressing, subnetting, firewall rules, VPN, and perform network troubleshooting and security tasks.

CO5: Present and explain concepts and practical applications related to computer hardware, operating systems, and network administration through seminar

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	3
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	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).

Assessment Methodology

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

Note:

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH571	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	Create a Network topology using any network simulation software.	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**

Textbook for Reference:

1. D.Balasubramanian ,Computer Installation And Servicing ,Second Edition, Tata Mc-Graw Hill, New Delhi 2010
2. Behrouza.Forouzan , Data Communication and Networking, 4th Edition, Tata Mc-Graw Hill, New Delhi,2017.
3. 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 – 30 Nos
- Laser Printer -1 No, Web camera – 1 No,
- Biometric Device – 1 No, Scanner – 1 No, Crimping Tool – 6 Nos,
- Screwdriver set – 6 Nos,
- Network Cables – 50m, Switch- 1 No,
- Router - 1 No, Cable, Cable Tester - 6 Nos, RJ45

Software Requirements:

- Windows server OS, Oracle Virtual Box, Windows OS(Host System),
- Simulation Software (GNS3/ Cisco Packet Tracer)

Suggested List of Students Activity

- PC Assembling, Troubleshooting of Hardware effects using indicators.
- OS installation & Configuration in Server and Client
- Printer, Scanner, Biometric, Camera Installation and Configuration
- Usage of various networking tools

BOARD PRACTICAL EXAMINATION
PART - A

1.Hard Disk/SSD
a) Partition and Format.
sk, 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

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

CRH586	DATA ANALYTICS	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 in build libraries.

Course Objectives:

The student should be made 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 from multiple sources.
4. Create data visualizations with Python library – pyplot.
5. Model and interpret data using Python library – scikit-learn.

Course Outcomes:

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

CO1: Apply data types, data analysis processes, and Python functional programming techniques including map, filter, reduce, lambda, and list comprehension to solve data analytics problems.

CO2: Load, clean, and preprocess datasets using Pandas data structures and functions by handlin handling missing data, duplicates, and performing data transformation tasks effectively.

CO3: Analyze datasets by performing statistical analysis and correlation studies, and visualize feature relationships using libraries such as Seaborn and heatmaps.

CO4: Develop and evaluate predictive models using linear and logistic regression techniques with Scikit-learn, including training, testing, and prediction on real datasets.

CO5: Present and explain concepts, techniques, and applications of data analytics and machine learning through seminar

Pre-requisites: Python Programming, Data Structures Using Python.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.
- **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.

Assessment Methodology

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

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

10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH586	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	Name of the Experiment	
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.	12
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.	

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	Name of the Experiment	
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.	18
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.	
5	Load a dataset into a Pandas data frame, find and remove duplicate rows and rename indexes (Column name).	

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	Name of the Experiment	
6	Load a dataset into a data frame, drop the non- numeric columns and list out the basic static analysis of each column.	12
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.	

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	Name of the Experiment	
8	Load a pre-cleaned dataset into a data frame, plot the values of feature and target variables using scatterplot to visualize their relation.	18
9	Visualize a pre-cleaned dataset to detect an outliner and filter out them.	
10	Train the sklearn linear model with a pre-cleaned dataset using fit function and predict the target variable.	
TOTAL PERIODS		**75**

Textbook for Reference:

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

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

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
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos
- Printer – 1 No

Software Requirements:

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

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.

BOARD 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

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

CRH587	MOBILE COMPUTING	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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:

The student should be made to

1. To learn the basics of wireless communication and cellular networks.
2. To study the popular cellular networking technologies.
3. 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: Formulate the mobile communication services, signals, protocols by applying various technologies such as GSM, Wimax and GPRS.

CO2: Analysethe strategies used in the implementation of mobile computing architecture. CO3: Demonstrate the properties of communication system components and processes by designing sample wireless networks.

CO4: Simulate wireless communication network by using modern tools like Qualnet/Matlaband analyse the obtained results to arrive at substantial conclusions by communicating effectively as a member of diverse team.

CO5:Ascertain the technological growth to interpret various types of mobile generation Services through assignments.

Pre-requisites: A background in computer networks is required.CO5:

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	-	1		

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 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.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.

Assessment Methodology

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

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

Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be

evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH587	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
Ex.No	Name of the Experiment	
1	Installation of Network Simulator (Eg.NS2)	18
2	Implementation of Bluetooth network (transfer a file from one device to another).	
3	Implement a basic function of Code Division Multiple Access (CDMA).	
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
Ex.No	Name of the Experiment	
4	Simulate authentication and encryption techniques used in GSM and analyze their performance.	12
5	Illustration of Hidden Terminal Problem using Network Simulator.	
Unit III	**MOBILE NETWORK LAYER**	
Mobile IP - Mobility features in IPv6 - Proactive and reactive ad hoc routing protocols - DSDV, DSR and AODV.		5
Ex.No	Name of the Experiment	
6	Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc.	12
7	Simulate AODV Protocol.	
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
Ex.No	Name of the Experiment	
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
Ex.No	Name of the Experiment	
9	Set up a simple mobile network topology using a network simulator. Configure and manage mobile devices within a simulated network environment.	12
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).	
TOTAL PERIODS		**75**

Textbook for Reference:

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

Equipment / Facilities required to conduct the Practical Portion
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos
- Printer – 1 No

Software Requirements:

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

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.

BOARD 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 or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

CRH588	COMPONENT BASED TECHNOLOGIES	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 student should be made to

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

Course Outcomes:

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

CO1: Apply programming concepts including variables, data types, control structures, classes and objects, Windows Forms development, ASP.NET basics, ADO.NET connectivity, and XML processing in .NET applications.

CO2: Develop web applications utilizing ASP.NET web forms, state management, web controls, web services, database queries, and XML serialization for dynamic, data-driven web solutions.

CO3: Construct database-driven applications with ADO.NET performing SQL operations, stored procedures, disconnected data handling, data binding to web controls, and XML document manipulation.

CO4: Design and implement full-stack .NET applications combining C# programming, web technologies, database integration, and XML handling with emphasis on software quality and maintainability.

CO5: Present and explain full-stack development concepts, web programming, database connectivity, and XML handling through seminars

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

Assessment Methodology

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

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH588	COMPONENT BASED TECHNOLOGIES	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

Unit I	**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
Ex.No	Name of the Experiment	
1	Accept a character from console and check the case of the character.	12
2	Develop a menu-based application to implement a text editor with cut, copy, paste, save and close operations with accessing and shortcut keys.	

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
Ex.No	Name of the Experiment	
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.	18
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.	

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
Ex.No	Name of the Experiment	
6	Connect to a database using ADO.NET and retrieve data using SQL queries.	18
7	Create an ADO.Net application using Stored Procedure	
8	Bind data from a database to web controls in an ASP.NET web form.	

Unit IV	**Working with XML in .NET**	
Introduction to XML- Construction of an XML document -: XML Serialization in the .NET Framework		2
Ex.No	Name of the Experiment	
9	Develop a Window application to read an XML document containing subject, mark scored, year of passing into a Dataset	12
10	Develop a Window application to read students records from Database using ADO.NET and generate XML document containing students' records	
TOTAL PERIODS		**75**

Textbook for Reference:

1. 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
2. mar Spaanjaars , Beginning ASP.NET 4.5.1: in C# and VB, 1st Edition,Wrox,2014
3. 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
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos

Software Requirements:

- Microsoft Visual Studio IDE

Suggested List of Students Activity

- Creation of a Standalone .NET Application
- Creation of a Website.
- Creating a Web Service.

BOARD 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 or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

CRH589	MULTIMEDIA SYSTEMS	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 student should be made to

1. Understand the basic concepts of multimedia systems
2. Introduce various aspects of multimedia components like Images, audio, video, graphics and animation.
3. Gain knowledge on Image, audio and video editing software tools
4. Provide hands-on experience through a series of practical skill building tasks and exercises.
5. Develop multimedia applications using various tools

Course Outcomes:

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

CO1: Demonstrate foundational knowledge of multimedia principles, including multimedia elements, digital media transition, text processing, image fundamentals, audio concepts, and video and animation basics.

CO2: Analyze multimedia components and techniques for digital content creation, including color models, image compression, audio editing, and video authoring.

CO3: Apply multimedia software tools to design and create text effects, edit and manipulate images, process audio files, and perform basic video editing and animation tasks.

CO4: Develop multimedia projects integrating text, images, audio, video, and animation by utilizing appropriate software tools and authoring techniques.

CO5: Present and explain multimedia concepts, software applications, and project outcomes through seminars..

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.
- In addition to traditional lecture method, different types of teaching methods and media are to be employed to develop the outcome.
- Guide students to create multimedia objects and applying it in relevant application

Assessment Methodology

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

Note:

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH589	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, 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**

Textbook for Reference:

1. Ze- Nian Li and M.S. Drew, Fundamental of Multimedia, Second Edition, Pearson Education, 2014.

2. 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
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos
- Printer – 1 No

Software Requirements:

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 Movie Maker

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.

BOARD 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 or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

CRH58A	FULL STACK DEVELOPER	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 student should be made 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:

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

CO1: Apply roles and responsibilities of a full stack developer, HTML5 semantic elements, JavaScript validation, Bootstrap container and grid classes, AngularJS DOM manipulation and events, and Django project setup for web development.

CO2: Analyze and design responsive web pages using Bootstrap navigation bars, scrollspy plugin, AngularJS forms and validation, Django views and templates, and SQLite model operations.

CO3: Develop full stack web applications using AngularJS dynamic list creation, Django app creation, template rendering, and CRUD operations on models with SQLite database.

CO4: Demonstrate testing and deployment concepts of full stack applications including front-end validation, framework integration, and backend data management.

CO5: Apply and present full stack development concepts and application development through seminars to enhance professional ethics and communication skills.

Pre-requisites: Web Designing and Scripting Languages.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.
- **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.

Assessment Methodology

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

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

10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH58A	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	Name of the Experiment	
1	Design a webpage with header, footer and navigation sections using appropriate semantic elements of HTML5.	12
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.	
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	Name of the Experiment	
3	Design a web page to demonstrate the bootstrap container and grid classes.	18
4	Design a web page with navigation bar using. navbar classes.	
5	Design a web page to demonstrate the scroll spy plugin.	
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	Name of the Experiment	
6	Display a list in a webpage in which list elements can be dynamically added using AngularJS.	12
7	Display a list in a webpage in which list elements can be dynamically removed using AngularJS.	
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	Name of the Experiment	
8	Create a Django App to display “Hello World.”	18
9	Create and display a template in Django App.	
10	Create a Model in a Django app and insert data.	
TOTAL PERIODS		**75**

Textbook for Reference:

1. Jacob Lett, Bootstrap 4 Quick, First Edition, Bootstrap Creative, 2018.
2. Ken Williamson, Learning AngularJS: A Guide to AngularJS Development, First Edition, O'Reilly,2015.
3. 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
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos
- Printer – 1 No

Software Requirements:

- Windows / Linux Operating System
- Any Browser – Microsoft Edge/Chrome.
- Editor – Notepad/ Notepad++
- Server Software - WSGIServer.
- Python IDLE /Spyder.

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.

BOARD 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 removed using 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 or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

CRH58B	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 student should be made to

1. Understand the fundamentals of RPA tools, including their features and user interface.
2. Master the concept of variables in UiPath, covering various variable types.
3. 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.
4. Develop skills in advanced automation techniques including recording, table extraction, selectors, and automation of Excel and PDF files using UiPath.
5. 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:

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

CO1: Demonstrate fundamental knowledge of RPA tools, user interfaces, variable types, control flow concepts, selectors, Excel and PDF automation, event triggers, exception handling, and orchestrator functions for bot management.

CO2: Analyze and construct RPA workflows using variables, control flow activities, selectors, Excel automation, PDF data extraction, event triggers, exception handling, bot deployment, and package management in orchestrator.

CO3: Develop automation projects that integrate recording techniques, data table manipulation, dynamic selectors, and exception handling, while managing deployment and package control using orchestrator.

CO4: Investigate, analyze, and troubleshoot robotic process automation workflows by examining variable usage, control flow logic, selectors, data extraction methods, user event handling, exception management, and orchestrator-based package deployment.

CO5: Present and explain RPA concepts, workflow design, automation development, error handling, and orchestrator deployment through seminars.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	1		

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.

Assessment Methodology

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

Note:

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)
Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION
Model Practical Examination and End Semester Examination- Practical Exam

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

CRH58B	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

Unit I	**RPA TOOL INTRODUCTION**	
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.		15
Ex.No	Name of the Experiment	
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.	

Unit II	**BASIC PROGRAMMING CONCEPTS**	
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.		15
Ex.No	Name of the Experiment	
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.	

Unit III	**ADVANCED AUTOMATION CONCEPTS & TECHNIQUES**	
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.		21
Ex.No	Name of the Experiment	
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.	

Unit IV	**HANDLING USER EVENTS & EXCEPTION HANDLING**	
Triggers: Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - An example of monitoring email. Exception Handling - Strategies for handling errors and exceptions - Implementing error-catching mechanisms in RPA workflows.		09
Ex.No	Name of the Experiment	
8	Write a program to demonstrate email automation. (Note: use triggers and exception handling)	

Unit V	**DEPLOYING AND MANAGING THE BOT:**	
Orchestrator overview for Automation Developers – Working with Orchestrator Resources. Managing packages - Uploading packages - Deleting packages.		15
Ex.No	Name of the Experiment	
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.	
TOTAL PERIODS		**75**

Textbook for Reference:

1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018
2. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation, First Edition 2015.
3. 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 Portion
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos

software Requirements:

- UIPath Studio.

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.

BOARD 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)
    a. 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 in UIPath 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 or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

CRH573	INNOVATION AND STARTUP	L	T	P	C
Practicum		**1**	**0**	**2**	**2**

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 student should be made to

1. To understand the concept of Innovation and Start-ups
2. To acquire knowledge of Prototype development, IPR, Patents and Copyrights
3. To have the practical experience in preparing Business plan for Start-ups
4. To visit the existing nearby industry to prepare project report about the present challenges of that industry
5. To know the different funding supports available from Government and Non-Government schemes for Start-ups

Course Outcomes:

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

CO1: Explain the fundamentals of innovation, creativity, and different types of innovation, along with innovation management techniques and design thinking principles.

CO2: Apply the concept of incubation clubs, intellectual property rights, patents, copyrights, and the processes to create, managing and protecting innovations.

CO3: Analyze various government and non-government funding schemes for start-ups and develop a business model and plan incorporating opportunities and challenges.

CO4: Design the business plant and discuss innovation-related topics such as idea generation, product development, business models, leadership, and start-up ecosystems for realworld problem through seminars.

CO5: Conduct an industry visit and prepare a detailed project report covering aspects such as organization profile, manufacturing processes, quality control, and marketing strategies.

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	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2
CO2	3	-	-	-	-	-	-		
CO3	-	2	-	-	-	-	-		
CO4	-	-	2	2	2	2	-		
CO5	-	-	-	-	-	-	2		

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

Assessment Methodology

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Class Assessment (Unit I,II & Unit III)	Seminar Presentations (Unit IV)	Submission of Industry Visit Project Report (Unit V)	Practical Examination (Project)
Duration	2 hours	-	-	3 hours
Exam Marks	50	20	30	100
Converted to	10	10	20	60
Marks	**10**	**10**	**20**	**60**

Continuous Assessment - 40 marks

S. No	Description	Marks
CA1 i) ii)	**Class Assessment (50 marks) - Unit – I,II & III** Written Examination - Theory Questions 10 questions out of 15 questions (10 x 3 marks :30 marks) 4 questions out of 6 questions (4 x 5 marks : 20 marks)	10 marks
CA 2	**Seminar Presentations (20 marks- each topic carries 10 marks) - Unit IV** Students should present any two topics with PPTs	10 marks
CA 3	Submission of Industry Visit Project Report - **(30 marks) - Unit V**	20 marks
	Total	**40 marks**

End Semester Examination –Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations.

Detailed Allocation of Marks

S. No	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)	Presentation of Industry Visit Project Report	25
ii)	Interaction and Evaluation	30
	TOTAL	**100**

CRH573	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 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		9
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 PERIODS		**45**

CRH574	INDUSTRIAL TRAINING	SUMMER VACATION	C
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 professionals guide and mentor students throughout the training.
- Skill Development Workshops: Sessions on technical skills, software tools, and industry best practices.
- Assessment and Feedback: Performance evaluations and constructive feedback to help students improve.

Benefits for Students

- Enhanced Employability: Practical experience makes students more attractive 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 as required. Practice clear and concise verbal and written communication.
    - Demonstrate professionalism in all interactions, respecting confidentiality, and adhering to company policies and procedures.
7. Safety and Compliance:
    - Prioritize safety at all times. Familiarize yourself with safety protocols, procedures, and emergency exits in the workplace.
    - Follow all safety guidelines and regulations to ensure your well-being and that of others around you.

After Completing Industrial Training:

8. Reflection and Documentation:
    - Reflect on your training experience. Evaluate what you have learned, the challenges you faced, and how you have grown professionally.
    - Maintain a journal or log documenting your daily activities, achievements, and lessons learned during the training period.
9. Feedback and Evaluation:
    - Seek feedback from your industry supervisor and faculty mentor on your performance and areas for improvement.
    - Use constructive feedback to enhance your skills and competencies for 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.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 40 Marks by industry supervisor and polytechnic faculty mentor for the Internal Assessment.

S. NO.	Description	Marks
1	Punctuality and regularity. (Attendance)	10
2	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
3	Self expression / communication skills. Interpersonal skills / Human Relation.	10
4	Report and Presentation.	10
	Total	40

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of industrial training. The marks scored will be converted to 60 marks for the End Semester Examination.

S. NO.	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
4	Viva Voce	20
	Total	100

SEMESTER 6

CRH681	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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 of functions 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:

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

CO1: Apply mathematical techniques to solve problems involving matrices, multivariable calculus, vector fields, differential equations, and Laplace transforms.

CO2: Analyze and interpret results from matrix theory, vector calculus, differential equations, and transforms in mathematical modeling.

CO3: Evaluate mathematical models involving multiple variables, vector fields, and differential equations

CO4: Integrate mathematical concepts from linear algebra, calculus, and differential equations to formulate sustainable solutions for any problem.

CO5: Create mathematical models using advanced calculus, matrix theory, and Laplace methods to solve real-world engineering problems through assignments.

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

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	1	1		

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.

CRH681	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 field 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 PERIODS	**45**

Textbook for Reference:

- John Bird, Higher Engineering Mathematics, Routledge, 9th Edition, 2021.
- Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
- Arumugam, S., Thangapandi Isaac, A., & Somasundaram, A., Differential Equations and Applications, Yes Dee Publishing Pvt. Ltd., 2020.
- Duraipandian, P., & Kayalal Pachaiyappa, Vector Analysis, S Chand and Company Limited, 2014.
- 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/

Suggested List of Students Activity

- 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.

CRH682	ENTREPRENEURSHIP	L	T	P	C
Theory		**3**	**0**	**0**	**3**

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

1. Acquire entrepreneurial spirit and resourcefulness
2. Familiarize Acquire knowledge about the business idea and product selection
3. Analyze the banking and financial institutions
4. Understand the pricing policy and cost analysis
5. Get knowledge about the business plan preparation

Course Outcomes:

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

CO1: Apply entrepreneurial concepts, financial tools, and market understanding to analyse and manage various aspects of a business venture.

CO2: Analyze business ideas, risks, customer needs, and financial aspects to evaluate the viability and sustainability of an entrepreneurial venture.

CO3: Evaluate entrepreneurial competencies, financial strategies, and market factors for effective planning and decision-making.

CO4: Integrate principles of entrepreneurship, finance, marketing, and innovation to develop sustainable business solutions that address societal needs and promote environmental responsibility.

CO5 Create a structured and feasible business plan based on market research, innovation, financial analysis, and strategic thinking. and prepare 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	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	1
CO2	-	2	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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.
- **Simulation and Real-World Practice:** Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

CRH682	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, - Risk Taking-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 Statement, Prepare a Cash Flow Projection- Factors affecting pricing.- GST.		7
Unit V	**Business Plan Preparation**	
Feasibility Report – Technical analysis, financial analysis- Market Research - Concept, Importance and Process- tools for market research- Market Sensing and Testing, Marketing and Sales strategy, Digital marketing, Branding - Business name, logo, tag line, Promotion strategy, Business Plan Preparation, -Concept and Importance, , Execution of Business Plan		9
Revision and Test		**10**
TOTAL PERIODS		**45**

Textbook for Reference:

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

Website links for reference:

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

Suggested List of Students Activity

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

CRH683	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, 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,

1. To understand the concept, characteristics and elements of projects.
2. To understand the stages in Project Life Cycle.
3. To appreciate the need for Project Portfolio Management System.
4. To know the considerations in choosing appropriate project management structure.
5. To understand the components of techno-economic feasibility studies.
6. To know about the detailed project report
7. To learn about project constraints.
8. To understand the techniques of evaluation.
9. To get insight into the Social Cost Benefit Analysis Method.
10. To know how to construct project networks using PERT and CPM.
11. To learn how to crash project networks
12. To understand the meaning of project appraisal.
13. To understand the meaning of project audits.
14. To know the qualities of an effective project manager.
15. To understand the stages in Team Development model.

Course Outcomes:

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

CO 1: Apply project management principles, tools, and techniques to initiate, plan, and monitor projects across different phases of the project life cycle.

CO2: Analyze project feasibility, performance metrics, stakeholder expectations, and resource constraints to evaluate and improve project execution.

CO 3: Evaluate project strategies, resource allocations, and leadership approaches to ensure timely delivery and stakeholder satisfaction.

CO 4: Integrate knowledge of feasibility analysis, cost evaluation, team management, and project planning to design project solutions that promote sustainability, address societal needs, and minimize environmental impact.

CO 5: Prepare Detailed Project Report (DPR), incorporating feasibility studies, network scheduling, financial evaluation, team strategies, and control mechanisms through assignment,

Pre-requisites: Basic Knowledge.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-		
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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 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.

CRH683	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 PERIODS		**45**

Textbook for Reference:

- Clifford F. Gray And Erik W. Larson, Project Management – The Managerial Process, Tata Mcgraw Hill.
- Dragan Z. Milosevic, Project Management Toolbox: Tools And Techniques For The Practicing Project Manager,
- Gopalakrishnan, P/ Ramamoorthy, V E, Textbook Of Project Management, Macmillan India. Ltd.
- Harold Kerzner, Project Management: A Systems Approach To Planning, Scheduling, And Controlling, Eighth Edition, John Wiley & Sons

- Jason Charvat, Project Management Methodologies: Selecting, Implementing, And Supporting Methodologies And Processes For Projects, John Wiley & Sons
- 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

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, 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.

CRH684	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:

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

CO1: Apply financial concepts, terminology, and tools to manage personal finances, business funding, and budgeting decisions effectively.

CO2: Analyze personal and business financial situations using budgeting, cost analysis, and financial data interpretation to support informed decision-making.

CO3: Evaluate financial decisions by applying concepts of financial discipline, funding strategies, budget control, and cost analysis.

CO4: Integrate personal finance management, business funding, financial reporting, budgeting, and costing to develop sustainable financial practices.

CO5: Create a personal or business financial plan incorporating investment decisions, funding sources, budgeting strategies, and marginal costing applications.

Pre-requisites: Knowledge of basic mathematics

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	1
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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 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.

CRH684	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 – Concepts of 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)		9
Revision and Test		**10**
TOTAL PERIODS		**45**

Textbook for Reference:

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

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.

CRH685	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

1. Understand the fundamental principles and evolution of wireless communication systems, including the transition from previous generations to 5G.
2. Identify and explain the key features, requirements, and use cases of 5G networks in various industries and applications.
3. Analyze the architecture and components of 5G networks, including radio access technologies, core network elements, and network slicing.
4. Develop proficiency in radio access technologies such as OFDM, MIMO.
5. Explore emerging technologies and applications in 5G, such as IoT, edge computing, and AI integration, and assess their impact on future communication systems.
6. Gain hands-on experience in implementing and troubleshooting 5G networks through practical exercises and simulations.
7. Understand the regulatory and standardization processes governing 5G deployment, ensuring compliance and interoperability with global standards.
8. Analyze security protocols and mechanisms implemented in 5G networks to ensure data confidentiality, integrity, and availability.
9. Develop critical thinking and problem-solving skills to address challenges and optimize performance in 5G network design, deployment, and management.

Course Outcomes:

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

CO1: Apply foundational and advanced concepts of 5G architecture, radio access technologies, core networks, and protocols to real-world communication systems.

CO2: Analyze 5G technologies, protocols, network architectures, and their applications to evaluate system performance and deployment strategies.

CO3: Evaluate 5G network components, access technologies, and protocol mechanisms to ensure optimized, secure, and reliable communication systems.

CO4: Integrate knowledge of 5G architecture, radio access technologies, core networks, and emerging applications to design network solutions that prioritize user safety, environmental sustainability, and ethical deployment.

CO5: Create innovative and future-ready 5G network solutions by combining architecture, protocols, and application needs with considerations for scalability, sustainability, and security through assignment.

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	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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, 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.

CRH685	5G TECHNOLOGY	L	T	P	C
Theory		**3**	**0**	**0**	**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**

Textbook for Reference:

1. Afif Osseiran, Jose F Monserrat, Patrick Marsch, 5G Mobile and Wireless Communications Technology, 1st Edition, Cambridge University Press, 2016
2. Erik Dahlman, 5G NR: The Next Generation Wireless Access Technology , 1st Edition, Elsevier, 2016.
3. Jonathan Rodriguez , Fundamentals of 5G Mobile Networks, 1st Edition, Wiley, 2015
4. 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/

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.

CRH686	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, Jenkins.

Course Objectives:

The objective of this course is to enable the student to

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

Course Outcomes:

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

CO1: Apply DevOps principles and tools such as Git, Maven, Jenkins, and Ansible to automate stages of the software development lifecycle.

CO2: Analyze the role and integration of tools in the DevOps pipeline to improve collaboration, automation, and deployment efficiency.

CO3: Evaluate different DevOps tools and practices for their effectiveness in achieving continuous integration, version control, and configuration management.

CO4: Integrate version control, build automation, continuous integration, and configuration management tools to design DevOps pipelines that enhance software delivery with sustainable practices and resource efficiency.

CO5: Create an end-to-end DevOps pipeline using Git, Maven, Jenkins, and Ansible to automate and manage software delivery from code commit to deployment through assignment.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	-	2	-	-		
CO5	-	-	-	-	-	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.
- **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.

CRH686	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**

Textbook for Reference:

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

Website links for reference:

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

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.

CRH687	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 pathway this course gains much attention. This course also introduce basic machine learning algorithms.

Course Objectives:

The student should be made to

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

Course Outcomes:

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

CO1: Apply core Python libraries such as NumPy and Pandas to perform data handling, statistical computations, and data manipulation for real-world datasets.

CO2: Apply core Python libraries such as NumPy and Pandas to perform data handling, statistical computations, and data manipulation for real-world datasets.

CO3: Evaluate datasets through integrated data wrangling, statistical summary, and visualization to support machine learning model preparation.

CO4: Integrate data science tools and techniques to build workflows that support data preprocessing, visualization, and machine learning application.

CO5: Create and deploy end-to-end data science solutions using Python libraries for data handling, visualization, and machine learning on real-world datasets through seminar.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.
- **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.

Assessment Methodology

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

Note:
CA1 and CA2: All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical

test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH687	DATA SCIENCE	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

Unit I	**INTRODUCTION TO DATA SCIENCE**	
Data Science: Need, benefits and uses – facets of data -Data Science Process - Basics of Numpy Arrays.		3
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.	12
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;	
Unit II	**DESCRIBING DATA**	
Statistical Analysis: Mean Median, Mode, Standard Deviation, Range, Percentile. Missing value analysis - Numpy arrays : aggregations –computations on arrays, Introduction to Pandas		3
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().	12
Ex.No:4	Load a data into a pandas dataframe and perform following functions on it : min(), max(), cumsum(), mean(), median(), corrcoef(), std().	
Unit III	**PYTHON LIBRARIES FOR DATA WRANGLING**	
Data manipulation with Pandas: data indexing and selection –missing data; Data Transformation: Removing duplicates- Replacing values -aggregation and grouping.		3
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.	12
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.	
Unit IV	**DATA VISUALIZATION**	
Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms - Visualization with Seaborn.		3
Practical: Iris Dataset is one of best known datasets in pattern recognition literature. This dataset contains 3 classes of 50 instances each, where each class refers to a type of 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		12
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.	
Unit V	**Machine Learning Algorithms**	
Basic Machine Learning Algorithms: Classification: Support vector machines- Naive Bayes- Decision Trees- Clustering- Confusion Matrix.		3
Ex.No:**9**	Implement the Machine learning model for clustering with Iris dataset and analyse Decision Tree.	12
Ex.No:**10**	Implement the Machine learning model for clustering with Iris dataset and analyse K-means Clustering.	
TOTAL PERIODS		**75**

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.
- Aurelien 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 Portion
LIST OF EQUIPMENTS
Hardware Requirements:

- Desktop Computers / Laptop - 30 Nos

Software Requirements:

- Python /google colab

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

BOARD 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 and analyse K-means Clustering.

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

CRH688	CLOUD PLATFORM	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

Introduction

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 student should be made to

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:

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

CO1: Apply core services of AWS, GCP, Azure, and open-source cloud platforms to deploy, manage, and monitor virtual resources and storage solutions..

CO2: Apply core services of AWS, GCP, Azure, and open-source cloud platforms to deploy, manage, and monitor virtual resources and storage solutions.

CO3: Evaluate the effectiveness of cloud-based virtual machines, storage, IoT, and ML platforms in addressing real-world deployment, scalability, and performance issues.

CO4: Integrate services from multiple cloud platforms and IoT systems to build cross-platform cloud applications and interconnected device environments.

CO5: Create and deploy cloud-based solutions using commercial and open-source platforms Through presentation.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	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 necessary to achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entire class can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform a teacher guided image into several others of their own creation.

Assessment Methodology

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

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

Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The

same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH688	**CLOUD PLATFORM**	**L**	**T**	**P**	**C**
Practicum		**1**	**0**	**4**	**3**

Unit I	**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 II	**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 III	**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 IV	**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 for IoT- 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 V	**Open source Cloud and Machine learning Framework**	
Open Source Cloud - OpenStack -Introduction-Features- Architecture- Components. Cloud-Based Machine Learning Frameworks - Introduction to machine learning concepts- Azure Machine Learning Workspace - AWS Machine Learning Platform.		3
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**

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:

- https://docs.aws.amazon.com/
- https://dtcenter.org/sites/default/files/communitycode/nwp_containers/Documentation/AMS_2020/01_intro_to_cloud_and_aws.pdf
- https://aws.amazon.com/training/classroom/architecting-on-aws/
- 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 Requirements:

- Desktop Computers / Laptop with Internet Facility – 30 Nos
- Printer – 1 No

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

BOARD 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 resource hierarchy 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 and resource 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

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

CRH689	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:

The student should be made to

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

Course Outcomes:

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

CO1 Apply Python-based libraries and tools to import, explore, manipulate, and visualize datasets using basic and advanced visualization techniques.

CO2: Analyze datasets to identify relationships, trends, and distributions through appropriate visualization techniques that enhance interpretability.

CO3: Evaluate the effectiveness of various visualization methods and tools in representing different types of data accurately and ethically.

CO4: Integrate multiple data visualization techniques to design informative visual narratives that support data-driven decision-making using modern tools.

CO5: Create custom visualizations for complex datasets using Python libraries to find insights and support real-world data interpretation and communication through seminar.

Pre-requisites: Basics of statistics

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

Assessment Methodology

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

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH689	**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	Name of the Experiment	
1	Installing Python and Exploring Visualization Environment, Importing and Exporting Dataset	12
2	Explore your dataset using Dataframe, info, shape, head, tail, dtypes, describe, grouping of data in python	
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		6
Ex.No	Name of the Experiment	
3	Extract important variables and remove useless variables from the dataset	12
4	Identify and fill missing values within the dataset	
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	Name of the Experiment	
5	Creating Scatter Plot, Bar Chart, Pie Chart, Pair Plot with Matplotlib	12
6	Creating Density Plot and Histogram with ggplot	
Unit IV	**Advanced Visualization Techniques**	
Visualizing Categorical Data: Bar Chart-Box Plot -Frequency - Violin plot - Regression plot – Interactive Data Visualization: Plotly		3
Ex.No	Name of the Experiment	
7	Plotting data using Heatmaps, Treemaps and Regression plot	12
8	Load the Iris dataset; plot all the column's relationships using a pairplot for Creating Violin Plot and Boxplot with Seaborn	
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	Name of the Experiment	
9	Visualization of Time Series Data.	12
10	Visualization of Spatial Data.	
TOTAL PERIODS		**75**

Textbook for Reference:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with 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

Hardware Requirements:

- Desktop Computers – 30 Nos
- Printer – 1 No

Software Requirements:

- Windows
- Python /Tableau / Power BI

Data Sources:

- https://archive.ics.uci.edu/ml/index.php
- https://www.kaggle.com
- https://toolbox.google.com
- https://data.gov.in/

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.

BOARD 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

CRH68A	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 student should be made to

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:

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

CO1: Apply advanced database models and architectures to design, query, and manage relational, object-relational, distributed, temporal, and NoSQL databases.

CO2: Analyze and compare various database paradigms to identify suitable architectures and models for diverse data types and access patterns.

CO3: Evaluate database optimization strategies, data modeling approaches, and storage mechanisms across relational, spatial, temporal, and cloud environments.

CO4: Utilize modern database tools, platforms, and experimental techniques such as NoSQL systems, distributed/cloud infrastructures, and XML/Spatial technologies to design and implement data-driven solutions for real-world applications.

CO5: Create and implement database-driven applications by designing schema, optimizing queries, handling real-time data, and deploying solutions across platforms through presentation.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	1	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 necessary to achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entire class can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform a teacher guided image into several others of their own creation.

Assessment Methodology

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

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

Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The

same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH68A	ADVANCED DBMS	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

Unit I	**Query Optimization and Object based database Concepts**	
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 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.	8

Unit II	**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, 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 Employee fragments.	12

Unit III	**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..	4

	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.	
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 IV	**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. v. 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 V	**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 Operations of 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**

Textbook for Reference:

1. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, 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:

- https://archive.nptel.ac.in/courses/106/105/106105175
- https://link.springer.com/book/10.1007/3-540-57507-34.

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirements:

- Desktop Computers / Laptop – 30 Nos
- Printer – 1 No

Software Requirements:

- Java / Python
- MySQL, MongoDB, Cassandra

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

BOARD PRACTICAL EXAMINATION
PART - A

Ex No 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?
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, 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.

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

CRH68B	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

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 student should be made to

1. To facilitate students to understand android SDK.
2. To help students to gain a basic understanding of Android application development.
3. To inculcate working knowledge of Android Studio development tool.
4. To test Android applications.
5. To deploy Android applications.

Course Outcomes:

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

CO1 Apply fundamental Android development concepts to design and build mobile applications using core components.

CO2:Analyze and implement native mobile features such as location-based services, messaging, and sensors for interactive and context-aware application development.

CO3: Design user-centric interfaces by integrating various layout techniques, screen elements, and media components to enhance mobile user experience.

CO4: Utilize modern Android development tools, debugging techniques, and database management APIs such as SQLite and shared preferences to experiment with persistent data handling in mobile applications.

CO5 Create and deploy complete Android applications using common APIs, system services, and testing through seminar.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

Assessment Methodology

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

Note:

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

converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH68B	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Practicum		**1**	**0**	**4**	**3**

Unit I	**INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT**	
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**	
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**	
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**	
Testing Android applications, Publishing Android application, Using Android preferences.		3
Ex.No	Name of the Experiment	12
7	Develop a native application that uses GPS location information.	
8	Develop an application for sending & receiving SMS.	
Unit V	**ANDROID APIs AND DEPLOYING ANDROID APPLICATION**	
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**

Textbook for Reference:

1. Dawn Griffiths, David Griffiths, "Head First Android Development: A Brain-Friendly Guide", 1st edition, O'Reilly, 2017.
2. John Horton, Android Programming for Beginners, 2nd edition, Packt Publishing, 2018.
3. Barry Burd, Android Application Development All-in-One For Dummies, 2nd edition, For Dummies, 2020.

Website links for reference:

- https://developer.android.com/get-started/overview
- https://developer.android.com/courses/

Hard ware Requirements:

- Desktop / Laptop with internet Connectivity – 30 Nos

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.
- Micro project that shall be an extension of any practical lab exercise to real-world application

BOARD 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

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

CRH68C	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 student should be made to

1. To learn problem solving skills.
2. To gain knowledge of UI and UX Design.
3. To understand the concept of functions and their role in UX Design.
4. To comprehend the basics of interaction structures and its importance in application development.
5. To recognize the importance of visual design.

Course Outcomes:

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

CO1: Apply the principles of UI/UX design and product design life cycle to establish effective front-end and back-end interactions in real-world application interfaces.

CO2: Analyze user needs and apply user-centered methodologies such as persona creation, empathy mapping, and user journey modeling to inform design decisions.

CO3: Design interactive and responsive prototypes for mobile and web applications using digital prototyping techniques.

CO4: Experiment with modern visual design tools and techniques to create engaging user interfaces incorporating grid systems.

CO5: Integrate UX design principles, user insights, interaction strategies, and visual design elements to develop complete UI/UX solutions for digital products through seminar.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	-
CO2	-	3	-	-	-	-	-		
CO3	-	-	2	-	-	-	-		
CO4	-	-	-	2	-	-	-		
CO5	-	-	-	-	-	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.

Assessment Methodology

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

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

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

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

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

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim (5) & Procedure (30)	35
2	Execution and Result	15
TOTAL		50
3	Practical Documents (As per the portions)	10
		60

CA 3: Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

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

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

CA 4: All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

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

CRH68C	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
Ex.No	Name of the Experiment	
1	Identifying interface connectivity and establishing interface connectivity between two different program modules.	12
2	Understand front end and backend interfacing and Implementation of both interfacing.	
Unit II	**UX DESIGN**	
User Centred Design - Design Thinking - Activity Based Design - Agile Process.		3
Ex.No	Name of the Experiment	
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.	12
4	Designing a Responsive layout for a societal application	
Unit III	**USER RESEARCH**	
Stakeholder & User Interviews - Creating Personas - Empathy Mapping - Information Architecture - Building User Journey		3
Ex.No	Name of the Experiment	
5	Hands on Design Thinking Process for a new product.	12
6	Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.	
Unit IV	**INTERACTION DESIGN**	
Ideation Methods - Interaction & Prototyping - Paper & Digital Prototyping - Design a Web / Mobile App.		3
Ex.No	Name of the Experiment	12
7	Identifying interaction design and functional layout. practical implementation of interaction design and functional layout.	
8	Exploring various UI Interaction Patterns.	
Unit V	**VISUAL DESIGN**	
Web & Mobile App Design - Grid Systems - Colors Theory and Palette - Understanding Typography.		3
Ex.No	Name of the Experiment	
9	Create Social media advertisement using online tools and applications	12
10	Design super market special offer sales poster using online tools and applications.	
TOTAL PERIODS		**75**

Textbook for Reference:

1. Tom Green, Joseph Labrecque, A Guide to UX Design and Development: Developer's Journey Through the UX Process (Design Thinking), First Edition, APress, 2023
2. Jon Yablonski, Laws of UX: Using Psychology to Design Better Products & Services, First Edition, O'Reilly, 2020.
3. 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/

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirements:

- Desktop Computers – 30 Nos
- Printer – 1 No

Software Requirements:

- Windows / Linux Operating System

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.

BOARD 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.

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

CRH672	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:

On successful completion of internship, the student will be able to

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 opportunities for professional development.
- The interns have never done this kind of work before, they want to know that their work is measuring up to organizational expectations, hence provide professional guidance and mentoring to the intern.
- Daily progress report of Intern is to be evaluated by industry supervisor. Examine what the intern has produced and make suggestions. Weekly supervision meetings can help to monitor the intern's work.

Duties Responsibilities of the Faculty Mentor

- To facilitate the placement of students for the internship
- To liaison between the college and the internship provider
- To assist the Industrial Training Supervisor during assessment

Instructions to the Interns

- Students shall report to the internship provider on the 1st day as per the internship schedule.
- Intern is expected to learn about the organization, its structure, product range, market performance, working philosophy etc.
- The interns shall work on live projects assigned by the internship provider.
- The Intern shall record all the activities in the daily log book and get the signature of the concerned training supervisor.
- Intern shall have 100% attendance during internship programme. In case of unavoidable circumstances students may avail leave with prior permission from the concerned training supervisor of the respective internship provider. However, the maximum leave permitted during internship shall be as per company norms where they are working and intern shall report the leave sanctioned details to their college faculty mentor.
- The interns shall abide all the Rules and Regulations of internship provider
- Intern shall follow all the safety Regulations of internship provider.
- On completion of the internship, the intern shall report to the college and submit the internship certificate mentioning duration of internship, evaluation of interns by internship provider, Student's Diary and Comprehensive Training Report.

Attendance Certification

Every month students have to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Training Reports

The students have to prepare two types of reports: Weekly report in the form of 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.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 50 Marks by industry supervisor and polytechnic faculty mentor during 3rd Month and 5th Month. The total marks (50 + 50) scored shall be converted to 40 marks for the Internal Assessment.

S. NO.	Description	Marks
1	Punctuality and regularity. (Attendance)	10
2	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
3	Ability to solve practical problems. Sense of responsibility	10
4	Self expression / communication skills. Interpersonal skills / Human Relation.	10
5	Report and Presentation.	10
Total		50

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of internship period (June - May). The marks scored will be converted to 60 marks for the End Semester Examination.

S. NO.	Description	Marks
1	Daily Activity Report.	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
4	Viva Voce	20
Total		100

CRH673	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.

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 contributions to 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, 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 and submit it to the faculty mentor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Rubrics for Fellowship

Sl. No.	Topics	Description
1	Alignment with Objectives	Assess how well the project aligns with the stated objectives and requirements. Determine if the student has addressed the key aspects outlined 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.

INTERNAL MARKS - 40 Marks

As per the rubrics each topic should be considered for the Review 1 and Review 2. Equal weightage should be given for all the topics. It should be assessed by a faculty mentor and the industrial professional or research guide.

Review 1 shall be conducted after 8th week and Review 2 shall be conducted after 14th week in the semester. Average marks scored in the reviews shall be considered for the internal assessment of 40 Marks.

Scheme of Evaluation

PART	DESCRIPTION	MARKS
A	Assessment as per the rubrics.	30
B	Attendance	10
Total		**40**

END SEMESTER EXAMINATION - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of fellowship. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report of the Fellowship Work.	30
C	Presentation by the student.	30
D	Viva Voce	20
Total		**100**

CRH671	IN HOUSE PROJECT	Periods	C
PROJECT		**540**	**12**

Introduction

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 for the partial fulfillment for the award of Diploma in Engineering.

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

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

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

The final examination for project work will be evaluated based on the final report submitted by the project group **of not exceeding 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 acquired in coursework to solve practical engineering problems.
- **Skill Development**: Enhance technical skills related to the specific field of engineering through hands-on experience and application.
- **Problem-Solving Abilities**: Develop critical thinking and problem-solving abilities by addressing complex engineering issues within a defined scope.
- **Project Management**: Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.
- **Teamwork and Collaboration**: Foster 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 given timeframe, resources, and constraints. Avoid projects that are overly ambitious or impractical to complete effectively.
- Assess the availability of resources needed to conduct the project, such as equipment, materials, laboratory facilities, and access to relevant software or tools. Lack of resources can hinder project progress.
- Select a project that genuinely interests and motivates you. A project that captures your curiosity and passion will keep you engaged and committed throughout the project duration.
- Consider the availability and expertise of faculty advisors or industry mentors who can provide guidance and support throughout the project. Effective mentorship is crucial for success.
- Clearly define the learning objectives and expected outcomes of the project. Ensure that the project will help you achieve specific learning goals related to technical skills, problem-solving, and professional development.
- Look for opportunities to propose innovative solutions or explore new methodologies within your project. Projects that encourage creativity can set you apart and enhance your learning experience.
- Consider ethical implications related to the project, such as safety protocols, environmental impact, and compliance with ethical guidelines in research and engineering practices.
- Evaluate whether the project offers opportunities for collaboration with peers, experts from other disciplines, or industry partners. Interdisciplinary projects can broaden your perspective and enhance your teamwork skills.
- Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

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

Duties Responsibilities of the internal faculty advisor.

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

- The in-house project should be approved by the project monitoring committee constituted by the Chairman Board of Examinations.
- The in-house project should be selected in the fifth semester itself. Each in-house project shall have a maximum of four students in the project group.
- Provide comprehensive academic advising to help in the selection of appropriate in-house project that align with their interests and career goals.
- Offer expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between students and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure students have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of the in-house project, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging students to practice integrity and responsibility in their work.
- Assist in preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the students.

- Regularly meet with your internal faculty advisor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your faculty advisor.
- Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in in-house projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.

- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

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

Rubrics for In-House Project Work

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

SCHEME OF EVALUATION

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

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

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

END SEMESTER EXAMINATION - Project Exam

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

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

 # The marks scored will be converted to 60 Marks.

Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for a period of a maximum of two months. For those students who 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.

Integrated Learning Experiences (ILE)

Standard Operating Procedures(SOPs)

S.No	Contents	Page No
1	Introduction	3
2	Health & Wellness	4
3	Growth Lab	16
4	Induction Program	24
5	Student Led Initiatives	34
6	Shop Floor Immersion	39
7	Emerging Technology Seminars	42
8	Special interest Groups & Club activities	48
9	Student Induction Program Cell	52

Introduction:

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. This new curriculum revamping (R2023) 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. From this perspective, a new structure called "Integrated Learning Experiences(ILE)" is introduced in the regulation 2023. This ILE 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.

- - - - 23 - 886*		L	T	P	C**
AUDIT	**HEALTH & WELLNESS**	**0**	**0**	**2**	**1**

*(First four digits in the subject code is branch code and Seventh digit is Semester)

** Health & Wellness has one credit for the third semester only and it has no credits for other semesters.

Skill Areas:

Physical Fitness, Nutrition, Mental Health, Awareness on Drug addiction and its effects

Purpose:

The Health & Wellness course focuses on teaching the elements of physical, mental, emotional, social, intellectual, environmental well-being which are essential for overall development of an individual. The course also addresses the dangers of substance abuse and online risks to promote emotional and mental health.

Learning Outcomes:

Upon completion of the Health & Wellness course, students will be able to:

1. Demonstrate proficiency in sports training and physical fitness practices.
2. Improve their mental and emotional well-being, fostering a positive outlook on health and life.
3. Develop competence and commitment as professionals in the field of health and wellness.
4. Awareness on drug addiction and its ill effects

Focus:

During the conduct of the Health & Wellness course, the students will benefit from the following focus areas:

1. Stress Management.
2. Breaking Bad Habits.
3. Improving Interpersonal Relationships.
4. Building Physical Strength & Inner Strength.

Role of the Facilitator:

The faculty plays a crucial role in effectively engaging with students and guiding them towards achieving learning outcomes. Faculty participation involves the following areas:

1. **Mentorship & Motivation:** The Facilitator mentors students in wellness and self-discipline while inspiring a positive outlook on health. Faculty teach stress management, fitness, and daily well-being.
2. **Promoting a Safe and Inclusive Environment:** The facilitator ensures a safe, inclusive, and respectful learning environment for active student participation and benefit.
3. **Individualised Support and Monitoring Progress:** The facilitator plays a crucial role in providing personalized support, monitoring and guidance to students.

Guided Activities:

In this course, several general guided activities have been suggested to facilitate the achievement of desired learning outcomes. They are as follows:

1. Introduction to Holistic Well-being.
2. Holistic Wellness Program- Nurturing Body and Mind
3. Breaking Bad Habits Workshop.
4. Improving the elements of physical, emotional, social, intellectual, environmental and mental well-being.
5. Creating situational awareness, digital awareness.
6. Understanding substance abuse, consequences and the way out.

Period Distribution

The following are the guided activities suggested for this Audit course.

The Physical Director should plan the activities by the students.

Arrange the suitable Mentor / Guide for the wellness activities.

Additional activities and programs can be planned for Health and Wellness.

S.No	Guided Activities	Period
1	**Introduction to Holistic Well-being** 1. Introduce the core components of Health & Well-being namely Physical, mental and emotional well-being 2. Provide worksheets on all the four components individually and explain the interconnectedness to give an overall understanding.	
2	**Wellness Wheel Exercise (Overall Analysis)**	

	• Guide students to assess their well-being in various life dimensions through exercises on various aspects of well – being, and explain the benefits of applying wellness wheel. • Introduce Tech Tools: • Explore the use of technology to support well-being. • Introduce students to apps for meditation, sleep tracking, or healthy recipe inspiration.	
3	**Breaking Bad Habits (Overall Analysis)** • Open a discussion on bad habits and their harmful effects. • Provide a worksheet to the students to identify their personal bad habits. • Discuss the trigger, cause, consequence and solution with examples. • Guide them to replace the bad habits with good ones through worksheets.	
4	**Physical Well-being** **1. Fitness** Introduce the different types of fitness activities such as basic exercises, cardiovascular exercises, strength training exercises, flexibility exercises, so on and so forth. (Include theoretical explanations and outdoor activity). **2. Nutrition** Facilitate students to reflect on their eating habits, their body type, and to test their knowledge on nutrition, its sources and the benefits. **3. Yoga & Meditation** Discuss the benefits of Yoga and Meditation for one's overall health. Demonstrate different yoga postures and their benefits on the body through visuals (pictures or videos)	

	4. Brain Health Discuss the importance of brain health for daily life. Habits that affect brain health (irregular sleep, eating, screen time). Habits that help for healthy brains (reading, proper sleep, exercises). Benefits of breathing exercises and meditation for healthy lungs. **5. Healthy Lungs** Discuss the importance of lung health for daily life. Habits that affect lung health (smoking, lack of exercises). Benefits of breathing exercises for healthy lungs. **6. Hygiene and Grooming** Discuss the importance of hygienic habits for good oral, vision, hearing and skin health. Discuss the positive effects of grooming on one's confidence level and professional growth. **<u>Suggested Activities (sample):</u>** **Nutrition:** Invite a nutritionist to talk among the students on the importance of nutrition to the body or show similar videos shared by experts on social media. Organize a 'Stove less/fireless cooking competition' for students where they are expected to prepare a nutritious dish and explain the nutritive values in parallel.	
5	**Emotional Well-being** **1. Stress Management** Trigger a conversation or provide self-reflective worksheets to identify the stress factors in daily life and their impact on students' performance. Introduce different relaxation techniques like deep breathing, progressive muscle relaxation, or guided imagery. (use audio recordings or visuals to guide them through these techniques). After practicing the techniques, have them reflect on how these methods can help manage stress in daily life. **2. Importance of saying 'NO'.**	

	Explain the students that saying 'NO' is important for their Physical and mental well-being, Academic Performance, Growth and Future, Confidence, Self-respect, Strong and Healthy Relationships, building reputation for self and their family (avoid earning a bad name). Factors that prevent them from saying 'NO'. How to practice saying 'NO''. **3. Body Positivity and self-acceptance** Discuss the following with the students. ● What is body positivity and self-acceptance? ● Why is it important? ● Be kind to yourself. ● Understand that everyone's unique. **<u>Suggested Activities(Sample):</u>** (Importance of saying 'NO') Provide worksheets to self-reflect on… …how they feel when others say 'no' to them …the situations where they should say 'no' Challenge students to write a song or rap about the importance of saying no and how to do it effectively. Students can perform their creations for the class.	
6	**Social Well-Being** **1. Practicing Gratitude** Discuss the importance of practicing gratitude for building relationships with family, friends, relatives, mentors and colleagues. Discuss how one can show gratitude through words and deeds. Explain how practicing gratitude can create 'ripple effect'. **2. Cultivating Kindness and Compassion** Define and differentiate between kindness and compassion. Explore practices that cultivate these positive emotions. Self-Compassion as the Foundation.	

	The power of small gestures. Understanding another's perspective. The fruits of compassion. **3. Practising Forgiveness** Discuss the concept of forgiveness and its benefits. Forgiveness: What is it? and What it isn't? Benefits of forgiveness. Finding forgiveness practices. **4. Celebrating Differences** Appreciate the value of individual differences and foster inclusivity. The World: A Tapestry of Differences (cultures, backgrounds, beliefs, abilities, and appearances). Finding strength in differences (diverse perspectives and experiences lead to better problem-solving and innovation). Celebrating differences, not ignoring them (respecting and appreciating the unique qualities). Activities for celebrating differences (share culture, learn about others, embrace new experiences). **5. Digital Detox** **Introduce the students to:** The concept of a digital detox and its benefits for social well-being. How to disconnect from devices more often to strengthen real-world connections. **<u>Suggested Activities (sample)</u>**: (Practicing Gratitude) Provide worksheets to choose the right ways to express gratitude. Celebrate 'gratitude day' in the college and encourage the students to honour the house keeping staff in some way to express gratitude for their service.	
7.	**Intellectual Well-being** **1. Being a lifelong Learner** **Give students an understanding on:** The relevance of intellectual well-being in this 21st century to meet	

	the expectations in personal and professional well-being The Importance of enhancing problem-solving skills Cultivating habits to enhance the intellectual well-being (using the library extensively, participating in extra-curricular activities, reading newspaper etc.) **2. Digital Literacy** **Discuss:** The key aspects of digital literacy and its importance in today's world. It is more than just liking and sharing on social media. The four major components of digital literacy (critical thinking, communication, problem-solving, digital citizenship). Why is digital literacy important? Boosting one's digital skills. **3. Transfer of Learning** Connections between different subjects – How knowledge gained in one area can be applied to others. **Suggested Activities(sample):** Intellectual Well-being. Provide worksheets to students for teaching them how to boost intellectual well-being. Ask the students to identify a long-standing problem in their locality, and come up with a solution and present it in the classroom. Also organize an event like 'Idea Expo' to display the designs, ideas, and suggestions, to motivate the students to improve their intellectual well-being.	
8	**Environmental Well-being** 1.The Importance of initiating a change in the environment. **The session could be around:** Defining Environmental well-being (physical, chemical, biological, social, and psychosocial factors) – People's behaviour, crime, pollution, political activities, infra-structure, family situation etc. Suggesting different ways of initiating changes in the environment (taking responsibility, creating awareness, volunteering,	

	approaching administration). **<u>Suggested Activities (sample)</u>**: Providing worksheets to self-reflect on how the environment affects their life, and the ways to initiate a change. Dedicate a bulletin board or wall space (or chart work) in the classroom for students to share their ideas for improving environmental well-being. Creating a volunteers' club in the college and carrying out monthly activities like campus cleaning, awareness campaigns against noise pollution, (loud speakers in public places), addressing anti-social behaviour on the campus or in their locality.	
9	**Mental Well-being** **1. Importance of self-reflection** **Discuss:** Steps involved in achieving mental well-being (self-reflection, self-awareness, applying actions, achieving mental well-being). Different ways to achieve mental well-being (finding purpose, coping with stress, moral compass, connecting for a common cause). The role of journaling in mental well-being. **2. Mindfulness and Meditation Practices** Benefits of practicing mindful habits and meditation for overall well-being. **1. Connecting with nature** Practising to be in the present moment **–** Nature walk, feeling the sun, listening to the natural sounds. Exploring with intention – Hiking, gardening to observe the nature. Reflecting on the emotions, and feeling kindled by nature. **2. Serving people** Identifying the needs of others. Helping others. Volunteering your time, skills and listening ear. Finding joy in giving. **3. Creative Expressions**	

	Indulging in writing poems, stories, music making/listening, creating visual arts to connect with inner selves. **<u>Suggested Activities(Sample):</u>** (Mindfulness and Meditation) – Conducting guided meditation every day for 10 minutes and directing the students to record the changes they observe.	
10	**Situational Awareness (Developing Life skills)** **1. Being street smart** **Discuss:** Who are street smarts? Why is it important to be street smart? Characteristics of a street smart person: Importance of acquiring life skills to become street smart – (General First-aid procedure, CPR Procedure, Handling emergency situations like fire, flood etc). **2. Digital Awareness** **Discuss:** Cyber Security Information Literacy Digital Privacy Fraud Detection **<u>Suggested Activities</u>** (sample): (Street Smart) Inviting professionals to demonstrate the CPR Procedure Conducting a quiz on Emergency Numbers	
11	**Understanding Addiction** **Plan this session around:** Identifying the environmental cues, triggers that lead to picking up this habit. Knowing the impact of substance abuse – Adverse health conditions, social isolation, ruined future, hidden financial loss and damaging the family reputation. Seeking help to get out of this addiction. **<u>Suggested Activities</u>**:	

	Provide Worksheets to check the students' level of understanding about substance addiction and their impacts. Share case studies with students from real-life. Play/share awareness videos on addiction/de-addiction, experts talk. *Conduct awareness programmes on Drugs and its ill effects. (Arrange Experts from the concerned government departments and NGOs working in drug addiction issues) and maintain the documents of the program.	

Closure:

Each student should submit a Handwritten Summary of their Learnings & Action Plan for the future.

Assessments:

- Use Self-reflective worksheets to assess their understanding.
- Submit the worksheets to internal audit/external audit.
- Every student's activities report should be documented and the same have to be assessed by the Physical Director with the mentor. The evaluation should be for 100 marks. No examination is required.

Scheme of Evaluation

Part	Description	Marks
A	Report	40
B	Attendance	20
C	Activities (Observation During Practice)	40
Total		100

References/Resource Materials:

The course acknowledges that individual needs for references and resources may vary. However, here are some general reference materials and resources that may be helpful:

1. **The Well-Being Wheel:**

2. **Facilities & Spaces:** Some activities may require access to specific facilities, resources or spaces. Students may need to coordinate with the college administration to reserve these as required.
3. **Online Resources:**
    1. United Nations Sustainable Development Goals - Goal 3 - Good Health & Well-Being: https://www.un.org/sustainabledevelopment/health/
    2. Mindfulness and Meditation: Stanford Health Library offers mindfulness and meditation resources: https://healthlibrary.stanford.edu/books-resources/mindfulness-meditation.html

3. Breaking Bad Habits: James Clear provides a guide on how to build good habits and break bad ones: https://jamesclear.com/habits
4. 6 Ways to Keep Your Brain Sharp https://www.lorman.com/blog/post/how-to-keep-your-brain-sharp
5. What Is Social Wellbeing? 12+ Activities for Social Wellness https://positivepsychology.com/social-wellbeing/
6. How Does Your Environment Affect Your Mental Health? https://www.verywellmind.com/how-your-environment-affects-your-mental-health-5093687
7. How to say no to others (and why you shouldn't feel guilty) https://www.betterup.com/blog/how-to-say-no

- - - - 23 - 880*	**Growth Lab**
AUDIT	

*(First four digits in the subject code is branch code and Seventh digit is Semester)

Skill Areas:

Self-Discovery, Habit Formation, Mind-set Development.

Learning Outcomes:

The Growth Lab aims to provide students with various learning outcomes, including:

1. Develop personal ethics, a growth mind-set, and strong communication skills.
2. Practice effective time management, overcoming challenges, and teamwork.
3. Master academic skills like reading, writing, and goal setting.
4. Become job-ready through resume building, interviewing, and resource utilization.
5. Reflect on their growth journey and articulate its impact.

Focus:

While organizing and participating in the Growth Lab, students should focus on the following key areas:

1. **Mindful Habits:** Emphasize the importance of cultivating mindful habits in their daily lives. Encouraging students to be conscious of their actions, thoughts, and emotions can help them identify any negative patterns and replace them with positive and empowering habits.
2. **Self-reflection:** Students should engage in self-reflection to gain deeper insights into their own strengths, weaknesses, and areas for improvement. Taking the time to reflect on their experiences and learning helps in identifying personal growth opportunities.
3. **Goal Setting:** Students should set clear goals for their personal and professional development. Encourage students to set specific, measurable, achievable, relevant, and time-bound (SMART) goals.

Role of the Facilitator:

Department faculty shall play a crucial role in organizing the Growth Lab. Their responsibilities include:

1. **Facilitation:** Faculty lead and guide the students throughout the Growth Lab sessions. They provide instructions, facilitate discussions, and offer insights to foster a

stimulating learning environment. They ensure that the sessions are engaging, interactive, and conducive to student participation.

2. **Mentorship:** Facilitators should Provide clear explanations and guidance on the importance of cultivating mindful habits in their daily lives and engaging in self-reflection. Help students understand how these practices contribute to their personal growth and development.

Guided Activities:

The Growth Lab shall incorporate the following guided activities to support the development of students. Here are some examples of guided activities that could be included:

Period Distribution: Depends on the Curriculum Allocation

S.No	Guided Activities	Period
1	**Ethics and Values for Growth** **1. Avoiding Absenteeism** Discuss: Why regular attendance matters? Quick Quiz/Self-reflective worksheet on absenting for something other than being super sick. Brainstorm consequences of absenting often. (becomes a habit, affects productivity, lose inclusivity). How to avoid absenteeism – Initiate group discussion among students. Explain how the habit of absence often affects growth at the workplace. **2. The Importance of Obeying Rules** Talk about college rules and why they're important for students' success. Explain the benefits of following the rules (safe, respectful and productive environment). Consequences of breaking the rules (warnings to fines, academic sanctions, or even expulsion). Connect how the habit of disobeying the rules will affect growth in the workplace. **3. Identifying personal values**	

	Provide self-reflective worksheets to understand how students' get affected when others do not adhere to ethics and values. Help them identify their own ethics and values that they uphold. Explain how upholding ethics and values is important for professional success citing examples from real life. **<u>Suggested Activities (sample – Avoiding Absenteeism)</u>** Peer accountability partner – pair students up and have them check in with each other regularly to ensure both are attending class regularly. Provide statistics on the loss incurred by a company due to frequent absenteeism by employees. Ask students to prepare a comical skit on absenteeism and its consequences.	
2	**Identifying Strengths and Weaknesses** **1. Overcoming Self-doubt** Provide worksheets to check whether the students have felt unsure about doing something new. Briefly discuss self-doubt and how it can feel like a monster holding us back. Introduce strategies to overcome self-doubt - Train the students to say instead of "I can't," say "I'll try my best" or "I'm learning", focus on progress, and learn from mistakes. **2. Overcoming Procrastination** Ask students (worksheet/oral discussion) how they feel when they put off a task until the last minute. Brainstorm the consequences of procrastination (creates a cycle of avoidance and stress). Introduce strategies to overcome procrastination (Breaking down tasks and setting small goals, self-rewarding). **3. Overcoming Distractions** Help students identify the distractions (phones, social media, noise, conflicts with friends, hanging out with friends often, movies). Discuss the impacts of distractions on productivity and growth. Introduce strategies to fight the Distractions (introduce pomodoro	

	technique). **<u>Suggested Activities (sample –Over Coming Self-doubt)</u>** Present a challenge to the students, it could be anything from narrating a story, mimicking, singing, dancing, talking about their family. Encourage them to overcome their self-doubt and perform in front of their classmates. Finally ask them to express how they felt while performing.	
3	**Cultivating Growth Mind-set** **1. Cultivating Determination** Explain what determination is (hard work, not giving up, being ready to face challenges). Show videos/share stories of successful people who overcame challenges to achieve something big for them or the society. Define the ways to cultivate determination (setting SMART goals, learning from mistakes, celebrating every small win). **2. Cultivating Positive Habit Change** **Discuss:** Impact of habits on one's actions and decisions (triggers automatic responses, decision making). Impact on skills and abilities (practice makes progress). Impact on personal growth and well-being (confidence building, positive lifestyle). Impact on overall success (reaching goals, building discipline). Ways to switch to positive habits (use self-reflective worksheets to identify students' habits). **3. Time-management** Teach students the importance of prioritizing tasks for effective results. (important and urgent) Teach them prioritization matrix for organizing tasks, projects and ideas **<u>Suggested Activities (sample – Overcoming Procrastination)</u>** Host a procrastination-free week, ask students to team up and commit	

	to spending a week without procrastinating on any task or assignment. Announce a reward or incentive for the winning team. Also encourage them to share their feeling when they complete the tasks without procrastinating.	
4	**Improving the Basic Skills** **1. Reading, Writing and Speaking Practice** Train the students to read, write and speak fluently in English/Regional language. **2. Letter Writing Practice** Train the students in letter writing in English (leave letter, permission letter, apology letter) by providing them formats. **<u>Suggested Activities (sample -speaking practice)</u>** Create a WhatsApp group and share short animation English videos (maximum one minute long). Ask the students to listen to the dialogues, repeat it in their voice, record the same and send back. Observe their progress through the semester and reward them duly. **Letter Writing Practice** – set up a 'Mysterious Mailbox' in the classroom, encourage the students to write letters (leave letters, permission slips, apology letters), collect the letters and distribute them for others to analyse and give feedback.	
5	**Goal Setting and Mind Mapping** 1. Teach mind mapping & ask students to make mind maps for visualizing their personal goals. 2. Guide students in setting SMART goals for the semester. **<u>Suggested Activities (sample)</u>** Encourage students to take up at least one-value added course and receive certification per semester	
6	**Interpersonal Skills** Introduce the components of Interpersonal Skills such as: Communication Skills (verbal/non-verbal communication) Speaking, listening, body language. Problem-solving Skills (conflict resolution, negotiation, team work).	

	Team work. Flexibility. Patience. Educate students that how interpersonal skills help in building healthy relationships in personal and professional life. **<u>Suggested Activities (Sample)</u>** Organize a guest lecture on the importance of interpersonal skills by inviting a HR Personnel to educate the students (Especially communication skills)	
7	**Interview Skills** Introduce Resume Writing to students (conduct frequent resume writing drills through the semesters, and ask them to review the same to understand whether they have progressed in all areas). Train the students in self-introduction. Train the students in group discussions (Initiating a discussion, countering participants, using appropriate phrases to interrupt etc.). Introduce Interview ethics (body language, grooming, presentation). Cultivating the habit of researching (to know the profile of companies, their operating style, activity) **<u>Suggested Activities (sample)</u>** Conduct frequent mock interviews to train the students in the above interview skills. Stream videos of mock interviews.	
8	**Utilizing the Available Resources for Growth** Arrange a campus tour for the students to know the available facilities such as libraries, laboratories etc. Encourage the students to enrol in (online/offline) courses available in the college. Guide the students to use social media for their personal and professional growth (browsing for the latest trends in engineering and technology, following entrepreneurs on social media to understand	

	their journey, to check for institutions for higher studies etc). **Networking & Connecting** Help students connect with their alumni for guidance for their studies and career growth. Encourage students to follow entrepreneurs, eminent businessmen on a regular basis to stay updated and ask them to share the information in the class to inspire others. **<u>Suggested Activities (sample – Networking and connecting.</u>** Identify alumni who would be interested to contribute for the growth of the students and connect them with students for guidance in their studies and career growth.	
9	**Final Oral Presentation & Impact Assessment: *** 1. Give students an opportunity to present their semester's journey and the changes they have experienced. 2. Faculty shall compile a brief report assessing program impact based on student feedback.	

Closure: End of the semester a half-day session shall be given for the students to share their transformation and feedback can be collected about his self-reflection on the impact of the program. The faculty must submit a brief report by assessing every student's development on the impact of the program, comparing their initial state at the beginning of the semester with their progress at the end.	
Assessments: ● Use self-reflective worksheets to assess students' understanding. ● Subject the worksheets to internal/external audit.	

References / Resource Materials:

For the Growth Labs, the following references and resource materials may be utilized to support the learning and development of the students:

1. Facilities & Spaces: Growth labs may require access to specific facilities, resources or spaces. Faculty may need to coordinate with the college administration to reserve these as required.

Online Resources:

1. How to Begin Your Self-Discovery Journey: 16 Best Questions https://positivepsychology.com/self-discovery/
2. How to break a bad habit? https://www.health.harvard.edu/blog/how-to-break-a-bad-habit-202205022736
3. How To Mind Map Yourself For Growth? https://mindmapsunleashed.com/how-to-mind-map-yourself-for-growth
4. Interpersonal Communication and Its Importance at Work https://www.indeed.com/career-advice/career-development/importance-of-interpersonal-communication
5. Personal Responsibility: Embracing Accountability in Life https://www.graygroupintl.com/blog/personal-responsibility
6. The Power of Prioritization: Why You Need It in Your Life https://medium.com/@Jd-Lewis/the-power-of-prioritization-why-you-need-it-in-your-life-5fd49c7c2f6c#:~:text=Prioritization%20helps%20you%20make%20informed,achieve%20more%20in%20less%20time.
7. How To Write An IT Fresher Resume: A Step-By-Step Guide https://in.indeed.com/career-advice/resumes-cover-letters/how-to-write-it-fresher-resume
8. How to Overcome Self Doubt https://www.wikihow.health/Overcome-Self-Doubt
9. The Surprising Health Benefits of Bird-Watching https://www.nytimes.com/2022/12/10/well/move/bird-watching-health-benefits.html
10. Positive Daily Affirmations: Is There Science Behind It? https://positivepsychology.com/daily-affirmations/

- - - - 23 - 881*	**Induction Program**
AUDIT	

*(First four digits in the subject code is branch code and Seventh digit is Semester)

Induction Program - I (One Week) Should be scheduled at the First Week after reopening as per the schedule.

Induction Program - II (As per the curriculum) Should be scheduled in the beginning of the III Semester.

Induction Program - III (One Week) Should be scheduled at the beginning of the V Semester.

Skill Areas:

Interpersonal Skills, Academic Orientation, Technical Skills Development, Soft Skills and Communication, Study Skills and Time Management, Healthy and Safety Environmental Awareness, Ethics and Professionalism, awareness on drug addiction and its related physical and mental health issues, Career Guidance and Industry Interaction, Extracurricular Activities and Personal Development.

Purpose:

The transition from school to college life is one of the most challenging events in a student's life. The Induction Programme helps new students adjust, learn institutional values, build bonds, and explore the institutional policies, processes, practices, culture, universal human values, and get introduced to DOTE regulations, overview of the diploma programme, and prospective skill areas.

Learning Outcomes:

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

1. Feel comfortable in the new college environment.
2. Understand the curriculum, preparing for their academic journey comprehensively.
3. Get introduced to various committees recommended by AICTE
4. Experience diverse activities, promoting holistic development.
5. Connect with faculty, including the Principal, HoD, and department faculty.
6. Interact with industry professionals and alumni.
7. Learn about the resources needed for skill development.
8. Understand professional ethics and responsibilities in technical fields.
9. Aware of career opportunities and pathways in technical fields

10. Aware of student support services, including counselling and mentorship.
11. Train in effective communication, presentation skills, public speaking, teamwork and collaboration exercises.
12. Awareness of drug addiction and its related health issues.

Focus:

The induction program focuses on providing clarity and support for a successful academic journey and holistic development of students. Key areas include adjustment, comfort in the new environment, fostering institutional culture, building bonds, and promoting self-exploration. Some key focus areas include,

1. Credit System and GPA/CGPA Assessment.
2. Diverse Classes at the End.
3. Theory, Laboratory, and Practicum Sessions.
4. Assessment Methods.
5. Internship Opportunities.
6. Fast Track Courses.
7. Exposure to Extracurricular Activities.
8. Course Add/Drop.
9. Examination Withdrawal.
10. Role of a Mentor.
11. Choosing Pathways.
12. The importance of understanding the Universal Human Values.
13. Role of DOTE in diploma programme.
14. Role of AICTE in diploma programme and the various committees and their objectives recommended by Dote and AICTE.

Role of the Facilitator

The SIP committee comprises the Head of the Institute, Heads of various departments, Senior Faculty, Senior Students (Second and Final Year), and Alumni. Their roles are as follows:

1. **Head of the Institute:** Explains new regulations from DoTE, institute rules, and significant changes in the new regulations.
2. **Head of the Department:** Walks through department facilities, and discusses achievements of senior and alumni students, placement training and assistance, Entrepreneur development activities, higher education ideas.
3. **Senior Faculty**: Guides diploma students on post-program pathways with faculty

mentor assistance.

4. **Senior Students:** Introduce student clubs, and conduct department and lab tours.
5. **Alumni:** Share the growth opportunities available to diploma students, recent trends and placement opportunities in the relevant field, entrepreneurship ideas and the available resources for the same.

Guided Activities:

The SIP should have the below list of activities.

Period Distribution

Induction Program - I

S.No	Guided Activities	Period	Day
1	Registration, Formation of student classroom groups of respective programs & Formation of Student Representatives		
2	Presentation cum Interactive Session with Important Institution Functionaries like Head of Institute, Principal, HoDs, etc.		
3	Visit to departments & facilities of the Institution. Motivate students to utilize library, sports facilities, Institution Innovation Council's (IIC) opportunities, Entrepreneur Development Cell, Skill Development and Training facilities, Placement opportunities and other amenities		
4	Ice breaking activity for the new students & Self Introduction of some newly joined students		
5	Introduction to Various Clubs & Community Initiatives; A short session on the importance of joining such initiatives will be taken. The activities may include: Cultural Activities, Movie shows,		

	Sports Activities, Visits to museum, community centres, club relevant field visits. Quiz Literary Activities such as, Tamil/English debate, discourses etc..		
6	Introduction to Committees/Associations and their Functions. (Committees of High Importance) Vishaka Committee Anti-ragging Committee Grievance Redressal mechanism SC/ST Committee etc. **Other Preferred Committees/Associations** Alumni Association etc. Department Associations		
7	Interaction with Senior Students		
8	Interaction with Alumni Students		
9	Talks, Lectures or Workshops by Eminent People from varying domains - This may include hackathon, ideation camps, motivational talks, personality development, universal human values, career development, group activities, social awareness lectures etc		
10	Talk on Respective Program scheme of studies and details of courses, examination pattern, types of courses, credit system, assessment methods, examination withdrawal, internship, passing and eligibility criteria, attendance requirements and board exam guidelines by respective program coordinator Educate the students on the importance of preparing reports on internships attended during the programme		

11	Industrial Interaction; Local Industrial Visits or Interactions with Industry Experts invited to the Induction. Providing guidelines on following safety measures, undertaking from both students and parents, maintaining discipline during these activities		
12	• Awareness talks on “drugs and its ill effects” should be arranged. • College authorities has to explain the various mechanism to control the drug consuming and peddling drugs in their college premises		
Induction Program - II The induction programme for the Second Year can be planned. (You may include the above mentioned activities) in addition to the following activities. Emphasis on the importance of improving the academic performance as the students are in their Second Year. Guide students for the Academic and Internship Programmes. Guide students on choosing the elective subjects. Guide students on ● Project Selection. ● Student Batch Identification. ● Financial Planning and Transparent Transaction. ● Synopsis Writing. ● Execution of the Project. ● Project Reviews and Presentation. ● Preparing Project Report. ● Project Assessment Pattern. ● Board Exam Evaluation Pattern. ● Dote Prescribed Norms for the Project. Awareness program of, ● Anti-ragging guidelines,			

• Internship policy guidelines & procedures • Grievance Redressal mechanism • Vishaka committee guidelines • Sexual Harassment of Women (Prevention, Prohibition and Redressal) • Awareness talks on “drugs and its ill effects” should be arranged. • College authorities has to explain the various mechanism to control the drug consuming and peddling drugs in their college premises		
Induction Program - III The induction programme for the Final Year. (You may include the above mentioned activities in addition to the following activities). As the focus and the weightage are mainly on project work, internship and fellowship: Impart in depth Knowledge on • In-house projects • Internship • Fellowship Instruct the Dos and Don’ts on the above. Guide students on the report preparation for the above. Explain the DOTE’s Objective behind the periods allotted for the above. A Talk by training and placement cell; Career opportunities for students, placement activities in college; placement process which includes introduction to platforms that offer value-added courses such as: SWAYAM NPTEL, CIICP, TCS ION CAREER EDGE, Self-assessment Platform - Parakh Portal. Awareness Program on Competitive Exams such as TNPSC, SSC, JEEE. Introduction to AICTE internship programs.		

Awareness Program about the Non Resident Tamils Rehabilitation and Welfare. Experts from the Commissionerate of Rehabilitation and Welfare Non Resident Tamils can be called for this session. The following contents can be included. Understanding the different types of migration and employment opportunities. Learning about the legal requirements and documentation needed for migration. Exploring the cultural and social aspects of living and working in a foreign country. Identifying common challenges and risks associated with migration, such as exploitation, discrimination and human trafficking. Providing guidance on how to reach and evaluate potential employers and job offers. Educating students about their rights and responsibilities as migrant workers. Offering practical advice of financial management, healthcare, and personal safety while abroad. Highlighting the importance of maintaining communication with family and seeking support when needed. By incorporating this into the induction program, we can empower our youth with the knowledge and skills they need to make informed decisions and migration and protect themselves from potential risks.		

Recording the Activities

SIP is intended for ice-breaking and familiarization purposes; hence no student assessment is required. However, documenting visitors' and students' feedback is highly recommended. Also, submitting the prepared report for internal/external audit is encouraged.

For every induction programme conducted, a report may be prepared in the following format.

Preparing Invitation and Poster

Report

Programme:

Theme:

Duration:

Date/Time:

Resource Person (internal/External):

Objective:

Outcomes:

Photograph:

Feedback:

Collection of student feedback on induction program - Make a report of Induction program by collecting student feedback

References/Resource Materials:

Regulation 2023 (R-2023) SOP given by DoTE.

60 Awesome Icebreakers for Orientation and Beyond:

https://sapro.moderncampus.com/blog/60-awesome-icebreakers-for-orientation-and-beyond

AICTE INTERNSHIP POLICY GUIDELINES & PROCEDURES

http://www.aicte-india.org/sites/default/files/Aicte%20Internship%20Policy-%2002.04.2019.pdf

AICTE Link Safety of Students in and Outside of Technical Campus

https://www.aicte-india.org/downloads/AICTE_Circular.PDF

Grievance Redressal mechanism:

https://aicte-india.org/bureaus/grievance-redressal

https://www.aicte-india.org/sites/default/files/approval/2023-24/Appendix-6.pdf

Vishaka committee guidelines:

https://www.vishaka.org/#:~:text=Vishaka%20reinforces%20ICC%20formation%20with,Right%20Act%20of%201964%20compliance.

Anti-ragging guidelines: https://www.aicte-india.org/downloads/Antiragging.doc

GUIDELINES

Induction Program - I (One Week) Should be scheduled at the First Week after reopening as per the schedule.

Day 1: FN: Registration and Inaugural Session.

(Welcome and Brief about the college, and their academic program. Rules and Regulation guidelines, Orientation, Familiarization College, Dept./ Branch)

Day 1: AN: Familiarization about the Dept./ Branch.

Day 2: FN: Literary activity

Day 2: AN: Proficiency Modules

Day 3: FN: Lectures & Workshops by Eminent People

Day 3: AN: Visits to the College Common areas, Respective Department facilities.

Day 4: FN: Extra-Curricular Activities in College, Awareness talk on Drug addiction and its ill effects

Day 4: AN: Mentor-mentee groups meet

Day 5: FN: Interaction Session

Day 5: AN: Feedback and Report on the Program and Valedictory Session

Note: Inauguration and Valedictory can be conducted commonly; other sessions can be organised in the respective department.

Induction Program - II (As per the curriculum) Should be scheduled in the beginning of the III Semester.

Brief sessions about the importance of the Diploma Program, Growth and opportunity for higher education and employability.

Guidelines to select the Electives and Projects. Alumni, Industrial experts and Senior faculties can be engaged for this program.

Conduct Awareness programs on Drug addiction and its ill effects

Induction Program - III (One Week) Should be scheduled at the beginning of the V Semester.

Day 1: FN: In-house projects, Internship, Fellowship

Day 1: AN: Online Skill Courses

Day 2: FN: Employability Skills - I (Industry Awareness and Trends)

Day 2: AN: Employability Skills - II (Resume Building and Job Application Skills)

Day 3: FN: Employability Skills - III (Interview Preparation, Technical Skill Enhancement)

Day 3: AN: Employability Skills - IV (Soft Skills and Communication)

Day 4: FN: Employability Skills - V (Entrepreneurship and Innovation)

Day 4: AN: Employability Skills - VI (Career Counselling and Guidance)

Day 5: FN: College to Corporate (Ethics and Professionalism, Emotional Intelligence and

Stress Management)

Day 5: AN: Non Resident Tamils Rehabilitation and Welfare Program

- - - - 23 - 884*	**Student-Led Initiative**
AUDIT	

*(First four digits in the subject code is basic Engg. / branch code and Seventh digit is Semester)

Skill Areas:

Team Work, Presentation Skills, Communication.

Purpose:

The aim is to promote active participation and collaboration among students, allowing them to learn from each other. One such initiative is the student-led tech talk series, where students can share knowledge and explore new technologies. These initiatives also provide resources and support to help students achieve their personal and career goals with guidance from the educational institutions.

Learning Outcomes:

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

1. Collaborate and Communicate effectively
2. Develop interpersonal skills with self-confidence and resilience
3. Foster a culture of collaborative learning with peers by sharing knowledge effectively.

Focus:

When conducting a student-led initiative, there are several focus areas that students should keep in mind to ensure a successful and impactful endeavour. Here are some key areas to consider:

1. Teamwork
2. Planning and Execution
3. Personal Growth and Learning

Role of the Facilitator:

The role of a college faculty facilitator in student-led initiatives is crucial in providing guidance, support, and mentorship to the student participants. Here are some key aspects of the faculty facilitator's role:

1. **Mentorship and Coaching:** Faculty facilitators act as mentors, providing one-on-one or group coaching to students involved in the initiative. The faculty facilitator serves as an

advisor, offering expertise, knowledge, and feedback to guide students in the planning and implementation of their initiatives.

2. **Resource Support:** Faculty facilitators assist students in accessing resources necessary for the success of their initiatives. They can help students identify relevant research or technical expertise.

Guided Activities:

In a student-led initiative, various guided activities can be implemented. Here are some guided activities to be undertaken:

1. Identify Technology Areas/Themes
2. Team Formation for the Presentation
3. Oral Presentation Preparation
4. Oral Presentation
5. Feedback
6. One Page Report

Note: *The student teams are expected to conduct an Oral Presentation in a seminar format, which means they* ***don't*** *need to create presentation slides. Instead, they will present their content through verbal communication during the presentation.*

Period Distribution

S.No	Guided Activities	Period
1	Introduction and Briefing 1. Identification of 8-10 Emerging Trends/Technology by the faculty 2. Briefing of the 8-10 Emerging Trends/Technology to the students	
2	Team Formation for the Presentation 1. Team of 4 students are formed based on the topic that is selected 2. Faculty assigns the roles and responsibilities of each student in the team	

3	Oral Presentation Preparation 1. Students browse the topics or go to the library to learn the topics for the presentation 2. Students develop contents for the presentation 3. Faculty mentor the students to form a outline for the presentation in the following format a. Introduction b. Working Principle c. Advantages & Limitations d. Applications	
4	Oral Presentation 1. Students need to prepare & deliver the Oral presentation based on guidelines prescribed by the Faculty mentor 2. Deliver within the allotted time of 15 minutes 3. Include a Q&A Section covering a maximum of 3 minutes	
5	Feedback 1. Mentor gives the feedback to the student team about a. Presentation Contents b. Presentation Delivery/Quality c. Suggestions for improvisations for individual student	
6	One Page Report 1. Each Student submits a handwritten one-page summary of the oral presentation	

Rubrics for the Evaluation

Category		SCORE			
		5—Excellent	**3—Good**	**2—Fair**	**1—Needs Improvement**
A	**Quality of oral Presentation**	Well-structured Content and clear presentation; engages the audience with good preparation and confidence.	Sufficiently clear content and reasonably organized; presents with moderate confidence.	Somewhat clear with basic organization; needs improvement in coherence and confidence.	Unclear about topic and disorganized presentation; lacks coherence and preparation.
B	**Communication**	The delivery is confident, natural, and engaging. The student maintains excellent eye contact, gestures appropriately, and uses a clear and well-modulated voice.	The delivery is mostly confident and engaging but may have some minor areas for improvement in eye contact, gestures, or vocal delivery.	The delivery is somewhat engaging, but there are noticeable issues with eye contact, gestures, or vocal delivery.	The delivery is hesitant, and the student struggles with eye contact, gestures, or vocal delivery.
C	**Teamwork**	The team runs perfectly coordinated, with clear guidelines about each member's role. Each member has participated.	The team was mostly coordinated, but there were some moments of doubt and/or unbalance. A minority of the members of the group did not know what to do.	One or two members of the group have focused most of the presentation. The rest of the group did not have clear instructions about their role.	The team did not know when to speak, or what role they were having. Only one person leads the group.
	SCORE	(A+B+C)/15 Points			

Closure:

After finishing their student-led initiatives, each team member must write a one-page summary of the oral presentation by hand. This summary should include topics covered in the Oral presentation.

Assessments:

No formal assessments are required for the student-led initiatives since it's just a platform for peer-to-peer to exchange knowledge and skills.

References/Resource Materials:

Student-led initiatives may require a variety of resource materials to support their planning, implementation, and success. Here are some general requirements:

1. **Informational Resources:** These include textbooks, reference materials, and online information relevant to the topic or theme of the initiative.
2. **Facilities and Spaces:** Some initiatives may require access to specific facilities or spaces for presentations. This can include classrooms, laboratories, meeting rooms, performance spaces, exhibition halls, or outdoor areas.
3. **Online Resources:**
    1. How to Do a Presentation in Class? - https://www.wikihow.com/Do-a-Presentation-in-Class
    2. How to Give a Short Class Presentation Competently? - https://www.instructables.com/How-to-Give-a-Short-Class-Presentation-Competently/
    3. Best Practices for Oral Presentation: https://www.uow.edu.au/student/learning-co-op/assessments/presentations/
    4. How to keep up with the latest emerging trends? - https://pakwired.com/latest-technology-trends/
    5. Body Language Tips for Presentation - https://www.toastmasters.org/resources/public-speaking-tips/gestures-and-body-language

- - - - 23 - 883*	**SHOP FLOOR IMMERSION**
AUDIT	

*(First four digits in the subject code is Basic Engg. / Branch code and Seventh digit is Semester)

Skill Areas: 5S Methodology, LOTO, Six Sigma, ISO, SAP, Agile Methodology, etc…

Note: Any one industrial practices can be planned for every semester.

Purpose:

First semester, students will learn about the importance of '5S' through a shop floor workshop. '5S' helps reduce waste and improve productivity by organizing the workplace and using visual cues. It involves five steps: sort, set in order, shine, standardize, and sustain.

Learning Outcomes:

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

1. Creates an organised and clean environment in their lab/workshop
2. Acquire self-discipline as they need to maintain the standards
3. Identify and eliminate wastes
4. Creating a safe workplace by reducing accidents caused by external factors

Focus:

This course introduces the important concept of 5S, a fundamental skill used in various industries. It focuses on workplace organization and efficiency, which is essential for students entering the industry.

The 5S Methodology includes five steps:

- Sort: Remove unnecessary items to tidy up the space.
- Set In Order: Organize the work area with a place for everything.
- Shine: Clean and maintain the area to prevent dirt and grime.
- Standardize: Create written procedures to make new practices a norm.
- Sustain: Continuously commit to maintaining the organized and efficient workspace.

Additionally, safety is integrated throughout all the steps to improve workplace safety, not just efficiency.

Role of the Facilitator:

Faculty introduce the concepts of 5S to the students and assign a specific activity to each team of 4 students and guide them to implement 5S to a specific lab or workshop.

Guided Activities:

In the shop floor immersion course, few activities can be implemented to reach the desired course outcome. Here are some guided activities to be undertaken:

1. **Workshop (Learning Session):** The Faculty can take a session 5S Methodology covering the aspects of 5S like; What is 5S?, Why use 5S?, Advantages & Limitations, Case Studies, The 6th S - Safety.

2. **5S Implementation:** Students will implement 5S in a chosen lab. Faculty guides lab selection, assesses its state, gathers inventory, plans resources. After implementation, a post-assessment is done with faculty guidance.

Period Distribution

S.No	Guided Activities	Period
1	Workshop (Learning Session) 1. Faculty will conduct Session on 5S Methodology and its significance in the industry 2. Faculty need to conduct a Q&A Section to address questions, concerns & clarifications related to 5S	2
2	5S Implementation 1. Preparation: a. Faculty should identify lab/workshop needing 5S implementation b. Faculty will form a teams of 4 students	6

	2. Implementation a. Develop an implementation plan for 5S b. Document lab's current state by taking a photograph c. Proceed with the implementation of 5S by assigning specific jobs to the student teams.	

Closure:

The faculty in charge of the session is responsible for maintaining a one page record of the 5S implementation in the lab along with the "before" and "after" photographs.

Assessments:

No assessments are required for students. The facilitator monitors & guides the students to implement the practical implementation of 5S in the lab/workshop.

References/Resource Materials:

The references and resource materials required may differ depending on the department and type of lab 5S implementation is done. However, here are some general reference materials and resources that may be helpful:

1. **Facilities and Spaces:** 5S Implementation may require access to specific facilities or spaces. This can include access to workshops or labs.

2. **Online Resources:**
    1. What is 5S?: https://www.graphicproducts.com/articles/what-is-5s/
    2. 5S Guide: Improve efficiency with effective organisation: https://leanscape.io/what-is-5s-and-what-are-its-benefits/
    3. How to implement 5S in Workplace? https://www.simplilearn.com/implementing-5s-methodology-to-achieve-workplace-efficiency-article

Note: Every semester any one activity can be planned as above.

- - - - 23 - 885*	**Emerging Technology Seminars**
AUDIT	

*(First four digits in the subject code is Basic Engg. / Branch code and Seventh digit is Semester)

Skill Areas:

Knowledge Enhancement, Communication Skills, Confidence Building, Awareness of Trends.

Learning Outcomes:

1. Research Skills: Students learn how to gather information, analyze data, and present findings. This enhances their research abilities.
2. Presentation Skills: By delivering seminars, students improve their presentation techniques, including slide design, body language, and engaging with the audience.
3. Critical Thinking: Preparing for seminars encourages critical thinking. Students evaluate different perspectives, assess evidence, and form well-reasoned arguments.
4. Networking: Seminars provide opportunities to connect with industry professionals, guest speakers, and fellow students. Networking is crucial for future career prospects.
5. Time Management: Balancing seminar preparation with other academic tasks teaches students effective time management.

Role of the Facilitator:

The department faculty will be the facilitator. All the students will be given opportunity to prepare a seminar on the selected topic during the Library periods also. Each student should present on topic for about 10 minutes. The faculty in-charge should make the necessary facility for the presentation. The HOD is requested to deploy at least two staff members for the Assessment during the presentation.

Guided Activities:

Preparation

1. Select a Relevant Topic:
    - Choose an emerging technology that is relevant to the engineering field and has significant current and future impact.

- Ensure the topic is neither too broad nor too narrow, allowing you to cover it comprehensively within the given time.

2. Research Thoroughly:
    - Gather information from reputable sources such as academic journals, industry reports, and expert interviews.
    - Stay updated with the latest developments and advancements related to your chosen technology.
3. Define Objectives:
    - Clearly outline the learning objectives of your seminar. What should the audience learn or understand by the end of your presentation?
4. Structure Your Presentation:
    - Introduction: Introduce the topic and explain its importance.
    - Body: Discuss the key aspects of the technology, including its principles, applications, benefits, and challenges.
    - Conclusion: Summarize the main points and discuss future prospects.
5. Create Visual Aids:
    - Develop slides that are visually appealing and easy to understand.
    - Use diagrams, charts, images, and videos to illustrate complex concepts.
    - Keep text minimal on slides; use bullet points and short phrases.
6. Prepare Supporting Materials:
    - Provide handouts or digital resources for further reading.
    - Prepare a list of references and sources for credibility.

Presentation

1. Practice:
    - Rehearse your presentation multiple times.
    - Time yourself to ensure you stay within the allotted time.
    - Practice in front of friends or colleagues to get feedback.
2. Engage Your Audience:
    - Start with a compelling opening to grab attention.
    - Use questions and interactive elements to involve the audience.
    - Encourage participation and allow time for Q&A sessions.
3. Communication Skills:
    - Speak clearly and confidently.
    - Maintain eye contact with your audience.

- Use appropriate gestures and body language.

4. Use Technology Effectively:
    - Ensure your presentation equipment (laptop, projector, microphone) is set up and functioning properly.
    - Be familiar with the software you are using for your slides.
5. Handle Questions Gracefully:
    - Listen carefully to questions from the audience.
    - Answer clearly and concisely. If you don't know the answer, acknowledge it and offer to find out later.

Follow-Up

1. Feedback:
    - Collect feedback from your audience to understand what worked well and what can be improved.
    - Use this feedback to refine future presentations.
2. Provide Additional Resources:
    - Share your presentation slides and any additional resources with your audience.
    - Offer to answer further questions via email or a discussion forum.
3. Stay Updated:
    - Continue to follow developments in your chosen technology area.
    - Update your presentation and materials as new information becomes available.

Rubrics for the Evaluation:

1. **Content Quality (40%)**
    - Relevance: The topic is relevant to the field of engineering and is current.
    - Depth of Research: The presentation demonstrates thorough research with accurate and up-to-date information.
    - Clarity of Objectives: Clear objectives are defined and met during the presentation.
    - Comprehensiveness: The topic is covered comprehensively within the scope and time limits.
    - Accuracy: Technical details are correct and well-explained.

2. **Presentation Skills (30%)**
    - Clarity and Coherence: The presentation is clear, logically structured, and easy to follow.
    - Engagement: The presenter engages the audience and maintains interest throughout the presentation.
    - Communication: The presenter speaks clearly and confidently, using appropriate language and terminology.
    - Visual Aids: Slides and other visual aids are well-designed, relevant, and enhance the presentation.
3. **Delivery (20%)**
    - Confidence and Poise: The presenter appears confident and handles the presentation smoothly.
    - Body Language: Appropriate body language, gestures, and eye contact are used.
    - Time Management: The presentation is well-timed, adhering to the allotted duration.
    - Handling Questions: The presenter answers questions clearly and accurately, demonstrating a good understanding of the topic.
4. **Originality and Creativity (10%)**
    - Innovative Approach: The presentation includes original ideas or perspectives.
    - Creativity: The presenter uses creative methods to explain concepts and engage the audience.

Assessment Process

1. **Pre-Presentation Briefing:**
    - Provide students with the evaluation criteria and explain how they will be assessed.
    - Ensure students understand the importance of each criterion.
2. **During the Presentation:**
    - Use a standardized evaluation form to score each criterion. This ensures consistency and fairness.
    - Have multiple assessors, if possible, to provide a balanced evaluation. Assessors can be faculty members, industry experts, or peers.

3. **Post-Presentation Evaluation:**
    - Assessors should meet to discuss and finalize scores.
    - Provide detailed feedback to students, highlighting strengths and areas for improvement.

Assessments:

Sample Evaluation Form

Criteria	Weight	Score (1-10)	Comments
Content Quality	40%		
Relevance			
Depth of Research			
Clarity of Objectives			
Comprehensiveness			
Accuracy			
Presentation Skills	30%		
Clarity and Coherence			
Engagement			
Communication			
Visual Aids			
Delivery	20%		
Confidence and Poise			
Body Language			

Time Management			
Handling Questions			
Originality and Creativity	10%		
Innovative Approach			
Creativity			
Total Score	100%		

Feedback

1. Individual Feedback:
    - Provide each student with detailed feedback on their strengths and areas for improvement.
    - Use the comments section in the evaluation form to offer specific suggestions.
2. General Feedback:
    - Share common strengths and areas for improvement with the entire class to help all students learn and improve.
3. Follow-Up:
    - Offer opportunities for students to discuss their feedback with assessors.
    - Encourage students to apply feedback in future presentations and projects.

By following these guidelines, you can ensure a fair, transparent, and constructive evaluation process that helps students improve their seminar presentation skills.

- - - - 235887*	**Special Interest Groups (Placement Training)**
AUDIT	

*(First four digits in the subject code is Branch code)

Note: Training related to enhance the employability skill can be conducted during this period.

- - - - 23 - 882*	**I&E / Club Activity / Community Initiatives**
AUDIT	

*(First four digits in the subject code is Basic Engg. / Branch code and Seventh digit is Semester)

Club Activity

Skill Areas: Collaboration, Ownership, Interpersonal Skills
Purpose: Club activities provide a platform for students with similar interests to engage, participate in events, workshops, and competitions. This fosters collaboration and skill development in various fields.
Learning Outcomes: At the end of the course, students will be able to: 1. Collaborate and work in interdisciplinary teams towards contributing effectively 2. Learn or enhance skills through workshops, competitions, and experiential learning.
Focus: During club activities students should prioritize key focus areas to enhance their learning and impact. Here are some focus areas to consider: 1. Collaboration & Communication 2. Identify strengths and weaknesses, and learn from experiences to foster personal growth
Role of the Facilitator: The faculty facilitator's role is crucial in guiding and supporting students in club activities. Key aspects of their role include:

1. **Mentorship and Guidance:** Faculty facilitators act as mentors, providing one-on-one or group guidance to students involved in the club.
2. **Creating a Supportive Learning Environment:** Facilitators will nurture a supportive, inclusive environment in the clubs where students freely express and learn collaboratively. They provide a platform for like-minded students to engage, collaborate, and participate.

Guided Activities:

For Club Activities, students can engage in learning and developing a new skill or enhancing their skill by involving & actively participating in one or more clubs of their interest. These clubs can be used as a platform for Personal growth.

They may include but are not limited to the following clubs: Tamil Mandram, Music, Dance, Math, Chess, Arts, Anti-drug, Photography, Sports, Astronomy, Science, Robotics, English, Theatre, NCC, NSS, Digital Media Club, Cooking, UN Sustainable Development Goal, YRC (Youth Red Cross), Olympiad clubs, etc. The Outcome can be achieved through conducting **Competitions and Challenges.**

Period Distribution

S.No	Guided Activities	Period
1	Enrolment to Clubs 1. Invite club representatives along with Faculty to give short presentations, and collect names of students who are interested to join 2. Students should list their top 3 preferred clubs based on their interests and submit to the respective club representative	
2	Exploring of Clubs 1. Ensure students understand their responsibilities as club members. 2. Emphasize the importance of commitment and regular participation. 3. Explore with club representatives about planning and hosting competitions, or events for the club.	

3	Learn & Exhibit 1. Encourage students to participate actively and showcase their skills. 2. The Faculty should provide a necessary platform to enhance students skills, learn new skills, and exhibit skill through various competitions, events or initiatives.	
4	Recognition 1. Acknowledge the efforts and contributions of individual members as well as the whole club	

Closure:

No formal documentation is needed for course completion, but students must participate in at least one or more of the clubs meeting the 30 Period Requirement.

Assessments:

No formal assessments are required for the Innovation and Entrepreneurship, Cub activities or Community Initiatives.

References/Resource Materials:

The references and resource materials required for club activities may vary based on the personal focus, goals, and also resources available at each college. However, here are some general reference materials and resources that may be helpful:

1. **Facilities and Spaces:** Some clubs may require access to specific facilities or spaces. This can include classrooms, laboratories, meeting rooms, performance spaces, exhibition halls, or outdoor areas.
2. **Coaching:** Students may require coaching from faculty members or professionals with relevant knowledge and experience related to the club.
3. **Online Resources:**
    1. How to choose the Right Club for your personal growth? https://www.topuniversities.com/student-info/student-stories/5-common-mistakes-avoid-when-choosing-student-clubs
    2. How to make your club great? https://www.pearson.com/ped-blogs/pearsonstudents/2021/04/11-tips-to-

make-a-any-college-club-great.html

Note: Innovation & Entrepreneurship and Community Initiatives awareness program and activities can also be conducted.

STUDENT INDUCTION PROGRAM CELL (SIP CELL)

The Principal or HOD will be the Chairman of the Student Induction Program Cell.

SIP Cell (or Induction Unit) will be managed by the department faculty members with the help of student volunteers.

The SIP Cell will be responsible for planning, organization, coordination and reporting of the annual Student Induction Program with the help of other faculty members and student volunteers.

Students Counselling Service (SCS)

In order to provide advice or help to the students of the institute, Student Counselling Service (SCS) needs to be initiated. Team of SCS will assist and strengthen the students at the institute for enhancing their academic skills and career developments, as well as for their overall wellness.

Student Coordinators may be appointed with the guidance of a staff mentor.

1. Wellness Coordinator.
2. Skills Coordinator
3. Career Coordinator
4. Academic Coordinator etc…

OBJECTIVE:

The objective of the SIP cell is

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

OUTCOME:

At the end, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Note: ILE activity can be conducted and monitored by the SIP Cell.

EQUIVALENT COURSES						
E SCHEME			**G SCHEME**		**H SCHEME**	
#	**Subject Code**	**Subject**	**Subject Code**	**Subject**	**Subject Code**	**Subject**
1	CRE301	Basic Electricals and Electronics Engineering	CRG301	Basic Electricals and Electronics Engineering	-	-
2	CRE302	Operating systems	CRG302	Operating systems	CRH373	Operating systems
3	CRE303	C and Data Structures	CRG303	C and Data Structures	-	-
4	CRE304	Computer Architecture	CRG304	Computer Architecture	-	-
5	CRE305	Electrical and Electronics Lab	CRG371	Electrical and Electronics Lab	-	-
6	CRE306	Operating Systems Lab	CRG372	Operating Systems Lab	-	-
7	CRE307	C and Data Structures Lab	CRG373	C and Data Structures Lab	-	-
8	CRE401	Object Oriented Programming through C++	CRG401	Object Oriented Programming Concepts through C++	-	-
9	CRE402	Relational Database Management Systems	CRG402	Relational Database Management Systems	CRH302	RDBMS
10	CRE503	Web Technology	CRG601	Web Technology	CRH372	Web Designing
11	CRE403	Computer Hardware and Servicing	CRG602	Computer Hardware and Servicing	-	-
12	-	-	CRG403	Cloud Computing and Internet of Things	-	-
13	CRE404	Object Oriented Programming Concepts through C++ Lab	CRG471	Object Oriented Programming Concepts through C++ Lab	-	-
14	CRE405	Relational Database Management Systems Lab	CRG472	Relational Database Management Systems Lab	-	-
15	CRE406	PC Hardware Servicing and Networks Lab	CRG672	Computer Hardware And Networking Security Lab	-	-
16	CRE502	Computer Networks and Security	CRG503	Computer Networks and Security	CRH401	Computer Networks and Security
17	CRE405	Relational Database Management Systems Lab	CRG472	Relational Database Management Systems Lab	-	-
18	CRE406	PC Hardware Servicing and Networks Lab	CRG672	Computer Hardware And Networking Security Lab	-	-
19	CRE502	Computer Networks and Security	CRG503	Computer Networks and Security	CRH401	Computer Networks and

						Security
20	CRE607	E-Publishing Lab	-	-	CRH473	E-Publishing Tools
21	CRE607	E-Publishing Lab	-	-	CRH473	E-Publishing Tools
22	CRE501	Java Programming	CRG501	Java Programming	CRH471	Java Programming
23	-	-	CRG502	Python Programming	CRH472	Python Programming
24	CRE504	System Analysis and Design	CRG581	System Analysis and Design	-	-
25	CRE505	Management Information System	CRG582	Management Information System	-	-
26	CRE506	Software Engineering	CRG583	Software Engineering	-	-
27	CRE507	Information Storage and Management	CRG584	Artificial Intelligence and Data Analytics	-	-
28	CRE508	Java programming Lab	CRG571	Java Programming Lab	-	-
29	-	-	CRG572	Python Programming Lab	-	-
30	-	-	CRG573	Entrepreneurship and Startups	CRH682	-
31	CRE509	Multimedia Systems Lab	CRG671	Multimedia Systems Lab		Entrepreneurship
32	CRE510	Web Technology Lab	CRG573	Web Technology Lab	-	
33	CRE601	.NET Programming	CRG682	.Net Programming	CRH588	-
34	CRE602	Mobile Computing	CRG683	Mobile Computing	-	Component Based Technologies
35	CRE603	Open Source Software	CRG681	Open Source Software	-	-
36	CRE604	Advance Java Programming	CRG501	Java Programming	CRH471	-
37	CRE605	Embedded Systems	-	-	-	Java Programming
38	CRE606	.Net Programming Lab	CRG685	.Net Programming Lab	-	-
39	CRE608	Open Source Software Lab	CRG684	Open Source Software Lab	-	-
40	-	-	CRG686	Mobile Computing Lab	-	-
41	CRE609	Project planning and Entrepreneurship	CRG673	Project Work and Internship	CRH67X	-
42	CRE505	Management Information System	CRG582	Management Information System	-	Internship or Industrial Training / Fellowship / In-house Project

DR. DHARMAMBAL GOVT POLYTECHNIC COLLEGE FOR WOMEN, THARAMANI, CHENNAI-13.
DEPARTMENT OF COMPUTER ENGINEERING
COMPARISION BETWEEN H SCHEME AND G SCHEME

#	H SCHEME Subject	Added Content	Removed Conent	Percent of Change
1	CRH301 - Digital Logic Design Circuits	• Binary arithmetic • ASCII, BCD • Digital Interfacing • ADC and DAC • Memories, Programmable Logic Devices	• AC and DC Fundamentals (Basic Electrical concepts) • Electrical machines • Analog devices • Safety measures, Earthing	60% (3 Units changed)
2	CRH302 - RDBMS	• Correlated Sub-queries • Pattern Matching, • Import and Export of data • Order By and Limit Handling • Compound Indexes	• Data Modeling & E-R Diagrams • DBMS Architecture • DBA Concepts • Big Data & NoSQL • Normalization • MySQL with PHP	15% (advanced SQL added)
3	CRH371 - C programming	This subject in H-Scheme only deals with C Programming language. In G-Scheme, the syllabus dealt with C & Data structures.		
4	CRH372 - Web Designing	-	• Server Side Scripting language • AJAX concepts	20% (1 Units changed)
5	CRH373 - Operating Systems	-	• Operating System Components • Operating System Services • Operating System Structures • Process Management • Process Scheduling • Inter-process Communication and Synchronization • Deadlocks • Basic Memory Management • Virtual Memory • Page Replacement Algorithms • Disk Management • File Management • Access Methods	25% (many theory topics removes)
6	CRH374 - Digital Logic Design Lab	• Design a 4 bit asynchronous up counter using any simulation tool. • Design 4 bit shift register (SeriaI in Parallel Out)	• Verify Ohm's law and Kirchoff's law. • Draw the forward bias characteristics of a PN Junction diode and determine the forward resistance of the diode. • Draw the reverse bias characteristics of a Zener diode.	**40%** – Many experimen ts removed

		using any simulation tool.	• Common Emitter Configuration characteristics . • Construct and test half - wave and full - wave rectifier circuits. • Realize the logic gates using Universal gates. • Realize the circuit to simplify the logic equation by using karnaugh map. • Construct Half adder circuits using ICs and verify their truth table. • Construct Half subtractor circuits using ICs and verify their truth table. • Verify the operation of a de-multiplexer using IC' • Verify the operation of a encoder circuits. • Implement and Test RS- T and D flip-flops. • Verify the operation4- bit ripple counter and observe the output waveform • Verify the operation Asynchronous counter • Verify the operation Modulo N counter and observe the output waveform	
7	CRH401- Computer Networks and Security	• Wi-Fi – Bluetooth • Stop and wait protocol • Software Supply Chain Attacks	• FDDI • ISDN • Switching • Kerberos • Internet Security • RAID	**20%** – Some old protocols removed, some new ones added
8	CRH402- Data Structures Using Python	In G-Scheme, the syllabus dealt with C & Data structures. In this subject in H-Scheme, only deals with Data Structures Using Python language.		
9	CRH471 - Java Programming	-	• Advanced Java Concepts • Applets- Awt Controls • Multithreads- Streams- Networking & Database Concepts	**25%** (Advanced Java topics removed)
10	CRH472 - Python Programming	• Numpy • Pandas package	-	**20%** – (Added Numpy and Pandas)
11	CRH473 - E-Publishing Tools	No E-Publishing lab in G-Scheme		

12	CRH474 - Scripting Languages	• Web applications frameworks • Bootstrap • Django	-	**25%** – (Added frameworks)
13	CRH501 - Cloud Computing	• Virtualization • Google App Engine	• IoT Concepts	**50%** – (2 Units removes, some new content added)
14	CRH571 - Computer Hardware and Networking	• Disk Cleaning • Defragmentation • Peripheral Devices Installation • Administering Window Server • Network Device	• Power Supply, BIOS • Removable Storage and Special Devices • Maintenance and Troubleshooting of Desktop and Laptop Computers • Mobile Phone Servicing	
15	CRH572 - Internet of Things &Digital Twins	• Cloud and Digital Twins	-	**50%** – Digital Twins added
16	CRH573 - Innovation and startup	Newly Added Course		
17	CRH581- Machine Learning			
18	CRH582 - Data Warehousing and Data Mining			
19	CRH583 - Ethical Hacking			
20	CRH584 - Agile Product Development			
21	CRH585 - Artificial Intelligence	• Knowledge Representation and Optimization Techniques • Game Playing and Constraint Satisfaction Problems • Intelligent Agents	-	40% (2 Units added)
22	CRH586 - Data Analytics	• Data Loading and Cleaning • Static Analysis • Feature Analaysis	-	50% (3 Units added)

23	CRH587- Mobile Computing	• All 5 Units are new	-	-
24	CRH588 - Component Based Technologies	• **C#.NET**	-	20% (1 Unit changed)
25	CRH589 - Multimedia Systems	Newly Added Course		
26	CRH58A - Full Stack Developer			
27	CRH58B - Robotic Process Automation			
28	CRH681 - Advanced Engineering Mathematics			
29	CRH682 - Entrepreneurship	• SWOT • Competitors • GST • Risk Types	• Motivation • Networking • Startups • Incubation Centres • Entrepreneurship Cell (E-Cell) • Use of Technology and Social Media • Negotiation – Importance and Methods • Success Stories (Indian and Global Entrepreneurs) • Learn to Earn • Launch Strategy after Pricing and Proof of Concept • Social Entrepreneurship	30%
30	CRH683 - Project Management	Newly Added Course		
31	CRH684 - Finance Fundamentals			
32	CRH685 - 5G Technology			
33	CRH686 – DevOps			

34	CRH687 - Data Science CRH688 - Cloud Platform CRH689 - Data Visualization	Newly Added Course
35	CRH68A - Advance DBMS CRH68B - Mobile Application Development CRH68C - UI & UX Design	