

VIRUDHUNAGAR S.VELLAICHAMY NADAR POLYTECHNIC COLLEGE (AUTONOMOUS)

(Affiliated to Directorate of Technical Education, Chennai- 25)

VIRUDHUNAGAR- 626 001.

SYLLABUS

“R23” SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY

2023-2024 onwards



ACADEMIC BOARD

V.S.V.N.POLYTECHNIC COLLEGE (AUTONOMOUS)

VIRUDHUNAGAR-626001.

Technical Assistant (Eval – I)
Directorate of Technical Education,
Chennai – 25.

Principal
B C M Government Polytechnic College
for Women, Ettayapuram.

Thiru.R. Ravisekar
(Expert from Industry)

Thiru.R. Ananthavel
(Representative of Alumni)

Thiru.M. Vignesh
(Expert from Industry)

Dr.S. Senthil
(ISTE Nominee)

Submitted to the Cell Office

The enclosed syllabus has been verified and submitted.

CHAIRMAN
Board of Studies

PRINCIPAL & CHAIRMAN
Academic Board

“R23” Scheme - Regulations

MPEC SYSTEM

Implemented from 2023-2024

Diploma Courses in Engineering & Technology

Autonomy and Multi Point Entry and Credit system (MPEC)

As per G.O. Ms. No.1136 Education (J2) Department dated 20.11.1992 our Institution has been granted full Autonomous status from the academic year 1994–95.

The Students admitted for the I / III Semester Engineering & Technology at this Institution in Multi Point Entry Credit System (MPEC) will study under Autonomous pattern.

Preamble

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

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

The 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 program is offered through the core, electives, certifications, capstone projects and other ways to enable a student's transformation. Each domain is carefully crafted to cater to diversified needs, dynamic contexts, and differentiated expectations in a learner-centric environment. The crux of this program lies in the way experiential learning, divergent thinking, problem-solving creativity and so on are integrated into one.

Objective:

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

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

Admission:

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

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

Lateral Entry Admission:

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

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

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

Structure of the Program

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

Pathways for progressive learning experience:

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

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

- **Entrepreneur:**

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

- **Higher Education:**

Students with aspirations of pursuing higher education to acquire higher-order skills and competencies in the domain of interest.

- **Technocrats:**

Students who aspire to acquire mastery of technical tools and methods to manage people who manage the processes

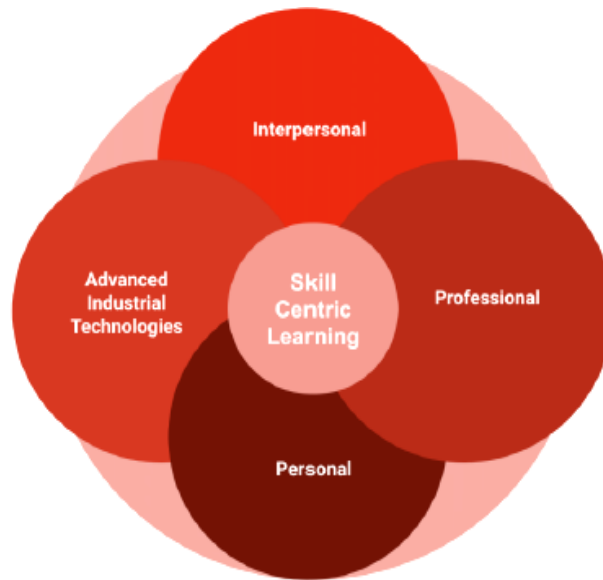
- **Technologists:**

Students who aspire to gain leadership in a particular discipline / technology to evolve into Problem Solvers & Innovators

Various Dimensions for Transformation:

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

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



Integrated Curriculum:

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

Course Levels:

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

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

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

Course Types:

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

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

- **Practicum (P)** - Integrated course taught in a hands-on learning environment. This may be offered wherever theoretical concepts are to be learned simultaneously with relevant practical sessions. Such courses shall be offered only if sufficient laboratory facilities are available to conduct such courses, and both practical and theory components shall be considered for continuous assessment. Final evaluation based on the proportion of the credit awarded for the respective component.
- **Lab (L)** - Practical Courses taught in a designated lab. This may be offered when conceptual learning has to be augmented by practical experiments and also to bring focus on acquiring skills through doing. Such courses shall be offered only if sufficient laboratory facilities are available to conduct such courses.
- **Field Study (FS)** - Offered as a special / curriculum-enriching component to understand certain practical issues/work practices / hands-on training/immersion project/market survey. Field Study, if it forms a part of the course, then credit(s) shall be assigned accordingly, otherwise, such course(s) may be specified in the Grade Sheet without grades.
- **Certification (Cer)** - Industry-driven course shall be offered, jointly with an industry that would result in learning the emerging trends / employment potential topics / solving real-time problems. The contents of the course shall be jointly designed by an industry expert and a suitable faculty member, with relevant assessment and evaluation. Hybrid/Online learning options shall be available. Students are permitted to complete these courses through MOOCs / Professional Certification and credit equivalence (Program Elective or Open Elective).
- **In-House Projects (J)** - Capstone Project shall be offered once a student completes >95% of the core courses related to the Diploma program. The Capstone Project is expected to involve concepts from fundamentals to recent developments and may be restricted to one domain or multi-domains / multi-disciplines. Capstone Project shall be offered only after completing all the fundamental courses and offered during the final semester. It shall also focus on Environment, Society, Sustainability, Entrepreneurship and Project Management. In the case of a multidisciplinary project, a suitable co-supervisor shall be opted for the students from the relevant Department for successful completion. Capstone Project may be offered in phases, i.e. Phase I and Phase II (single topic or two different topics). Students are encouraged to submit the softcopy of the complete report for evaluation and abstract in the printed form during the final presentation.
- **Fellowship (Fs)** - Up to 6 Months for professional and/or academic development offered by an external organisation identified and nominated by DoTE in India or abroad. Students shall be shortlisted for the same under sponsorship/scholarship by competent authorities and approved by the Head of the Institution.
- **Boot Camp (B)** - 2-to-5-day training camps for imparting knowledge and skills in emerging areas. It may be offered jointly by a team of faculty members / external experts with course content that includes interdisciplinary topics from different domains, thereby enhancing the Professional Knowledge & Skills of the students. However, such courses shall not have any significant repetition of other courses offered in that particular diploma program. If a student fails to complete such a course on the first attempt or lacks attendance requirements, they may opt for a different course in the subsequent semester and meet the minimum credit requirements of the program or may 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 Polytechnic College. In this case, if a candidate fails in an Audit Course, it is not mandatory to repeat that course and these courses shall not be considered for eligibility for awarding the Diploma. Grades shall be awarded as “Completed”.

Definition of Credit:

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

Theory (L) - 15 Periods	1 Credit
Tutorial (T) - 15 Periods	1 Credit
Practical (P) – 30 Periods	1 Credit
Internship (I) - 45 Periods	1 Credit
Project (J) - 30 Periods	1 Credit

Curriculum Structure:

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

Category	Credit Range
Humanities and Social Sciences	8-13
Basic Science Courses	17-20
Engineering Sciences	6-13
Program Core	40-51
Program Elective	3-12
Open Elective	13-20
Industrial Training / Project work	12-16
Audit Course (Health and Wellness – III Semester)	1
Integrated Learning Experiences	
Induction program	Non-Credits Course
I&E / Club Activity / Community Initiatives	Non-Credits Course
Shop Floor Immersion	Non-Credits Course
Health & Wellness	Non-Credits Course
Student-Led Initiative	Non-Credits Course
Special Interest Groups (<i>Placement Training</i>)	Non-Credits Course
Emerging Technology Seminars	Non-Credits Course

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

- 1. Basic Sciences:** This course is common to all programs to develop fundamental knowledge of science and mathematics; it also enhances the reasoning and analytical skills amongst students.
- 2. Engineering Sciences:** Engineering Science shall create awareness of different specializations of engineering studies. The goal of these courses is to create engineers of tomorrow, who possess the knowledge of all disciplines and can apply their interdisciplinary knowledge in every aspect. It could be any branch of engineering - Civil, Computer Science and Engineering, Electrical, Mechanical, etc.
- 3. Professional Core:** This includes core courses designed in the program, which are major courses of the discipline, are required to attain desired outcomes and to ignite critical thinking skills amongst students.

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

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

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

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

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

Outcome-Based Education:

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

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

2. 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.

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

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

5. 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.

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

7. 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.

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

Academic and Curriculum Flexibility

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

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

Break of Study:

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

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

Course Add / Drop:

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

Credit Equivalence:

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

- (i) Credits earned through Extra and Co-curricular Activities (only against program elective / open elective – Global)
- (ii) Credits earned through online courses (only against Open Electives - Technical and Global and program electives)
- (iii) Credits accumulated through Capsule courses, One-Credit courses

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

Credit Transfer:

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

Examination Withdrawal:

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

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

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

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

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

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

Fast-Track:

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

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

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

Flexi-Credit System:

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

Bridge Course:

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

Integrated Learning Experience

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

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

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

Innovation Track:

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

Peer 2 Peer Learning:

P2P learning involves interactions between students from senior classes, leading to valuable additions and deepening the understanding of certain concepts. This may happen as a part of a scheduled time-table or after instructional hours in a day, by Peers (from senior classes), leading to value addition, enriching the understanding of certain concepts and implementing practically (developing models, prototypes, proofs-of-concept) for learning satisfaction, participating in competitions / competitive examinations. These efforts are expected to improve teamwork, communication, understanding of societal needs, project management and life-long learning activities.

Growth Lab:

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

Shop Floor Immersion:

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

Health & Wellness:

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

Induction Program:

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

Special Interest Groups:

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

Club Activity:

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

Community Initiatives:

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

Emerging Tech Seminars:

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

Student-Led Initiative:

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

Industry Specific Training:

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

Duration of the Program

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

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

Attendance Requirements

- A student who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.
- Ideally every student is expected to attend all classes of all the courses and secure 100% attendance.
- However, in order to make provision for certain unavoidable reasons such as medical / participation in sports, the student is expected to attend at least 75% of the classes.
- Therefore, the student shall secure not less than 75% (after rounding off to the nearest integer) of overall attendance for each semester.

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

Class Committee

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

- Solving problems experienced by students in the classroom and in the laboratories. Clarifying the regulations of the diploma program and the details of rules therein.
- Informing the student representatives, the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- Informing the student representatives, the details of regulations regarding weightage used for each assessment. In the case of practical courses (laboratory / drawing / project work / seminar etc.) the breakup of marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analysing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the slow-learners, if any, and requesting the faculty concerned to provide some additional help or guidance or coaching to such students.
- The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first semester which is generally common to all branches), the class committee is to be constituted by the Head of the Institution.
- The class committee shall be constituted within the first week of each semester. At least 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee, covering all the elective courses.
- The chairperson of the class committee may invite the class in-charge / mentor(s) and the Head of the Department to the class committee meeting.
- The Head of the Institution may participate in any class committee meeting of the institution.
- The chairperson is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate it among the students and faculty concerned. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the Head of the Institution.
- The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the regulations.
- Two or three subsequent meetings may be held in a semester at suitable intervals.

- During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

Course Committee for Common Courses

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

Assessment and Examination

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

(i) Continuous Assessment [40%]:

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

(ii) End Semester Examination [60%]:

- The End Semester Examination will be conducted for 100 marks and shall be converted to 60 marks in the final results.
- The End Semester Examinations (Theory, Practical, Project) of three hours duration will be conducted.
- For Practicum courses, the end semester examination will be conducted as a theory or a practical or a project examination based on the credits for each component, the decision on the mode of exam could be based on the recommendation by the Chairman, Board of Studies duly forwarded and approved by Principal and Chairman, Academic Board.

Continuous Internal Assessment and End Semester Examination [For all Courses]:

COURSE TYPE THEORY → END EXAM THEORY

Assessment Method	Assessment Marks		Converted Marks	Internal Marks	External Marks	Total Marks
Periodical Test – I (Unit – I & II) (2 Hours) (Written Test)	60 Marks	Best of PT–I and PT–II	10 Marks	40 Marks		
Periodical Test – II (Unit – III & IV) (2 Hours) (Written Test)	60 Marks					
Model Theory Examinations (All Units) (3 Hours)	100 Marks		10 Marks			
Assignment – 3 Nos.	100 Marks		20 Marks			
END THEORY EXAMINATIONS (3 Hours)	100 Marks		60 Marks		60 Marks	100 Marks
TOTAL						

Periodical Test Question Pattern

Part A – 6 Questions x 2 marks = 12 Marks

Part B – 6 Questions x 8marks = 48 Marks

60 Marks

In Each Unit Part – A (3 Questions) and Part – B (3 Questions)

Model / End Theory Examination Question Pattern

Part A – 10 Questions (out of 15 Questions) x 2 Marks = 20 Marks
(Three Questions from each Unit)

Part B – 2 Questions (out of 4 Questions) / Unit x 8 Marks
10 Questions x 8 Marks = 80 Marks

100 Marks

Special Question Pattern

Refer Program Syllabus

Assignment

Assignment – 1 (from Unit I & II) = 40 Marks

Assignment – 2 (from Unit III & IV) = 40 Marks

Assignment– 3 (from Unit V) = 20 Marks

100 Marks → Converted to 20 Marks

Assignment Question Pattern for Each Unit

2 Questions x 2 Marks = 4 Marks

2 Questions x 8 Marks = 16 Marks

20 Marks

COURSE TYPE PRACTICAL → END EXAM PRACTICAL

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Model Practical Examinations (3 Hours)	100 Marks	20 Marks			100 Marks
Record Note submission (Each Exercise / Experiment / Drawing plate should be evaluated to 10 Marks)	Total Marks	20 Marks	40 Marks		
END PRACTICAL EXAMINATIONS (3 Hours)	100 Marks	60 Marks		60 Marks	
TOTAL					

COURSE TYPE PRACTICUM → END EXAM THEORY

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Periodical Test – I (Unit – I & II) (2 Hours) (Written Test)	60 Marks	Best of PT-I and PT-II 5 Marks	40 Marks	60 Marks	100 Marks
Periodical Test – II (Unit – III & IV) (2 Hours) (Written Test)	60 Marks				
Model Practical Examination (3 Hours)	100 Marks	5 Marks			
Model Theory Examinations (All Units) (3 Hours)	100 Marks	10 Marks			
Assignment – 3 Nos.	100 Marks	20 Marks			
END THEORY EXAMINATIONS (3 Hours)	100 Marks	60 Marks			
TOTAL					

Periodical Tests, Model Theory, Assignments and End Theory Examination as per Theory to Theory pattern

Model Practical Examination Assessment

Observation	–	30 Marks
Practical	–	65 Marks
Viva Voce	–	5 Marks

		100 Marks

COURSE TYPE PRACTICUM → END EXAM PRACTICAL

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Periodical Test – I (Unit – I & II) (2 Hours) (Written Test)	60 Marks	10 Marks			
Model Practical Examinations (3 Hours)	100 Marks	10 Marks			
Record Note / Drawing Plate submission (Each Exercise / Experiment / Drawing plate should be evaluated to 10 Marks)	Total Marks	20 Marks			
END PRACTICAL EXAMINATIONS (3 Hours)	100 Marks	60 Marks		60 Marks	
TOTAL					100 Marks

Periodical Test as per Theory to Theory pattern

Model and End Semester Practical Examination Assessment

Theory Assessment	–	20 Marks
Practical	–	75 Marks
Viva Voce	–	5 Marks

		100 Marks

COURSE TYPE PROJECT → END EXAM PROJECT (IV SEMESTER - ECE)

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Observation (Each Exercise / Experiment should be evaluated to 10 Marks)	Total Marks	10 Marks	40 Marks	60 Marks	100 Marks
Review – I (After 6 th week)	15 Marks	15 Marks			
Review – II (After 12 th week)	15 Marks	15 Marks			
END EXAMINATIONS (3 Hours)	100 Marks	60 Marks			
TOTAL					

End Semester Examination Assessment

Report Submission	–	30 Marks
Demo	–	50 Marks
Viva Voce	–	20 Marks

100 Marks

COURSE TYPE PRACTICUM → END EXAM PROJECT (IV SEMESTER - COMPUTER ENGG.)

Assessment Method	Assessment Marks	Converted Marks	Internal Marks	External Marks	Total Marks
Observation (Each Exercise / Experiment should be evaluated to 10 Marks)	Total Marks	10 Marks	40 Marks	60 Marks	100 Marks
Model Theory Examination (3 Hours)	100 Marks	10 Marks			
Review – I (After 6 th week)	20 Marks	20 Marks (Average)			
Review – II (After 12 th week)	20 Marks				
END EXAMINATIONS (3 Hours)	100 Marks	60 Marks			
TOTAL					

End Semester Examination Assessment

Report Submission	–	30 Marks
Demo	–	50 Marks
Viva Voce	–	20 Marks

100 Marks

A hand written report of 10 pages containing Abstract, Introduction, Block diagram with description, Implementation, Result and Conclusion along with bonafide certificate. Project members not more than six in each group.

Common Note:

1. For appearing in end practical examinations students must submit their record note and for project work, students must submit their project report.
2. Any fraction in converting the marks (Both Internal and External) must be awarded with the next higher integer.

Project Work

- 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 six 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 (100 Marks)		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 marks)	Project Report (30 Marks)	Presentation / Demonstration (50 Marks)	Viva Voce (20 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.
- 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 institute from time to time.

Passing Requirement for Award of Diploma

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

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

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

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

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

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

The COE will arrange for the revaluation and the results will be intimated to the student concerned through Head of the Department. Revaluation is not permitted for practical courses and project work.

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

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

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

"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 & W will figure both in the Grade Sheet as well as in the Result Book. In the 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 Principal and Chairman, Awards Committee. Every student needs a minimum of 75% attendance in the Audit / integrated Learning experience compulsorily. However, for valid reasons, the Head of the Institution may permit a student to exempt/complete this requirement in the subsequent years. Successful completion of these courses is compulsory for the award of diploma. These courses will be monitored by the Head of the Department.

The grades O, A+, A, B+, B, C obtained for the one/two credit course (not the part of curriculum) shall figure in the Grade Sheet under the title 'Value Added Courses/Internship/Industrial training'.

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

Grade Sheet:

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

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

where C_i is the number of Credits assigned to the course

GP_i is the point corresponding to the grade obtained for each course

n is number of all courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA.

Award of Diploma

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

- ❖ Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's program within the stipulated time.
- ❖ Successfully completed the course requirements, appeared for the end semester examinations and passed all the courses within the period as prescribed.
- ❖ Successfully passed any additional courses prescribed by the Principal & Chairman Awards Committee / Academic Board whenever the student is readmitted under R23 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 Principal & Chairman Awards Committee.

Classification of Diploma Awarded

FIRST CLASS WITH DISTINCTION:

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

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

FIRST CLASS:

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

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

SECOND CLASS:

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

Discipline

Every student is expected to maintain disciplined and respectable behaviour both within and outside the Polytechnic College premises, refraining from engaging in any activities that may tarnish the reputation of the Polytechnic 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 Disciplinary Action Committee for Malpractice from time to time. For any malpractices in any continuous assessment, the same shall be reported to the Head of the Institution for disciplinary actions.

Revision of Regulation, Curriculum and Syllabi

Virudhunagar S.Vellaichamy Nadar Polytechnic College (Autonomous) may from time-to-time revise, amend or change the regulations, curriculum, syllabus and scheme of examinations through the Board of Studies with the approval of the Principal and Chairman Academic Board.

Academic Audit

All Test Papers and assignment note books after getting the signature from the students must be kept in the safe custody in the Department for verification and audit for two semesters.



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R 23–SCHEME

CURRICULUM OUTLINE

PROGRAM: Diploma in Plastic Technology

(From 2023 - 2024 Onwards)

Scheme : R23

Department Code : 8

Program Structure : **1073 Diploma in Plastic Technology (FT)**

Program Outcomes (PO's)

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 analyse individual needs and engage in updating in the context of technological changes.

Credit Distributions

Semester	No of Courses	Periods	Credits
Semester I	8	640	20
Semester II	9	640	20
Semester III	8	640	21
Semester IV	7	640	19
Semester V	8	635#	22
Semester VI	3	660	18
Total			120

Industrial Training during summer vacation for Two Weeks has to be completed to earn the required two credits

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SEMESTER: I

CURRICULUM OUTLINE

S. No	Course Category	Course Type	Course Code	Course Name	L –T –P	Period	Credit	End Exam
1	Humanities and social science	Theory	0231110	Tamil Marabu	2–0–0	30	2	Theory
2	Basic Science	Theory	0231210	Basic Mathematics	3–1–0	60	4	Theory
3	Basic Science	Practicum	0231330	Basic Physics	2–0–2	60	3	Theory
4	Basic Science	Practicum	0231430	Basic Chemistry	2–0–2	60	3	Theory
5	Humanities and social science	Practicum	0231540	Communicative English I	1–0–2	45	2	Practical
6	Engineering Science	Practicum	0231640	Drafting Practices	1–0–2	45	2	Practical
7	Engineering Science	Practical	0231720	Digital Workplace	0–0–4	60	2	Practical
8	Open Elective	Advanced Skill Certification	0231870	Basic English for Employability	0–0–4	60	2	NA
9	Humanities and Social science	Integrated Learning Experience	0231980	GrowthLab	–	15	0	–
10	Audit Course	Integrated Learning Experience	0231981	Induction Program–I	–	40	0	–
11	Audit Course	Integrated Learning Experience	0231982	Club Activity /Community	–	30	0	–
12	Audit Course	Integrated Learning Experience	0231983	Shop Floor Immersion	–	8	0	–
13	Audit Course	Integrated Learning Experience	0231984	Student-Led Initiative	–	22	0	–
14	Audit Course	Integrated Learning Experience	0231986	Health and Wellness	–	30	0	–
Test & Revisions						60		
Library						15		
Total						640	20	

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SEMESTER: II

CURRICULUM OUTLINE

S. No	Course Category	Course Type	Course Code	Course Name	L-T-P	Period	Credit	End Exam
1	Humanities & Social Science	Theory	0232110	Tamils and Technology	2-0-0	30	2	Theory
2	Program Core	Theory	0232211	Basics of Civil Engineering (Civil)	3-0-0	45	3	Theory
			0232212	Basics of Mechanical Engineering (Mech & PT)				
			0232213	Basics of Electrical and Electronics Engineering (EEE)				
			0232214	Basics of Textile Technology (GT)				
			0232215	Basics of Computer Engineering (CT)				
3	Basic Science	Practicum	0232341	Applied Mathematics-1*	1-0-4	75	3	Practical
			0232342	Applied Mathematics-2**				
4	Basic Science	Practicum	0232441	Applied Physics-1*	1-0-2	45	2	Practical
			0232442	Applied Physics-2**				
5	Basic Science	Practicum	0232541	Applied Chemistry-1*	1-0-2	45	2	Practical
			0232542	Applied Chemistry-2**				
6	Engineering Science	Practicum	0232641	Basic Engineering Practice (Other than GT)	1-0-2	45	2	Practical
			0232642	Apparel Machinery Engineering Practice				
7	Engineering Science	Practicum	0232740	Basic Workshop Practices	1-0-2	45	2	Practical
8	Humanities & Social Science	Practicum	0232840	Communicative English- II	1-0-2	45	2	Practical
9	Open Elective	Advanced Skill Certification	0232970	Advanced Skill Certification-II	1-0-2	45	2	NA
10	Humanities & Social Science	Integrated Learning Experience	0232080	Growth Lab	-	30	0	-

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S. No	Course Category	Course Type	Course Code	Course Name	L-T-P	Period	Credit	End Exam
11	Audit Course	Humanities & Social Science	0232082	Club Activity / Community Initiatives	–	30	0	–
12	Audit Course	Integrated Learning Experience	0232083	Shop Floor Immersion	–	8	0	–
13	Audit Course	Integrated Learning Experience	0232084	Student-Led Initiative	–	8	0	–
14	Audit Course	Integrated Learning Experience	0232085	Emerging Technology Seminars	–	24	0	–
15	Audit Course	Integrated Learning Experience	0232086	Health and Wellness	–	30	0	–
Test & Revisions						75	–	
Library						15	–	
Total						640	20	

*For Non-Circuit Branches

**For Circuit Branches

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SEMESTER: III

CURRICULUM OUTLINE

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	8233110	Basic Organic Chemistry	3-0-0	45	3	Theory
2	Program Core	Theory	8233210	Mould Manufacturing Technology	3-0-0	45	3	Theory
3	Program Core	Practicum	8233340	Polymer Science	2-0-4	90	4	Practical
4	Program Core	Practicum	8233440	Basic Electrical and Control Circuits	2-0-4	90	4	Practical
5	Program Core	Practical	8233520	Tool Room Special Machines Practical	0-0-4	60	2	Practical
6	Program Core	Practical	8233620	CNC Simulation Practical	0-0-4	60	2	Practical
7	Open Elective	Advanced skill Certification	8233770	Advanced skill Certification- III	1-0-2	60	2	NA
8	Humanities and social science	Integrated learning Experience	8233880	Growth Lab	-	30	-	-
9	Audit Course	Integrated learning Experience	8233881	Induction Program-II	-	16	-	-
10	Audit Course	Integrated learning Experience	8233882	I & E / Club Activity /Community Initiatives	-	30	-	-
11	Audit Course	Integrated learning Experience	8233883	Shop Floor Immersion	-	8	-	-
12	Audit Course	Integrated learning Experience	8233884	Student-Led Initiative	-	30	-	-
13	Audit Course	Integrated learning Experience	8233885	Emerging Technology Seminars	-	8	-	-
14	Audit Course	Integrated learning Experience	8233886	Health and Wellness	0-0-2	30	1	NA
Test & Revisions					-	23	-	-
Library					-	15	-	-
Total					-	640	21	-

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SEMESTER: IV

CURRICULUM OUTLINE

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	8234110	Plastics Processing	3-0-0	45	3	Theory
2	Program Core	Practicum	8234230	Plastics Materials	2-0-2	60	3	Theory
3	Program Core	Practicum	8234340	Basic Hydraulics and Pneumatics	1-0-4	75	3	Practical
4	Program Core	Practicum	8234440	Mould Elements using 3D Software Practical	2-0-4	90	4	Practical
5	Program Core	Practical	8234520	Plastics Identification Practical	0-0-4	60	2	Practical
6	Program Core	Practical	8234620	Plastics Processing Practical I	0-0-4	60	2	Practical
7	Open Elective	Advanced skill Certificatio	8234770	Advanced skill Certification- IV	1-0-2	60	2	NA
8	Audit Course	Integrated learning Experience	8234882	I & E / Club Activity /Community Initiatives	-	30	-	NA
9	Audit Course	Integrated learning Experience	8234883	Shop Floor Immersion	-	8	-	-
10	Audit Course	Integrated learning Experience	8234884	Student-Led Initiative	-	30	-	-
11	Audit Course	Integrated learning Experience	8234885	Emerging Technology Seminars	-	8	-	-
12	Audit Course	Integrated learning Experience	8234886	Health and Wellness	-	30	-	-
13	Audit Course	Integrated learning Experience	8234887	Special Interest Groups (Placement Training)	-	30	-	-
Test & Revisions					-	39	-	-
Library					-	15	-	-
Total					-	640	19	-

VIRUDHUNAGAR S.VELLAICHAMY NADAR POLYTECHNIC COLLEGE (AUTONOMOUS),
(Affiliated to Directorate of Technical Education, Chennai – 25)
VIRUDHUNAGAR – 626 001

SEMESTER: V

CURRICULUM OUTLINE

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Practicum	8235130	Advanced Plastics Materials and Testing of Plastics	3-0-2	75	4	Theory
2	Program Core	Practicum	8235230	Industrial Engineering and Management	3-0-2	75	4	Theory
3	Program Elective	Theory		Elective 1	3-0-0	45	3	Theory
4	Program Core	Practicum	8235440	Plastics Processing Practical II	1-0-4	75	3	Practical
5	Program Elective	Practical		Elective 2	0-0-4	60	2	Practical
6	Humanities and social science	Practicum	8235660	Innovation and Startup	1-0-2	45	2	Project
7	Project / Internshi	Project / Internship	8235750	Industrial Training (Summer Vacation 90 Hrs)	-	-	2	Project
8	Open Elective	Advanced skill Certificatio	8235870	Advanced skill Certification- V	1-0-2	60	2	NA
9	Audit Course	Integrated learning Experienc	8235981	Induction Program III	-	40	-	-
10	Audit Course	Integrated learning Experience	8235984	Student-Led Initiative	-	30	-	-
11	Audit Course	Integrated learning Experience	8235986	Health and Wellness	-	30	-	-
12	Audit Course	Integrated learning Experience	8235987	Special Interest Groups (Placement Training)	-	40	-	-
Test & Revisions					-	45		
Library					-	15	-	
Total					-	635	22	-

SEMESTER : V

Elective 1

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	8235311	Plastics Mould and Die Design	3-0-0	45	3	Theory
2	Program Elective	Theory	8235312	Plastics Packaging Technology	3-0-0	45	3	Theory
3	Program Elective	Theory	*****	Inter Discipline Course #	3-0-0	45	3	Theory

Elective 2

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Practical	8235521	Plastics Mould Design Drawing Practical	0-0-4	60	2	Practical
2	Program Elective	Practical	8235522	Plastics Packaging Technology Practical	0-0-4	60	2	Practical
3	Program Elective	Practical	*****	Inter Discipline Course #	0-0-4	60	2	Practical

Course from other program with the same credit can be considered after proper approval from the Principal & Chairman Awards Committee

VIRUDHUNAGAR S.VELLAICHAMY NADAR POLYTECHNIC COLLEGE (AUTONOMOUS),
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VIRUDHUNAGAR – 626 001

SEMESTER: VI

CURRICULUM OUTLINE

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Open Elective	Theory		Elective 3 (Pathway)	3-0-0	45	3	Theory
2	Open Elective	Practicum		Elective 4 (Specialization)	1-0-4	75	3	Practical
3	Industrial Training / Project	Project / Internship		In-house project / Internship / Fellowship	-	540	12	Project
Total						660	18	-

Elective 3 (Pathway)

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Open Elective Higher Education	Theory	C236111	Advanced Engineering Mathematics	3-0-0	45	3	Theory
2	Open Elective Entrepreneurship	Theory	C236112	Entrepreneurship	3-0-0	45	3	Theory
3	Open Elective Technocrats	Theory	C236113	Project Management	3-0-0	45	3	Theory
4	Open Elective Technocrats	Theory	C236114	Finance Fundamentals	3-0-0	45	3	Theory
5	Open Elective Technocrats	Theory	8236115	Plastics Waste Management and	3-0-0	45	3	Theory
6	Open Elective Technologist	Theory	*****	Online Elective Course \$	3-0-0	45	3	Theory

\$ Online course with the same credit available in AICTE, NPTEL and reputed institution with proper Evaluation system and certification can be consider after proper approval from the Principal & Chairman Awards Committee

VIRUDHUNAGAR S.VELLAICHAMY NADAR POLYTECHNIC COLLEGE (AUTONOMOUS),
 (Affiliated to Directorate of Technical Education, Chennai – 25)
 VIRUDHUNAGAR – 626 001

SEMESTER: VI

Elective 4 (Specialization)

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Per iod	Credit	End Exam
1	Open Elective	Practicum	8236241	Plastics Mould Making Practical	1-0-4	75	3	Practical
2	Open Elective	Practicum	8236242	Composites Technology	1-0-4	75	3	Practical
3	Open Elective	Practicum	C236249	Nano and Solar Engineering	1-0-4	75	3	Practical

S. No	Course Category	Course Type	Course Code	Course Title	L-T-P	Per iod	Credit	End Exam
1	Industrial Training / Project	Project / Internship	8236390	In-house project	-	540	12	Project
2	Industrial Training / Project	Project / Internship	8236391	Internship	-	540	12	Project
3	Industrial Training / Project	Project / Internship	8236392	Fellowship	-	540	12	Project

8233110	BASIC ORGANIC CHEMISTRY	L	T	P	C
THEORY		3	0	0	3

Introduction

Organic chemistry is the branch of chemistry that deals with the structure, properties, and reactions of compounds that contain carbon. It is a highly creative science. Chemists in general and organic chemists in particular can create new molecules never before proposed which, if carefully designed, may have important properties for the betterment of the human experience.

Organic compounds play a major role in the manufacture of Polymeric materials. Organic compounds are all around us and in industries such as the rubber, plastics, fuel, pharmaceutical, cosmetics, and detergent, coatings, dyestuffs, and agricultural industries. Organic chemistry is critically important to our high standard of living.

Course Objectives

The objective of this course is to enable the students,

- To learn about the IUPAC nomenclature of the organic compounds.
- To understand the different methods of purification of the organic compound
- To understand the types of Isomerism and polymerization
- To know about the methods of preparation properties and uses of Alkane, Alkene, Alkynes, Alcohols, carbonyl compounds and Amines.
- To learn about the fractional distillation of coal tar and the various fractions

Course Outcomes

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

CO1	Narrate the Functionality, IUPAC nomenclature and different types of bond.
CO2	Explain the types of isomerism and different methods of purification of the organic compounds..
CO3	Describe about the types of organic reactions and methods of preparation properties and uses of methane, ethylene and acetylene.
CO4	Explain the different methods of preparation properties and uses of Alcohols, carbonyl compounds and amines
CO5	Discuss about the fractional distillation of coal tar and the various fractions and also preparation of properties and uses of Benzene, nitrobenzene, aniline and phenol

8233110	BASIC ORGANIC CHEMISTRY	L	T	P	C
THEORY		3	0	0	3

Pre-requisites: Basic Chemistry, Applied Chemistry-1

CO/PO Mapping

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

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

Instructional Strategy

- Conduct group discussions on various types of organic compounds
- Encourage students to know about the Periodic table and various compounds in it
- Use power point presentations and animations.
- Practices on preparation of various chemicals in Laboratory

8233110	BASIC ORGANIC CHEMISTRY	L	T	P	C
THEORY		3	0	0	3

Syllabus Contents

UNIT I	CLASSIFICATION, NOMENCLATURE AND TYPES OF BOND	Periods
<p>Chapter 1.1 : Classification of organic compounds – Functional Group - IUPAC nomenclature of Alkane, Alkene, Alkyne, alcohol (Monohydric, dihydric and trihydric), ether, Aldehyde, ketone, carboxylic acid (mono and di), and amines (Primary, secondary and tertiary).</p> <p>Chapter 1.2 : Types of Bond – Ionic Bond , Covalent Bond and Hydrogen Bond (Definition with example) - Homolytic and Hetrolytic fission of Covalent Bond. Free Radical, Carbocations and Carbanions (Defnition with example)</p>		9
UNIT II	PURIFICATION OF ORGANIC COMPOUNDS AND ISOMERISM.	Periods
<p>Chapter 2.1 : Purification of organic compounds - crystallization, sublimation, simple distillation and Column Chromatography</p> <p>Chapter 2.2 : Isomerism chain isomerism, position isomerism, functional isomerism,metamerism, and tautomerism (Keto-enol tautomerism only). Stereoisomerism.- optical isomerism (Lactic acid only)-Geometrical isomerism (Maleic acidand Fumaric acid only).</p>		9
UNIT III	TYPES OF ORGANIC REACTIONS AND HYDROCARBONS	Periods
<p>Chapter 3.1 : Types of organic reactions - Substitution reactions and Addition reaction(Definition with example) - Markonikaff's Rule - Peroxide effect, Elimination reaction and Polymerisation reactions</p> <p>Chapter 3.2 : General methods of preparation, properties and uses of Methane, Ethylene and Acetylene</p>		9
UNIT IV	ALCOHOLS , CARBONYL COMPOUNDS AND AMINES	Periods
<p>Chapter 4.1: General methods of preparation, properties and uses of Methanol (Preparation from water gas and by oxidation of CH₄). Ethylene glycol (Preparation from ethylene and ethylene diamine), Glycerol (Preparation from propylene).</p> <p>Chapter 4.2 : General methods of preparation, properties and uses of Formaldehyde, Acetone, Acetic acid and Amines (Primary, Secondary and Tertiary amines)- Separation of amines by Hoffmann's method.</p>		9

8233110	BASIC ORGANIC CHEMISTRY	L	T	P	C
THEORY		3	0	0	3

UNIT V	AROMATIC COMPOUNDS	Periods
Chapter 5.1 : Coal tar - Fractional distillation of coal tar - Different products and their uses Chapter 5.2: Commercial preparation of benzene (from (i) coal tar and (ii) Petroleum) - Properties of benzene. General methods of preparation, properties and uses of Nitrobenzene, Aniline and Phenol		9
Total Periods		45

Suggested list of Students Activity :

1. Prepare organic and inorganic compound in laboratory.
2. Practice purification of organic compounds by sublimation and distillation
3. Prepare various solutions and salts using chemicals
4. Prepare ester and study its odour and other properties.
5. Prepare a list of chemicals that can be prepared from coal tar.

Text Books and Reference Books:

1. B.S. Bahl and Arun Bahl - Text book of organic Chemistry
2. P.L. Soni and H.M. Chawla - Text book of organic Chemistry
3. K.S. Tewari S.N. Mehrotra and N.K. Vishnoi - Text book of organic chemistry
4. B.K. Sharma, G.P. Pokhariyal and S.K. Sharma.- Organic Chemistry - Vol-I and II
5. S.P. Shukla and G.L. Trivedi - Modern Organic Chemistry
6. +1 and +2 Chemistry - Tamil Nadu Textbook Corporation.

Web-based/Online Resources:

1. <https://publicchem.com>
2. <https://chemistryindia.com>
3. <https://chemistryworld.com>
4. <https://masterorganicchemistry.com>
5. <https://purificationorganiccompounds.com>

8233110 BASIC ORGANIC CHEMISTRY

Model Question

Time – Three Hours
Maximum Marks: 100

N.B:

1. Answer any ten questions under Part – A. Each question carries 2 marks
2. Answer all questions, choosing any two sub-divisions from each question under Part-B. Each sub-division carries 8 marks

PART – A

(10 X 2 = 20 Marks)

1. State the significance of IUPAC Nomenclature.
2. What is functional group?
3. Define Ionic Bond.
4. What is Sublimation?.
5. What is position Isomerism?
6. What is Metamerism?
7. Write addition reaction with an example.
8. Write the preparation of Methane.
9. What is peroxide effect?
10. Write the preparation of methanol from water gas
11. Name the different types of amines
12. Write the uses of Acetic acid.
13. Write the uses of Phenol
14. What is Tri Nitro Benzene?
15. Write the preparation of Benzene

PART – B

(5 X16 = 80 Marks)

16. (a) Discuss the different types of Amines with suitable example.
(b) State the different types of alcohols with example.
(c) Explain covalent bond with an example.
(d) Write notes on hemolytic and hetrolytic fission
17. (a) Discuss the purification of organic compounds by crystallisation.
(b) Explain the purification of organic compounds by Simple distillation
(c) Discuss Tautomerism with suitable example.
(d) Explain optical isomerism exhibited by Lactic acid
18. (a) Write the preparation of Nylon 6,6.
(b) Explain the properties of methane.
(c) Discuss the preparation and applications of Acetylene.
(d) Explain the preparation of polyethylene by addition polymerisation
19. (a) Discuss the properties and uses of ethylene glycol.
(b) Explain the preparation and uses of Formaldehyde.
(c) Discuss the chemical properties of Acetic acid.
(d) Write the separation of Amines by Hoffmann's method
20. (a) Discuss the fractional distillation of coal tar.
(b) Explain the chemical properties of Benzene.
(c) Discuss the preparation and properties of Phenol.
(d) Explain the properties of Aniline

8233210	MOULD MANUFACTURING TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

Introduction:

Generally, a manufacturing process involves products to be manufactured from raw materials. In order to achieve the objectives, certain processes consisting of many operations and steps need to be executed. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through the manufacturing process to become the required part. This will provide the students an opportunity to skill themselves in various mould manufacturing techniques available in the industry and also how to select the materials for engineering applications.

Course Objectives:

The objective of this course is to enable the students,

- To expose to the concept and basics of Metal Cutting and familiarize the accessories of Lathe and drilling.
- To familiarize with the working of the reciprocating machine tools such as Shaper and slotter.
- To familiarize with the working of the Milling machine and milling cutters.
- To familiarize with the working of the Grinding Machine
- To expose to the concept and basic working of unconventional machining processes and CNC machining process.

Course Outcomes:

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

CO 1 :	Know the single point cutting tool and understand the accessories of lathe and drilling
CO 2 :	Understand the principle, construction, operation and accessories of reciprocating machines
CO 3 :	Describe the principle, construction, operation of milling machines and cutters
CO 4 :	Understand principle, construction, operation, and types of grinding machines
CO 5 :	Know the principle, construction, operation and types of Unconventional machines and CNC machines

Pre-requisites:

Basics of Mechanical Engineering

8233210	MOULD MANUFACTURING TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

CO/PO Mapping:

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

Syllabus Contents

UNIT I	MACHINING PROCESS, LATHE AND DRILLING MACHINES	Periods
<p>Chapter 1.1: Machining Process: Mechanics of Chip formation, Single point cutting Tool and its geometry. Methods of Machining, Types of Chips, - Taylors Tool life Equation</p> <p>Chapter 1.2: Lathe accessories: chucks (three jaw, four jaw, and magnetic chuck), mandrels, rests, face plates, centers, and angle plates.</p> <p>Chapter 1.3: Lathe operations - facing, plain turning, taper turning, thread cutting, chamfering, grooving, knurling. Cutting parameters – speed, feed, depth of cut and machining time.</p> <p>Chapter 1.4: Drilling machine operations like drilling, reaming, boring, counter sinking, counter boring, spot facing. Cutting parameters - speed, feed, depth of cut and machining time.</p>		9
UNIT II	RECIPROCATING MACHINES	
<p>Chapter 2.1: Shaping Machine: Principle of working, classification, specification of standard shaper. Basic parts of standard shaping machine and their functions. Quick return mechanism – Crank and Slotted link only. Work holding devices – Operation done by Shaper</p> <p>Chapter 2.2: Slotting Machine: Principle of working, classification, specification. Basic parts of Slotting machine and their functions , Work holding devices - Operation done by Slotter</p>		9

8233210	MOULD MANUFACTURING TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

UNIT III	MILLING MACHINES	9
Chapter 3.1: Principle of operation - Types of milling machine – Basic Parts of Column and knee type horizontal milling machine and Vertical Milling machine Chapter 3.2: Milling process - Conventional milling and climb milling, Work holding devices, Tool holding devices-Standard Arbor - Stub arbor – Adapter and Spring collets. Chapter 3.3: Milling cutters - Plain - slab- End mill and Form milling cutters. Milling operations- Plain milling, End Milling, Form milling, Gear cutting, straddle and gang milling.		
UNIT IV	GRINDING MACHINES	
Chapter 4.1: Principle of operations - Classification of Grinding machines, Description of Reciprocating table with horizontal spindle Surface Grinding Machine. Chapter 4.2: Grinding wheels – Standard Marking of Grinding Wheel - Glazing and Loading of wheels, Dressing and Truing of Wheels, Balancing of grinding wheels , Mounting of grinding wheels		9
UNIT V	UNCONVENTIONAL MACHINING AND CNC MACHINING	9
Chapter 5.1: Introduction to Unconventional machining –Basic parts of Ultrasonic Machining – Basic parts of Laser beam Machining – Basic parts of Electric Discharge Machining (EDM) – Basic parts of Wire Cut EDM (Description only) Chapter 5.2: Introduction to CNC machines- Description and function of Horizontal turning center and Vertical machining center.		
Total Periods		45

Suggested list of Students Activity:

1. Observe the Lathe machine in the institute and study its specifications. List the possible operations that can be done on that machine.
2. Study different reciprocating machines available and draw the line sketch to study the working principle.
3. Study the types of milling cutters available for industrial applications. List its application in industry.
4. Study the types of grinding wheels available for industrial applications. Classify the abrasive materials and its properties.
5. Observe the CNC machine tool operation.

Text Books & Reference Books :

1. Hajra Chowdry & Bhattacharaya - Elements of workshop Technology Volume I & II – Iith Edition - Media Promoters & Publishers Pvt. Ltd., Seewai Building 'B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Rajendersingh - Introduction of basic manufacturing processes and workshop technology — New age International (P) Ltd. Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi – 110002
3. Myro N Begman - Manufacturing process, , , Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
4. WAJ Chapman - Workshop Technology- - Volume I, II, & III – Vima Books Pvt.

8233210	MOULD MANUFACTURING TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.

5. Workshop Technology – Raghuwanshi - Khanna Publishers. Jain & Gupta,

Web-based / Online Resources:

1. <https://www.youtube.com/watch?v=Wc2gpWcmGK4> - Lathe Machine Operation
2. <https://www.youtube.com/watch?v=zzXdddrV2so> - Milling machine
3. www.youtube.com/watch?v=T5gjkYvMg8A - Working with a Milling Machine
4. www.freevidelectures.com

8233210 MOULD MANUFACTURING TECHNOLOGY

Model Question

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. Write the Taylor's Tool life equation.
2. List the various types of lathe centers.
3. What is spot facing?
4. Give examples for reciprocating machine tools.
5. Write the specification of shaper .
6. Write the principle of slotter machine.
7. How milling machine are classified?
8. What are the work holding devices used in milling machine?
9. What is straddle milling?
10. Write the basic working principle of grinding machine.
11. What is glazing and loading in grinding wheel?
12. What is dressing and truing of grinding wheel?
13. What do you mean by unconventional machining?
14. Expand (i) LBM (ii) EDM
15. Write the advantages of CNC machining.

PART – B

(5 × 16 = 80 Marks)

16. (a) Explain single point cutting tool nomenclature.
(b) What are the work holding devices used in lathe? Explain any two with the sketch.
(c) What are the machining operations done on lathe? Explain any two with a neat sketch.
(d) Explain the various drilling machine operations.
17. (a) Draw a standard shaper machine and label its parts.
(b) Explain the crank and slotted link quick return mechanism used in the shaper.
(c) Describe the working principle of the slotter machine.
(d) Explain the machining operations done in the slotter machine.
18. (a) Discuss the basic parts of the column and knee type milling machine with a sketch.
(b) What are the tool holding devices used in the milling machine? and explain.
(c) List the various milling cutter. Explain any two with a neat sketch.
(d) Explain the gang milling operation in milling
19. (a) Describe reciprocating table with horizontal spindle surface grinder with a neat sketch.
(b) Write the classification of the grinding machine.
(c) Explain the standard marking system of a grinding wheel.
(d) Discuss balancing and mounting of a grinding wheel.
20. (a) Write an essay about the ultrasonic machining process.
(b) Explain the parts of Electric Discharge Machining process with a sketch.
(c) Describe the functions of the horizontal turning center.
(d) With a neat sketch, explain Vertical machining center.

8233340	POLYMER SCIENCE	L	T	P	C
PRACTICUM		2	0	4	4

Introduction:

It gives the student the knowledge of basic polymerization chemistry and their significance in polymer industries. With this information student can understand the structure of polymers and their effect on properties. Students can understand different methods of polymerization and problems associated with various polymerization techniques. Polymers are susceptible to degradation. Students can understand the various causes for degradation and methods of degradation.

Course Objectives:

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

- ❖ Monomer, Polymer and Polymerisation
- ❖ Free radical, initiators and inhibitors
- ❖ Significance of Molecular weight of polymers
- ❖ Relationship between viscosity and molecular weight
- ❖ Chemical and geometrical structures of polymer molecules
- ❖ Theory of Polymer crystallization and Significance of glass transition temperature
- ❖ The various causes of degradation and Types of degradation.

Course Outcomes:

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

CO1	Understand Monomer, Polymer and Polymerisation Free radical, initiators and inhibitors Ionic polymerization
CO2	Describe Poly addition polymerization and poly condensation polymerisation
CO3	Illustrate the significance of average molecular weights, Molecular weight distribution in polymers Relationship between viscosity and molecular weight
CO4	Explain Crystallinity and effect of Crystallinity on polymers
CO5	Narrate the Significance and determination of glass transition temperature and Types of degradation

Pre-requisites:

Basic Organic Chemistry

8233340	POLYMER SCIENCE	L	T	P	C
PRACTICUM		2	0	4	4

CO/PO Mapping:

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

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
- Incorporate technology tools and resources, such as online platforms, interactive multimedia, and virtual communication tools, to enhance engagement and provide additional practice opportunities.
- Incorporate formative and summative assessments to gauge student progress and provide targeted feedback.
- 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 may be followed in the real environment as far as possible.

8233340	POLYMER SCIENCE	L	T	P	C
PRACTICUM		2	0	4	4

Syllabus contents

Theory :		
UNIT I	CHEMISTRY OF POLYMERISATION AND POLYMERISATION TECHNIQUES	Periods
<p>Chapter 1.1: Classification of polymers - Chain polymerisation - Free Radical polymerisation – Poly addition polymerization (Preparation of polyethylene and polystyrene) and Condensation polymerization (Preparation of polyester and Nylon 6,6)</p> <p>Chapter 1.2: Polymerisation techniques - Bulk polymerization, Solution polymerization, Suspension and Emulsion polymerisation – Advantages and disadvantages of various Polymerisation Techniques.</p> <p>Chapter 1.3: Specific Gravity. and Melting Point of Polymers – significance and method of determination.</p>		15
Practical Exercises:		
Ex. No.	Name of the Experiment	Periods
1	Determination of Specific gravity of Polymers	30
2	Determination of Melting point of Polymer samples	
3	Preparation of PS by Bulk Polymerisation Technique'	
4	Preparation of PMMA by Solution Polymerisation Technique'	
5	Preparation of Nylon 6,6 by Polycondensation polymerization technique	
Theory :		
UNIT II	POLYMER MOLECULAR WEIGHT, DEGREE OF CRYSTALLINITY, GLASS TRANSITION TEMPERATURE AND POLYMER DEGRADATION	Periods
<p>Chapter 2.1: Molecular weight and degree of polymerization -, Simple Problems - Practical significance of polymer molecular weight. Co-polymers and types of co-polymers</p> <p>Chapter 2.2: Crystallinity - Degree of crystallinity - Effect of crystallinity on the properties of polymers - Glass transition temperature - Importance of glass transition temperature -Determination of Glass transition temperature by Dilatometric method.</p> <p>Chapter 2.3: Polymer degradation - Thermal degradation and Hydrolytic degradation.</p>		15
Practical Exercises:		
Ex.No.	Name of the Experiment	Periods
6	Determination of Degree of Crystallinity of polymer by Density method	
7	Determination of Thermal Degradation of Polymers	

8233340	POLYMER SCIENCE	L	T	P	C
PRACTICUM		2	0	4	4

8	Determination of Hydrolytic Degradation of Polymers	30
9	Determination of Moisture Content	
10	Determination of Ash content	
Total Periods		90

Suggested List of Students Activity:

Activity 1:

Study and understand the various plastic materials available in the laboratory. Then each student shall write and submit the report on physical nature and uses of the materials.

Activity 2:

Four students can be grouped as a batch to collect information about the various causes of degradation of plastics and methods by which plastics can be protected from degradation. They will have to prepare a report and submit.

Text Books and Reference Books :

1. V.R.Gowariker, N.V.Viswanathan & Jayadev Sridhar - Polymer Science - New age international publishers - 1986.
2. Fred W.Billmeyer - Text Book of Polymer Science - Wiley Interscience - 1971.
3. Anilkumar & S.K.Gupta -Fundamentals of Polymer Science - Tata McGraw Hill Pub. Co. 1978.
4. Odian.G - Principles of Polymerisation – McGraw-Hill, New York – 1970
5. Blackley & Halsted - Emulsion Polymerisations: Theory and Practice - McGraw-Hill, New York - 1975
6. I.Herman S.Haufman and Joseph J.Falce - Introduction to Polymer Science and Technology - Wiley Inter Science Publications- 1977.

Web Based / Online Resources

1. <https://polymerscience.com>
2. <https://polymerchemistry.com>
3. <https://polymercrystallisation.com>
4. <https://polymersdegradation.com>
5. <https://polymerisation.com>

8233340	POLYMER SCIENCE	L	T	P	C
PRACTICUM		2	0	4	4

SCHEME OF EVALUATION

Model practical examination and End practical examination

Note:

- All the exercises should be given in the question paper and students are allowed to select by lot
- Record of work done should be submitted for the examination with a Bonafide Certificate.

Part	Description	Marks
A	Aim & Apparatus Required	5
B	Procedure and Tabular column	30
C	Formula and calculation	30
D	Result	10
E	Theory Questions (10×2 Marks Covering all Units)	20
F	Viva voce	5
Total Marks		100

Equipments / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1.	Melting Point Apparatus	1
2.	Air Circulating Oven-	1
3.	Mechanical Stirrer-	1
4.	Analytical Balance	1
5.	Muffle Furnace	1
6.	Specific Gravity Bottle	Sufficient
7.	Thermometer	Sufficient
8.	Chemicals and Glassware	Sufficient
9.	Consumables	Sufficient

8233440	BASIC ELECTRICAL AND CONTROL CIRCUITS	L	T	P	C
PRACTICUM		2	0	4	4

Introduction:

It gives the knowledge to the students of basics of AC and DC circuits, Single phase induction motor, electronic circuits and logic gates and their construction & working principle and their applications in industries.

Course Objectives:

It gives the knowledge to the student the skill development on the basics of AC and DC circuits, Single phase induction motor, electronic circuits and logic gates by experience in handling various equipment's. This is accomplished by doing the related experiments in practical classes.

Course Outcomes:

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

CO1:	Understand the basics of DC Circuits.
CO2:	Understand the basics of AC Circuits.
CO3:	Understand the working of single-phase Induction Motor
CO4:	Understand the various electronic circuits.
CO5:	Illustrate the operation of PLC.

Pre-requisites:

Science and Mathematics in Secondary Education.

CO/PO Mapping

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

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.
- 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.

8233440	BASIC ELECTRICAL AND CONTROL CIRCUITS	L	T	P	C
PRACTICUM		2	0	4	4

Syllabus Contents :

UNIT I	BASICS OF D.C AND A.C CIRCUITS	Periods
<p>Chapter 1.1: Definitions: Atom, Charge and Current, Direct and Alternating Current, Voltage, Resistance, Power and Energy and their units. Basic Laws: Ohms Law, Kirchhoff's laws (Statement & Explanation)</p> <p>Chapter 1.2: D.C. Circuits: Equivalent resistance of Series and parallel circuits - simple Problems.</p> <p>Chapter 1.3: AC Fundamentals: Sinusoidal Waveform, Why sinusoidal waveform, Fundamentals of AC voltage, and current – peak, instantaneous, average, RMS value of sine wave, frequency, time period – Definition- Impedance, Reactance - inductive and capacitive reactance, Power in ac circuits – real, reactive and apparent, power factor.</p> <p>Chapter 1.4: Single Phase Induction Motor: principle of working -Capacitor Start induction Run Motor.</p>		15
Ex.No.	Name of the Experiment	Periods
1.	Measurement of unknown resistance using ohm's law.	30
2.	Verification of series and parallel circuit.	
3.	Verification of Kirchhoff's current law.	
4.	Verification of Kirchhoff's voltage law.	
5.	Load test on a single-phase induction motor.	
UNIT II	BASIC ELECTRONICS CIRCUITS AND INTRODUCTION TO PLC	Periods
<p>Chapter 2.1: Electronic Devices: Theory, Characteristics and uses of –PN Junction Diode, Bipolar Junction transistor, Zener Diode, Silicon Controlled Rectifier. Electronic Circuits: Construction, working and uses of – Full wave Rectifier, Bridge Rectifier, Voltage Regulator, Photo Diode.</p> <p>Chapter 2.2: Logic gates: Definitions, symbol and truth table of NOT, AND, OR, NAND, NOR and XOR Gates.</p> <p>Chapter 2.3: Programmable Logic Controllers: Definition- features and benefits of PLC- system and its elements – input and output modules - PLC memory system- PLC circuit verses hard wired circuit. Simple ON-OFF Motor control circuit.</p>		15
Ex.No.	Name of the Experiment	Periods
6.	Characteristics of P N junction diode and photo diode.	30
7.	Zener diode voltage regulator	
8.	Construction of bridge rectifier.	
9.	IC voltage regulator (7805)	
10.	Motor control using PLC	
Total Periods		90

8233440	BASIC ELECTRICAL AND CONTROL CIRCUITS	L	T	P	C
PRACTICUM		2	0	4	4

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
- Viva Voce will be conducted before conducting an experiment.

Text Books and Reference Books:

1. Text Book: A Text Book on Electrical Technology by B.L. Theraja,
2. Electronic Devices by V.K. Metha.
3. Digital principles and application- malvino.
4. Control of Electrical Machines-S.K. Bhattacharya, Brijinder Singh-New Age International Publication.

Web-based/Online Resources:

- <https://nptel.ac.in/courses/117/103/117103063>
- <https://nptel.ac.in/courses/108/105/108105158>
- <https://nptel.ac.in/courses/108/102/108102112>
- <https://nptel.ac.in/courses/108/105/108105113>
- <https://nptel.ac.in/courses/108/105/108105132>
- <https://nptel.ac.in/courses/117/106/117106086>
- <https://nptel.ac.in/courses/117/106/>
- <https://youtu.be/JF1A2GtdqQ>

SCHEME OF EVALUATION**Model Practical Examination and End Semester Practical Examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafide certificate.

Part	Description	Marks
A	Aim and Apparatus Required	15
B	Circuit diagram and Connection	20
C	Observations, Readings Taken, Calculation/graph	25
D	Procedure & Result	15
E	Theory Questions 10×2 Marks Covering all Units	20
F	Viva Voce	5
Total Marks		100

8233440	BASIC ELECTRICAL AND CONTROL CIRCUITS	L	T	P	C
PRACTICUM		2	0	4	4

Equipments / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Rheostat of various ranges	Sufficient
2	RPS (0-12v, 0-30v)	Sufficient
3	Ammeters (MC and MI) of various ranges	Sufficient
4	Voltmeters (MC and MI) of various ranges	Sufficient
5	Wattmeter – 300v/5A-2.5A/UPF	Sufficient
6	CRO	Sufficient
7	Diode and Photodiode	10 each
8	Single phase induction Motor	Sufficient
9	PLC trainer kit with computer	Sufficient
10	IC voltage regulator	Sufficient
11	Resistors, Capacitors various ranges	Sufficient
12	Breadboards and connecting wires	Sufficient
13	Multi meter and Lamp	Sufficient

8233520	TOOL ROOM SPECIAL MACHINES PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

Diploma technocrats frequently encounter diverse manufacturing processes. This course Tool Room Special Machines practical aims to enhance student's comprehension of manufacturing methods in various machine tools, like Lathe, Shaper, Surface grinder, Milling and use of Slotter machines.

Course Objectives:

The objective of this course is to enable the students,

- To learn the principles of machining process used in tool room.
- To understand and analyze the principles of manufacturing process used in engineering applications.
- To handle the measuring instruments used in tool room.

Course Outcomes:

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

CO1:	Apply the concepts of machining on lathe
CO2:	Understand the various operations to be performed on drilling machine and shaper.
CO3:	Understand the various operations to be performed slotter
CO4:	Understand the various operations performed in milling
CO5:	Understand the use of grinding in finishing process.

.Pre-requisites:

Basic Workshop Practices , Basic Engineering Practices

CO/PO Mapping:

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

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

Instructional Strategy:

- Take the students to tool room based industry visit and make the opportunity to visit them industrial approach on various machine tools.
- Encourage the students to know about the latest technological developed in machine tools.
- Use various charts about machine principle, power point and animations.
- Practices on shop floor.

8233520	TOOL ROOM SPECIAL MACHINES PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Syllabus Contents

Ex. No.	Name of the Exercise	Periods
1.	Facing and Plain turning operation in Lathe	60
2.	Step turning operation in Lathe.	
3.	Taper turning operation in Lathe.	
4.	Drilling and boring operation in lathe.	
5.	Knurling practice in lathe.	
6.	Machining multiple holes in drilling machine.	
7.	Squaring operation in shaper	
8.	External Key way cutting in slotter.	
9.	Machining Circular Pocket in milling machine.	
10.	Polishing of surface using Surface grinder.	
Total Periods		60

Suggested List of Students Activity:

1. Prepare a safety rules chart for working in machine and tools.
2. Prepare a Tool room Layout.
3. Prepare a list of work holding devices and tool holding devices available in the tool room.
4. Prepare a list of measuring instruments that are used in the tool room.

Text Books and Reference Books:

1. Workshop technology by W.A.J. Chapman, Part 1,2,&3
2. Elements of workshop technology vol-1 & 2 By S.K Hajra choudhury & S.K. Bose
3. Manufacturing Technology vol-1 By P.Radhakrishnan
4. Production technology By Jain & gupta
5. workshop technology by B.S. Raghuvamshi
6. Workshop technology vol-1 & 2 By R.S. Kurmi
7. A Text book of manufacturing Technology –I By P.C.Sharms Chand pub

Web-based / Online Resources:

1. <https://www.youtube.com/watch?v=km6ickQgIVY>
2. <https://www.youtube.com/watch?v=f2nbjRVJa88>
3. <https://www.youtube.com/watch?v=2jc3HkrHh9s>
4. <https://www.youtube.com/watch?v=1cppw8nLVnQ>
5. <https://www.youtube.com/watch?v=7Oh-VDsMfKs>
6. https://www.youtube.com/watch?v=6_KK_hnSlks

8233520	TOOL ROOM SPECIAL MACHINES PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

SCHEME OF EVALUATION

Model Practical Examination and End Semester Practical Examination

Note:

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafide Certificate.

Part	Description	Marks
A	Job preparation /marking	30
B	Setting and operation	30
C	Procedure	15
D	Dimension/ finish	20
E	Viva Voce	5
Total Marks		100

Equipments / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Lathe	3
2	Drilling Machine	1
3	Shaper	1
4	Slotter	1
5	Horizontal milling machine	1
6	Vertical milling machine	1
7	Surface grinding machine	1
8	Tools and measuring instruments	Sufficient
9	Consumables	Sufficient

8233620	CNC SIMULATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

Development of computer numerically controlled Machine is outstanding contribution to Manufacturing industry. It has made possible automation of machinery processes with flexibility to handle as small and medium batch quantities in part production. The production process is the most costly area of manufacturing when things go wrong. The efficiency and high throughput of modern machine tools means that simple things like tool wear, changes to environmental conditions or a small error in programming can add up to costly rework and scrap. This course allows validating CAD/ CAM programs prior to production to avoid costly collisions and mitigate against anomalies in machine tool behaviour.

Course Objectives:

The objective of this course is to enable the students,

- To study the working principle of CNC machines
- To study the datum points and offsets.
- To differentiate incremental System with absolute system
- To study the simulation software package.
- To write program and simulate in the Lathe software and Milling software.

Course Outcomes:

On successful completion of the course, the students will be able to

CO1:	Know the G codes & M codes for part programming
CO2:	Identify all the components of CNC Machine tool
CO3:	Prepare CNC Program for Turning centre
CO4:	Prepare CNC program for Vertical Machining Centre
CO5:	Make use of special programming features and execute the simulation on the CNC Lathe and CNC Vertical Machining Centre

Pre-requisites:

Mould Manufacturing Technology

CO/PO Mapping:

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

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

8233620	CNC SIMULATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Instructional Strategy:

- Narrate the part program execution for different components in different modes like single block, manual and auto mode.
- Explain the concept of tool and work offsets setting.
- Give more practice to prepare various programs as per drawing.

Syllabus Contents

Ex. No.	Name of the Exercise	Periods
1.	Using Box turning cycle – Create a part program for taper turning and simulate in the software	60
2.	Using Stock removal cycle – Create a part program for multiple turning operations. and simulate in the software	
3.	Using canned cycle - Create a part program for thread cutting, grooving. and simulate in the software	
4.	Using Linear interpolation and Circular interpolation – Create a part program for grooving. and simulate in the software	
5.	Using canned cycle - Create a part program for drilling and tapping. and simulate in the software	
6.	Using canned cycle - Create a part program for drilling and counter sinking. and simulate in the software	
Total Periods		60

Suggested List of Students Activity:

1. Prepare list of G codes and M codes.
2. Read the other component drawing to prepare part programming.
3. Access the CNC train teachware and learn to compare it with CNC machines.

Text and Reference Books:

1. CNC Machining Handbook: Basic Theory, Production Data, and Machining Procedure; Author: James Madison; ISBN: 0831130644 / 9780831130640.
2. Computer Numerical Control Simplified, (With CD-ROM); **Author:** Arthur Gill and Peter Smid, Steve Krar; **ISBN:** 0831131330 / 9780831131333
3. "CNC Programming Techniques" by Peter Smid
4. "CNC Programming Using Fanuc Custom Macro B" by S. K. Sinha

Web-based / Online Resources:

1. <https://www.youtube.com/watch?v=wYebU4JSkGQ>
2. <https://www.youtube.com/watch?v=4nrxofaSfQ>
3. <https://www.youtube.com/watch?v=OCa-pHi5S94>
4. <https://www.youtube.com/watch?v=mpOJ1u05rYU>

8233620	CNC SIMULATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

SCHEME OF EVALUATION

Model Practical Examination and End Semester Practical Examination

Note:

All the exercises should be given in the question paper and students are allowed to select by a lot.

Record of work done should be submitted for the examination with a Bonafide Certificate.

Part	Description	Marks
A	Program and Printout	40
B	Simulation and Printout	40
C	Procedure	15
D	Viva Voce	5
Total Marks		100

Equipments / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1.	Personal computer	Sufficient.
2.	CNC Simulation software(Lathe and Milling)	Sufficient.
3.	Laser Printer	1 No.
4.	Consumables	Sufficient

8234110	PLASTICS PROCESSING	L	T	P	C
THEORY		3	0	0	3

Introduction

Plastic processing is a process of converting plastics raw materials into finished or semi finished products. The raw materials are available in the form of resin, granules, pellets, powders, sheets, and preforms. Plastic materials can contain various additives that may influence their properties and processability. This plastic processing course will provide the students an opportunity to skill themselves in various plastics processing methods and their processing parameters and also how to select the processing methods, processing materials for engineering applications.

Course Objectives

The objective of this course is to enable the student,

- To understand the various types of compression and transfer moulding processes.
- To acquire knowledge about injection moulding machines and their processes.
- To identify the requirements applications of blow moulding and rotational moulding processes.
- To know the various forms of extrusion and calendaring processes.
- To familiarize the various forms of thermoforming processes.

Course Outcomes

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

CO1:	Understand the various types of compression and transfer moulding processes
CO2:	Acquire knowledge about injection moulding machines and their processes.
CO3:	Identify the requirements applications of blow moulding and rotational moulding processes
CO4:	Know the various forms of extrusion and calendaring processes
CO5:	Familiarize the various forms of thermoforming processes.

Pre-requisites:

Plastics material.

CO/PO Mapping

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

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

8234110	PLASTICS PROCESSING	L	T	P	C
THEORY		3	0	0	3

Instructional Strategy:

- It is advised that teachers take steps to students 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 to enhance engagement and provide additional learning opportunities.
- All demonstrations / Hand-on practices may be followed in the real environment as far as possible.

Syllabus contents

UNIT I	COMPRESSION AND TRANSFER MOULDING	Periods
<p>Chapter 1.1 Compression moulding: Introduction to compression moulding process - Compression moulding cycle- Bulk factor - Curing time - Flow properties - Preheating and preforming. Types of compression moulding press - up press and down press. Trouble shooting - Advantages and Limitation of compression moulding process.</p> <p>Chapter 1.2 Transfer moulding: Basic principle of transfer moulding process - Transfer moulding cycle - Types of transfer moulding process - Pot type-Plunger type-top plunger - bottom plunger - Advantages and Limitations of transfer moulding process. Comparison of transfer moulding process with compression moulding process.</p>		9
UNIT II	INJECTION MOULDING	
<p>Chapter 2.1 Basic principles of injection moulding process - Moulding Cycle time - Moulding materials. Types of injection moulding machine - plunger type-Single stage - Two stage- Screw type machines - reciprocating type - non reciprocating type.</p> <p>Chapter 2.2 Plasticizing unit: Construction of plasticizing unit (injection unit) - Screw - Types of screw - general purpose screw - PVC screw. Barrel - types of barrel - standard barrel-venting barrel. Nozzle - Types of nozzle - standard - Reverse taper - Shut off nozzle - Non return valve - Ring type - Ball type.</p> <p>Chapter 2.3 Clamping Unit: Clamping unit - Types of clamping system - Toggle clamping - Hydraulic clamping - merits and demerits. Specification of injection moulding machine - Calculation of clamping tonnage - Shot capacity - Injection rate - Plasticizing capacity.</p> <p>Chapter 2.4 Processing parameter and its effect on molding: Processing parameters - Pressure - injection pressure - hold on pressure - back pressure - reaction pressure. Temperature- Melt temperature - Temperature controller. Time - injection - hold on - cooling - mould opening and closing time.</p>		9

8234110	PLASTICS PROCESSING	L	T	P	C
THEORY		3	0	0	3

UNIT III	BLOW MOULDING - ROTATIONAL MOULDING - CASTING			
<p>Chapter 3.1 Blow Moulding: Basic principles of blow moulding- process and materials - Types- Extrusion blow moulding process - Injection blow moulding process - Stretch blow moulding process- injection stretch - extrusion stretch. Production of parison - Parison wall thickness control - die centering - die shaping - Parison programming. Advantages and limitations of blow moulding process - Trouble shooting.</p> <p>Chapter 3.2 Rotational moulding: Basic process and materials - Applications of rotational moulding - Advantage and trouble shooting.</p> <p>Chapter 3.3 Casting: Basic principle of casting - Shell casting - Continuous casting - Pressure casting - Centrifugal casting - Solvent casting.</p>				9
UNIT IV	EXTRUSION PROCESS - CALENDERING PROCESS			
<p>Chapter 4.1 Extrusion Process: Basic principle of extrusion process - Barrel - screw nomenclature - Design - Types of screw - L/D ratio-compression ratio. Screen pack - Breaker plate. Types of extruders - Single screw extruder - Twin screw extruder - applications.</p> <p>Chapter 4.2 Application of extrusion process: Production unit of Pipe - Sizing unit - Winding and cutting unit - Tubular blown film extrusion - Cast film - Extrusion coating - lamination - Sheet extrusion - Wire and cable covering - Co-extrusion (basic concepts only) - Trouble shooting .</p> <p>Chapter 4.3 Calendering Process: Basic principles of calendering process and materials - Types of canlenders. Manufacturing of PVC calendered sheets - controlling of Sheets thickness -Gauge control - crowing effect - Crowning effect - Wall thickness controlling methods - Contour grinding - Cross axis bending-roll bending - Application and limitation of calendering process.</p>				9
UNIT V	THERMOFORMING PROCESS AND FOAMS			
<p>Chapter 5.1 Thermoforming Process: Basic principle of thermoforming - Thermoforming materials - Mould and mould materials - Heating sources - Radiant - Contact heating - Draw ratio of sheet. Thermoforming techniques - Vacuum forming - Plug assist forming - Drape forming - Bubble or blister forming - Snap back forming- Advantages and limitations of thermoforming - Trouble shooting</p> <p>Chapter 5.2 Foams - Introduction to plastic foaming process - Structural foam moulding – Foaming process - Expandable polystyrene foam - PVC foam - Polyethylene.</p>				9
Total Periods				45

8234110	PLASTICS PROCESSING	L	T	P	C
THEORY		3	0	0	3

Suggested List of Students Activity:

- Presentation / Seminars by students on recent Plastic processing technology.
- Blended learning activities to explore the recent trends and developments in the field.
- To visit any one type of plastic processing industry.

Text Books and Reference Books:

1. William. J. Patton- Plastic Technology.
2. D.H. Marton., Jones - Polymer Processing
3. A.S. Athalye - Injection Moulding
4. Walter Mink - Practical Injection Moulding of Plastics
5. Irvin Rubin - Injection Moulding
6. Edward. A. Maccio - Plastic Processing Technology .
7. Donald V.Rosato - .Blow moulding handbook
8. Griffia., R.A. Elden - Calendering of Plastics .

Web based / Online Resources

- 1.<https://www.youtube.com/watch?v=Nee00dT2EfA>
- 2.<https://www.youtube.com/watch?v=oGe8lrmdAoU>

8234110 PLASTICS PROCESSING

Model Question

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any Ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. What is meant by Curing time?
2. Define "Bulk factor".
3. Write the limitations of transfer moulding process.
4. What is meant by "Moulding cycle time"?
5. Write the functions of barrel.
6. What is meant by "Shot capacity"?
7. What is the necessity of parison wall thickness control?
8. What are the advantages of rotational moulding?
9. What is meant by "Solvent casting"?
10. Write the functions of "breaker plate".
11. Define "Co-extrusion".
12. What is meant by "Crowning effect"?
13. Define "Drape forming".
14. What is meant by "Draw ratio of sheet"?
15. What are the advantages of thermoforming process?

PART – B

(5 × 16 = 80 Marks)

16. (a) Explain the compression moulding process with neat diagram.
(b) Explain the compression moulding press with diagram.
(c) Explain the working principle of pot transfer moulding process with neat diagram.
(d) Compare compression moulding process with transfer moulding process.
17. (a) Explain the working principle of reciprocating screw injection moulding machine.
(b) Write notes on (i) Reverse type nozzle (ii) Shut off nozzle.
(c) Explain the working principle of "Toggle clamping".
(d) Write short notes on (i) Back pressure (ii) Temperature controller.
18. (a) Explain the Extrusion blow moulding process with neat diagram.
(b) Explain the rotational moulding process with neat diagram.
(c) Explain the centrifugal casting process with neat diagram.
(d) Explain the "Parison programming".
19. (a) Explain the basic principle of extrusion process.
(b) With neat diagram, explain the production unit of pipe.
(c) Explain the blown film extrusion process.
(d) Explain the basic principle of calendering process with neat diagram.
20. (a) Explain the vacuum forming process with diagram.
(b) Explain the snap back forming process with neat diagram.
(c) Write notes on "Expandable polystyrene foam".
(d) Write notes on "PVC foam".

8234230	PLASTICS MATERIALS	L	T	P	C
PRACTICUM		2	0	2	3

Introduction:

To study the manufacturing technology, properties and applications of various plastics. Appreciate the influence of chemical structure on various properties of plastics. Acquire basic knowledge on thermoplastic and thermoplastic elastomers and polymer blends their properties and their applications. Familiar with preparation, properties and application of various plastics materials.

Course Objectives:

The objective of this course is to enable the students

1. To know the structure and property relationship of various plastics
2. To select a plastic for a given application based on its properties
3. To differentiate the various categories of plastics
4. To understand the applications of various plastics
5. To identify different plastics by simple identification method

Course Outcomes:

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

CO1	To know the structure and property relationship of various plastics
CO2	To select a plastic for a given application based on its properties
CO3	To differentiate the various categories of plastics
CO4	To understand the applications of various plastics
CO5	To identify different plastics by simple identification method

Pre-requisites:

Basic Organic Chemistry , Polymer science

CO/PO Mapping:

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

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

8234230	PLASTICS MATERIALS	L	T	P	C
PRACTICUM		2	0	2	3

Instructional Strategy:

- To help students learn and appreciate new concepts and principle, 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 the student's scientific mindset.
- Activities for student should be planned on feasible topics.
- Throughout the course, a theory-demonstrate-activity strategy may be used to ensure that learning is outcome-based and employability-based.
- All demonstrations/Hand-on practices are under a simulated environment (may be followed by a real environment as far as possible).
- ICT tools must be used to deliver the content more attractively so that the attention of the learners are drawn and will create a curiosity in them to understand the content in a better way.
- Industrial visit can be arranged to make the students to realize the application of theoretical knowledge gained in the classroom.
- Incorporation of Blended/Flipped learning will help the students to understand the content better.

Syllabus Contents :

UNIT I	COMMODITY PLASTICS – I	
	<p>Chapter 1.1 Plastics – Definition and Classifications – Abbreviations. Polyolefins: Polyethylene – Types: LDPE, HDPE, LLDPE – Structure – Manufacture of High-Density Polyethylene by Zeigler process - Properties and applications of PE – Polypropylene – Types: Isotactic, Syndiotactic and Atactic – Structure – Properties and applications of PP.</p> <p>List of experiments:</p> <ol style="list-style-type: none"> 1. Determination of burning behavior of (i) LDPE (ii) HDPE 2. Determination of floatation and solubility behavior of PP 	12
UNIT II	COMMODITY PLASTICS – II	
	<p>Chapter 2.1 Polystyrene: Structure, Properties and applications of PS, SAN, ABS ,HIPS and EPS Polyvinyl chloride: Manufacture of PVC - Structure – Property – Difference between rigid and flexible PVC - Applications.</p> <p>List of experiments:</p> <ol style="list-style-type: none"> 3. Determination of burning behavior of (I) PS (ii) ABS (iii) SAN (iv) HIPS 4. Determination of self-extinguishing characteristics of PVC 	12
UNIT III	ENGINEERING PLASTICS – I	
	<p>Chapter 3.1 Polyamides (Nylon 6 & Nylon 6,6 (only)): Structure, Preparation, Properties and applications</p> <p>Chapter 3.2 Polyesters – PET: Structure, Preparation, Properties and applications</p> <p>PMMA: Structure, Preparation, Properties and applications</p> <p>List of experiments:</p> <ol style="list-style-type: none"> 5. Determination of moisture absorption characteristics of Nylon 6 6. Determination of burning behavior of PET 	12

8234230	PLASTICS MATERIALS	L	T	P	C
PRACTICUM		2	0	2	3

UNIT IV	ENGINEERING PLASTICS – II	
Chapter 4.1 Polyacetals: Structure, Preparation, Properties and applications Chapter 4.2 PC: Structure, Preparation, Properties and applications Chapter 4.3 Fluorine containing Plastics: Structure, Preparation, properties & applications of PTFE. List of experiments: 7. Determination of self-extinguishing characteristics of (i) PC (ii) PTFE 8. Determination of burning behavior of PMMA		12
UNIT V	THERMO PLASTIC ELASTOMERS AND POLYMER BLENDS	
Chapter 5.1 Basic structure, Method of Manufacture, properties and applications of Thermoplastic styrene block copolymers, Polyurethane thermoplastic elastomers. Chapter 5.2 Introduction to polymer blends and alloys – difference between blends and alloys – classification of polymer blends – compatible and incompatible blends – important properties and applications of industrial poly blends like PPO/PS (NORYL), POM/Elastomer (DELTRIN) List of experiments: 9. Determination of hydrolytic stability of POM 10. Determination of burning behavior of PU		12
Total Periods		60

Suggested List of Students Activity:

- Presentation / Seminars by students on any recent technological developments based on the course
- MCQ have to be conducted for all the five units.
- Blended learning activities to explore the recent trends and developments in the field.

Text Books and References Books :

1. Brydson.J.A., Plastics Materials, 7th edition Elsevier Publication, 1999
2. Irvin.I. Rubin, “Hand Book of Plastic Materials and Technology”, Wiley Interscience, NY,1990.
3. Engineering. Plastics, Vol.2, ASM International 1988.
4. R.W. Dyson “Specialty Plastics” 2nd edition, Blackie Academic & Professional 1988.
5. Athalye& Prakash Trivedi, PVC Tech, Multitech Publishing Co, Bombay,1994.
6. Geoffrey Pritchard, “Plastics Additives”, Rapra Technology Ltd, UK, 2005.
7. Olagoke Olabisi, “Hand Book of Thermoplastics”, Marcel Decker, inc., 1997
8. James M. Margolis “Engineering. Plastics Handbook” McGraw – Hill, 2006.
9. G.Gordon Cameron - Ellis Hand Book of Analysis of Synthetic Polymers- Honwood Ltd., - 1977
10. Analysis of plastics – Lab manual

Web-based / Online Resources:

1. <https://www.youtube.com/watch?v=Nee00dT2EfA>
2. <https://www.youtube.com/watch?v=oGe8lrmdAoU>

8234230	PLASTICS MATERIALS	L	T	P	C
PRACTICUM		2	0	2	3

SCHEME OF EVALUATION

Model Practical Examination

Note:

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Observation should be submitted for the examination.

Part	Description	Marks
A	Aim	5
B	Procedure	30
C	Determination of Charters ties	25
D	Result	5
E	Observation	30
F	Viva Voce	5
Total Marks		100

Equipments / Facilities required to conduct the Practical

S.No.	Name of Equipments	Quantity Required Nos
1.	Tripod stand	4
2.	Mortar and pestle	2
3.	Tongs	5
4.	Test tube / Ignition tube	10
5.	Beaker	5
6.	Bunsen burner	4

8234230	PLASTICS MATERIALS	L	T	P	C
PRACTICUM		2	0	2	3

Model Question Paper

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any Ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. What is meant by plastics?
2. Give two examples for “Commodity plastics”.
3. Expand (i) LDPE (ii) PMMA
4. State two applications of HIPS.
5. Write the structure of PS.
6. What are the key properties of SAN?
7. Write the structure of Nylon 6.
8. Why PET is called as engineering plastic?
9. What 6, 6 mean in Nylon 6, 6?
10. Write two properties of POM.
11. Mention the structure of PTFE.
12. State two applications of PC?
13. Define "TPE".
14. What is meant by "Polymer Blend"?
15. What is Delrin?

8234230	PLASTICS MATERIALS	L	T	P	C
PRACTICUM		2	0	2	3

PART – B

(5 × 16 = 80 Marks)

16. (a) Explain the manufacture of HDPE with neat diagram.
- (b) Explain the properties and applications of LDPE.
- (c) Explain the types of PP. Compare their properties.
- (d) Explain the structure, properties and applications of PP.
17. (a) Discuss the structure, properties and applications of ABS.
- (b) Write notes on (i) properties of HIPS (ii) Applications of SAN.
- (c) Explain the manufacture of PVC with neat diagram
- (d) Compare plasticized PVC with un-plasticized PVC.
18. (a) Explain the preparation of Nylon 6 with neat diagram.
- (b) Write notes on (i) properties and (ii) Applications of PET.
- (c) Explain the manufacture of Nylon 6, 6 with neat diagram.
- (d) Explain the structure, properties and applications of PMMA.
19. (a) Explain the (i) properties and (ii) Applications of POM.
- (b) With neat diagram, explain the production of PC.
- (c) Explain the properties and applications of PTFE.
- (d) List important properties and applications of Polycarbonate.
20. (a) Explain the properties and applications of Thermoplastic styrene block copolymers.
- (b) Explain the manufacture of Polyurethane Thermoplastic elastomers.
- (c) Discuss classification of polymer blends.
- (d) Write properties and applications of NORYL.

8234230 PLASTICS MATERIALS

Model Question

Time – Three Hours

(Maximum Marks: 100)

N.B.

1. Answer any Ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. What is meant by plastics?
2. Give two examples for “Commodity plastics”.
3. Expand (i) LDPE (ii) PMMA
4. State two applications of HIPS.
5. Write the structure of PS.
6. What are the key properties of SAN?
7. Write the structure of Nylon 6.
8. Why PET is called as engineering plastic?
9. What 6, 6 mean in Nylon 6, 6?
10. Write two properties of POM.
11. Mention the structure of PTFE.
12. State two applications of PC?
13. Define "TPE".
14. What is meant by "Polymer Blend"?
15. What is Delrin?

PART – B

(5 × 16 = 80 Marks)

16. (a) Explain the manufacture of HDPE with neat diagram.
(b) Explain the properties and applications of LDPE.
(c) Explain the types of PP. Compare their properties.
(d) Explain the structure, properties and applications of PP.
17. (a) Discuss the structure, properties and applications of ABS.
(b) Write notes on (i) properties of HIPS (ii) Applications of SAN.
(c) Explain the manufacture of PVC with neat diagram
(d) Compare plasticized PVC with un-plasticized PVC.
18. (a) Explain the preparation of Nylon 6 with neat diagram.
(b) Write notes on (i) properties and (ii) Applications of PET.
(c) Explain the manufacture of Nylon 6, 6 with neat diagram.
(d) Explain the structure, properties and applications of PMMA.
19. (a) Explain the (i) properties and (ii) Applications of POM.
(b) With neat diagram, explain the production of PC.
(c) Explain the properties and applications of PTFE.
(d) List important properties and applications of Polycarbonate.
20. (a) Explain the properties and applications of Thermoplastic styrene block copolymers.
(b) Explain the manufacture of Polyurethane Thermoplastic elastomers.
(c) Discuss classification of polymer blends.
(d) Write properties and applications of NORYL.

8234340	BASIC HYDRAULICS AND PNEUMATICS	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

In the industry we use three methods for transmitting power from one point to another. Mechanical transmission is through shafts, gears, chains, belts, etc. Electrical transmission is through wires, transformers, etc. Fluid power is through liquids or gas in a confined space. It is very important for Mechanical Engineering based technocrats to master the basic knowledge and skills necessary to design the hydraulic system that is the basis of automation. Pneumatic and hydraulic actuators are power transmission media that use pneumatic air or hydraulic fluid to generate force and movement. This course deal with the operation principle of pneumatic and hydraulic components such as pneumatic actuators, by experiencing various hydraulic power circuits through experiments.

Course Objectives:

The objective of this course is to enable the student,

1. Identify various components of hydraulic & pneumatic systems.
2. Use pump and actuators for fluid operated systems.
3. Use control valves for fluid operated systems.
4. Use compressor and accessories for fluid operated systems.
5. Prepare different hydraulic and pneumatic circuits for simple applications.

Course Outcomes:

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

CO1:	Identify various components of hydraulic & pneumatic systems.
CO2:	Select pump and actuators for fluid operated systems.
CO3:	Select control valves for fluid operated systems
CO4:	Develop different hydraulic circuits for simple applications
CO5:	Develop different pneumatic circuits for simple applications

Pre-requisites:

Basic Physics , Applied Physics - 1

CO/PO Mapping:

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

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

Instructional Strategy:

- Show video/animation films depicting working principles of process automation.
- Take students to industry visit and make opportunity to learn the constructional features and maintenance procedures of different hydraulic and pneumatic devices and systems in the automation industries.

8234340	BASIC HYDRAULICS AND PNEUMATICS	L	T	P	C
PRACTICUM		1	0	4	3

Syllabus Contents :

Theory :					
UNIT 1	FLUID MECHANICS				Periods
Chapter 1.1 Properties of fluids - Density, specific weight, specific gravity, specific volume, vapor pressure, viscosity - Cohesion - Adhesion – Capillarity- Surface tension (Definitions only) - Vacuum pressure - Gauge pressure and absolute pressure - Units of pressure - U tube monometer (no problems)- Bourdon’s pressure gauge. Bernoulli’s theorem (no derivation) - Applications - Venturimeter (no derivation – no problem) - Orifice meter (no derivation – no problem) - Co-efficient of velocity - Co-efficient of discharge - Co-efficient of contraction (Definitions only).					5
UNIT 2	HYDRAULICS SYSTEMS				
Chapter 2.1 Elements of hydraulic system - Hydraulic symbols - Fluid power pumps - Gear pump-External Gear pump only - Pressure control valves- Pressure relief valve and pressure reducing valve, Flow control valves – Needle- globe valve - Directional control valves – Description of 4/3 Open centre sliding spool Valve only- Fluid power Actuators - cylinder- Description of Double acting Cylinder only, Hydraulic motor (Definition only) - Accumulator (Definition only) - Hydraulic fluid properties - Additives, Seals and packing.					5
UNIT 3	PNEUMATICS SYSTEMS				Periods
Chapter 3.1 Pneumatic circuit elements - Single stage compressor – Multi stage compressor - Intercooler (No Problems) FRL unit – Valves - Direction control valves – Three way solenoid operated DC valve – Flow control valve – Quick exhaust valve – Shuttle valve- Actuator – Description of Air motor – Applications of Pneumatics.					5
Chapter 3.2 Modes of Heat transfer – Conduction - Convection, Radiation (Definitions only) - Black body - Grey body – White body (Definition only) - Heat exchangers (Definition only) – Description of Shell and Tube Heat Exchanger - Thermal insulations - (Definitions only).					
Practical Exercises:					
Ex.No.	Name of the Experiment				Periods
	Hydraulics				60
1.	Direct operation of double acting cylinder.				
2.	Direct operation of hydraulic motor.				
3.	Speed control of hydraulic motor using metering-in control.				
4.	Speed control of hydraulic motor using metering-out control				
	Pneumatics				
5.	Direct operation of single acting cylinder.				
6.	Direct operation of double acting cylinder				
7.	Operation of double acting cylinder with quick exhaust valve.				
8.	Speed control of double acting cylinder using metering-in circuits.				
9.	Speed control of double acting cylinder using metering-out circuits.				
10.	Automatic operation of Double acting cylinder in single cycle using Limit Switch				
Total Periods					75

8234340	BASIC HYDRAULICS AND PNEUMATICS	L	T	P	C
PRACTICUM		1	0	4	3

Suggested List of Students Activity:

1. Students will prepare chart of different hydraulic symbols.
2. Students will collect information related troubleshooting various problems.
3. Students will search animations on internet for understanding functioning of various hydraulic and pneumatic components.

Text Books and Reference Books:

1. Industrial Hydraulics by John Pippenger and Tyler Hicks, McGraw Hill.
2. Oil Hydraulic Systems, Principle and Maintenance by S R Majumdar, McGraw-Hill.
3. Fluid Power with Applications by Anthony Esposito, Pearson.
4. Fluid Power: Generation, Transmission and Control, Jagadeesha T., Thammaiah Gowda, Wiley.
5. The Analysis & Design of Pneumatic Systems by B. W. Anderson, John Wiley.
6. Control of Fluid Power Analysis and Design by Mc Clay Donaldson, Ellis Horwood Ltd.
7. Hydraulic and Pneumatic Controls: Understanding made Easy, K.Shanmuga Sundaram, S.Chand & Co Book publishers, New Delhi, 2006 (Reprint 2009)
8. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar, McGraw-Hill.
9. Basic fluid power Dudley, A. Pease and John J. Pippenger, , Prentice Hall, 1987

Web-based / Online Resources:

1. https://www.youtube.com/watch?v=tw2MBRxSZMg&list=PLQmc-I2-FO2ERZ1h3D8jOgFUOIUUB_4r
2. <https://www.youtube.com/watch?v=VN9ICFwJQOI&t=0s>
3. <https://www.youtube.com/watch?v=G6n89muvXMc&t=0s>
4. <https://www.youtube.com/watch?v=qtc7WQ6wihc&t=0s>
5. <https://www.youtube.com/watch?v=RGU1bxhVWwA&t=0s>
6. <https://www.youtube.com/watch?v=zpLmFNe8K0Y&t=0s>

SCHEME OF EVALUATION**Model Practical Examination and End Semester Practical Examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafide certificate.

Part	Description	Marks
A	Hydraulics Exercise by lot	35
B	Pneumatics Exercise by lot	40
C	Theory Questions 10 × 2 Marks Covering all Units	20
D	Viva Voce	5
Total Marks		100

8234340	BASIC HYDRAULICS AND PNEUMATICS	L	T	P	C
PRACTICUM		1	0	4	3

Equipments / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Hydraulic Trainer Kit (All Cylinders , Control Valves and other accessories)	1
2	Pneumatic Trainer Kit (All Cylinders , Control Valves and other accessories)	1

8234440	MOULD ELEMENTS USING 3D SOFTWARE PRACTICAL	L	T	P	C
PRACTICUM		2	0	4	4

Introduction:

This course is designed to get the students familiar with the 3D drawings and the visualization of mould designs (core, cavity, feeding system, ejection system). The syllabus has been designed as individual exercises for learning 3D software and mould elements. The course provides practical examples along with the technicalities of the software to guarantee the student complete command over 3D software. These 3D software training features in-class training, a supportive learning environment, and industry-oriented training up to date as swiftly as possible.

Course Objectives:

The objective of this course is to enable the student,

- To identify various methods of creating components in given 3D software.
- To use drawing and assembly commands to create mould components.
- To acquire knowledge of mould elements.
- To develop hands-on skills to use 3D software.
- To create an effective 3D mould assembly drawing.

Course Outcomes:

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

CO1:	Acquire fundamental skill on 3D modeling & assembly
CO2:	Develop knowledge in basic mould elements.
CO3:	Develop and assemble 3 D drawing for mould aligning element
CO4:	Create 3D drawing for feed system of mould
CO5:	Acquire knowledge to create two plate assemblies drawing in 3d software

Pre-requisites:

Drafting Practices

CO/PO Mapping:

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

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

Instructional Strategy:

- Utilise a blended approach with lecturers on fundamentals in 3D software introduction.
- Incorporate hands-on sessions practice in 3D software .
- Assignments focus on creating detailed drawings of mould parts,

8234440	MOULD ELEMENTS USING 3D SOFTWARE PRACTICAL	L	T	P	C
PRACTICUM		2	0	4	4

Syllabus Contents :

Theory:		
UNIT 1	INTRODUCTION TO MOULD ELEMENTS	Periods
Chapter 1.1: Mould elements - Guide pillar-Guide bush-screw-dowel- Register ring- Chapter 1.2: Feed system- Sprue bush- runner – Gates -Types Chapter 1.3: Ejection system-ejection pins-ejector assembly-two plate mould assembly		8
UNIT 2	SOLID MODELING AND ASSEMBLY	Periods
Chapter 2.1 Solid modeling -Introduction to solid modeling- Part modeling - Datum Plane – constraint – sketch – dimensioning – extrude – revolve – hole – round – chamfer – copy – mirror – assembly – align – orient. Chapter 2.2 Assembly Assembling - direct approach-exploded view - editing the assembly-reconstruction of elements - 2D / 3D view.		7
Practical Exercises:		
Ex.No.	Name of the Experiment	Periods
1	Assembly of Guide pillar with Guide bush.	60
2	Assembly of Sprue Bush with register ring.	
3	Assembly of Register Ring with injection side back plate.	
4	Assembly of Core with Core retainer plate.	
5	Assembly of Cavity with Cavity retainer plate.	
6	Assembly of Ejection System	
Total Periods		75

Suggested List of Students Activity:

1. Students should practice production drawing with the GD&T representation.
2. Modeling competitions can be arranged.
3. Visit plastic industries to enhance mould operation.

Text Books and Reference Books:

1. Injection mould design - R.G.W. Pye
2. Plastic mould engineering handbook - J. Harry Dubois & Waying I. Prible
3. A Beginner's Guide to 3d Modeling by Cameron Coward
4. Solidworks 2022 step by step guide by Amit Bhatt and Mark Wiley
5. <https://www.sdcpublications.com/Textbooks/Designing-Creo-Parametric-9-0/ISBN/978-1-63057-533-5/>

8234440	MOULD ELEMENTS USING 3D SOFTWARE PRACTICAL	L	T	P	C
PRACTICUM		2	0	4	4

Web-based / Online Resources:

1. <https://www.autodesk.in/campaigns/autocad-tytorials>
2. <https://www.mycadsite.com/tutorials.html>
3. <https://www.autodesk.com/solutions/simulation/plastic-injection-molding>
4. <https://www.moldex3d.com/>
5. <https://www.simcon.com/cadmould>
6. <https://community.ptc.com/t5/3D-Part-Assembly-Design/Injection-Mould-Models/td-p/381899>
7. Youtube Channels

SCHEME OF EVALUATION**Model Practical Examination and End Semester Practical Examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafide certificate.

Part	Description	Marks
A	Aim	5
B	Procedure –(Command used)/ Creating drafting 2D model	20
C	Part Modeling , Assembly , Dimensioning	40
D	Output / Printout	10
E	Theory Questions 10 × 2 Marks Covering all Units	20
F	Viva Voce	5
Total Marks		100

Equipment / Facilities required to conduct Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Personal Computer	30
2	Any one Modeling Software (Solid Works/ Pro-E/ Catia / Unigraphics / Autocad, etc...)	Sufficient
3	Laser Printer	1
4	Consumables	Sufficient

8234520	PLASTICS IDENTIFICATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

It gives the students, the knowledge of basic methods by which plastics can be identified. With this information student can understand the structure of polymers and their effect on properties. Students can understand different methods of identification of plastics by various methods. By knowing the identification, products manufactured by competitors can be analyzed and identified. There by products can be manufactured at competitive price.

Course Objectives:

On completion of the units of syllabus contents the students must be able to know about

- ❖ Monomer, Polymer and their identification
- ❖ Simple preliminary tests used in identification
- ❖ Burning characteristics of plastics
- ❖ Elements presents in various plastics
- ❖ Identification of elements by preparing sodium fusion extract
- ❖ Chemical analysis of plastics
- ❖ Identification of plastics by chemical analysis

Course Outcomes:

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

CO1	Identify plastics by simple preliminary tests
CO2	Identify plastics by burning characteristics
CO3	Identify plastics by Detection of elements
CO4	Identify plastics by chemical confirmatory tests
CO5	Identify plastics by Analytical tests

Pre-requisites:

Plastics Materials

CO/PO Mapping

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

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

8234520	PLASTICS IDENTIFICATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Instructional Strategy:

- Make chart of various plastic materials and its structure and properties.
- Simple identification tests to find the type of plastic materials.
- Simple laboratory preparation of various plastic materials.
- List the various testing equipments for identification and confirmative test of plastic materials.

Syllabus contents :

Ex.No	Name of the Experiment	Periods	
IDENTIFICATION OF PLASTICS BY SIMPLE PRELIMINARY TESTS			
1.	Study on various preliminary tests	60	
2.	Identification of Polyolefins (PE and PP)		
3.	Identification of Vinyl plastics (PVC,PVAL)		
4.	Identification of Styrene based plastics (HIPS,ABS,SAN,GPPS)		
5.	Identification of Acrylic Plastics and Fluoro Polymers		
6.	Identification of Polyamides and PC		
7.	Identification of Acetal resin and saturated polyester		
8.	Identification of Thermoset plastic materials		
IDENTIFICATION OF PLASTICS BY DETECTION OF ELEMENTS			
9.	Preparation of sodium fusion extract.		
10.	Detection of elements (Chloride, Nitrogen, Fluoride and Sulphur) from sodium fusion extract		
IDENTIFICATION OF PLASTICS BY CONFIRMATORY TESTS			
11.	Confirmatory tests for Polyolefins		
12.	Confirmatory tests for Styrene based plastics		
13.	Confirmatory tests for Vinyl plastics		
14.	Confirmatory tests for Formaldehyde based plastics		
15.	Confirmatory tests for Thermoset Plastics		
Total Periods		60	

Suggested List of Students Activity:

1. Study the physical nature of various plastics.
2. Compare the colours of various plastic materials
3. Collect various products manufactured using commodity plastics.
4. Study the sound of plastics when they are dropped
5. Study the floatation test of plastics.
6. Burn plastics and note down their behavior.

8234520	PLASTICS IDENTIFICATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Text Books and Reference Books:

1. J.A. Brydson - Plastic Materials –7th Ed-Butterworths-Heinemann–London (1999)
2. Vishushah – Handbook of Plastic Testing Technology–WileyInter-science Publications-1998
3. How to identify plastics – CIPET Publication - 2003..
4. J.H.Collins-Testing and Analysis of Plastics–Plastics Institute–1955.
5. R.P.Brown-Handbook of plastic testing methods-1971

Web Based / Online Resources

1. <https://plasticsidentification.com>
2. <https://testing.com>
3. <https://plasticsanalysis.com>

SCHEME OF EVALUATION**Model practical examination and End practical examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by lot
- Record of work done should be submitted for the examination with a Bonafide Certificate.

Part	Description	Marks
A	Aim & Apparatus Required	10
B	Preliminary tests	25
C	Detection of elements	25
D	Chemical confirmatory tests	25
E	Result	10
F	Viva voce	5
Total Marks		100

8234520	PLASTICS IDENTIFICATION PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Equipments / Facilities required to conduct the Practical

S.No.	Name of the Equipments	Quantity Required Nos
1.	Identification bench	1
2.	Spatula	30.
3.	Pair of tongs	30.
4.	Test tube	30
5.	Beaker 250ml	10
6.	Glass rod	10
7.	Litmus paper (Blue and red)	Sufficient
8.	Filter paper	Sufficient
9.	Ignition tube	Sufficient
10.	Chemicals	Sufficient

8234620	PLASTICS PROCESSING PRACTICAL - I	L	T	P	C
PRACTICAL		0	0	4	2

Introduction

Plastic processing is a process of converting plastics raw materials into finished or semi finished products. The raw materials are available in the form of resin, granules, pellets, powders, sheets, and preforms. Plastic materials can contain various additives that may influence their properties and processability. This plastic processing practical will provide the students an opportunity to skill themselves in various plastics processing methods and their processing parameters and also how to select the processing methods, processing materials for engineering applications.

Course Objectives

The objective of this course is to enable the student,

- To understand the operation of hand injection and blow moulding machines.
- To acquire knowledge about semi automatic injection moulding machines.
- To identify the operation requirements of automatic injection moulding machines and processes.
- To know the various ancillary equipments operations.
- To familiarize the operation of scrap grinder.

Course Outcomes

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

CO1:	Understand the operation of hand injection and blow moulding machines
CO2:	Acquire knowledge about semi automatic injection moulding machines.
CO3:	Identify the operation requirements of automatic injection moulding machines and processes
CO4:	Know the various ancillary equipments operations
CO5:	Familiarize the operation of scrap grinder.

Pre-requisites:

Plastics Processing.

CO/PO Mapping

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

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

8234620	PLASTICS PROCESSING PRACTICAL - I	L	T	P	C
PRACTICAL		0	0	4	2

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.

Syllabus contents :

Introduction	
1. Study of various types of injection moulding machines and their operations. 2. Study of various tools used for processing of plastics. 3. Study of various plastics materials used for plastic processing and their operating conditions. 4. Study of safety equipments used in processing industries.	10
Practical Exercises	
1. Operation on Hand Injection Moulding Machine. 2. Operation on Hand Blow Moulding Machine. 3. Operation on Semiautomatic Injection molding Machine (Hydraulic Operation). 4. Operation on Semiautomatic Injection molding Machine (Pneumatic Operation). 5. Operation on Automatic Injection Molding Machine. 6. Operation on Colour mixer. 7. Operation on Vacuum Loader. 8. Operation on Hopper Dryer and Air Circulating Oven. 9. Operation on Scrap grinder. 10. Operation on Mould temperature controller.	50
Total hours	60

Suggested List of Students Activity:

1. Study the various hand moulds and their components.
2. Study the moulding defects.
3. Practices to get good quality products in processing machines.
4. Study the safety guidelines and precautions for a processing industry.

8234620	PLASTICS PROCESSING PRACTICAL - I	L	T	P	C
PRACTICAL		0	0	4	2

Text books and reference books:

1. Injection mould design - R.G.W. Pye
2. Plastic mould engineering handbook - J. Harry Dubois & Waying I. Prible
3. Plastic mould design - R.H.Bebb (Compression & Transfer mould)
4. Extrusion die design - M.V. Joshi.
5. Blow moulding handbook - Donald V.Rosato.
6. Product Design - Ronald D. Beck.

Web Based / Online Resources

1. <https://www.youtube.com/watch?v=Nee00dT2EfA>
2. <https://www.youtube.com/watch?v=oGe8lrmDAoU>

SCHEME OF EVALUATION**Model Practical Examination and End Semester Practical Examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafide certificate.

Part	Description	Marks
A	Aim	5
B	Procedure	20
C	Machine Setting / Mould Setting	40
D	Product	30
E	Viva voce	5
Total Marks		100

8234620	PLASTICS PROCESSING PRACTICAL - I	L	T	P	C
PRACTICAL		0	0	4	2

Equipments / Facilities required to conduct Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Hand Injection Molding Machine	1
2	Hand Blow Molding Machine	1
3	Semiautomatic Injection molding Machine (Hydraulic)	1
4	Semiautomatic Injection molding Machine (Pneumatic)	1
5	Automatic Injection Molding Machine	1
6	Colour Mixer	1
7	Vacuum Loader	1
8	Hopper Dryer	1
9	Air Circulating Oven	1
10	Scrap grinder	1
11	Mould Temperature Controller	1

8235130	ADVANCED PLASTICS MATERIALS AND TESTING OF PLASTICS	L	T	P	C
PRACTICUM		3	0	2	4

Introduction

In this subject students study the preparation, properties and applications of various thermoset materials and high performance materials. They also study the different methods of testing procedure. This subject also covers different properties of polymers namely mechanical properties, thermal properties, optical properties, Electrical properties and chemical properties also the methods by which these properties can be determined. This subject also deals with different tests that can be performed to products like pipes, containers, foams, hoses, belts and laminates. This subject will definitely help the students to operate various testing equipments

Course Objectives

On completion of the units of syllabus contents the students must be able to know about

- Understand the preparation, properties and uses of various thermoset and high performance materials
- Principle, test procedure, standards used, significance and the factors affecting the various mechanical properties of plastics like Short-term mechanical properties, Long-term mechanical properties and Mechanical properties of surfaces
- Principle, test procedure, standards used, significance and the factors affecting the various thermal Electrical and optical properties.
- Product Testing methods and Quality control tests for Pipes, plastic packages, Laminates / Multilayer films, Blow moulded containers and cellular materials

Course Outcomes

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

CO1	Demonstrate the Preparation, properties and uses of Thermo set plastic materials.
CO2	Demonstrate the Preparation, properties and uses of Thermo set plastic materials.
CO3	Explain the Principle, test procedure, standards used, significance Mechanical properties of plastics.
CO4	Narrate the Thermal and Electrical properties, weathering properties, Chemical properties of plastics.
CO5	Discuss the Product Testing of plastics,

Pre-requisites:

Plastics Materials

8235130	ADVANCED PLASTICS MATERIALS AND TESTING OF PLASTICS	L	T	P	C
PRACTICUM		3	0	2	4

CO/PO Mapping

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

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

Instructional Strategy:

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

8235130	ADVANCED PLASTICS MATERIALS AND TESTING OF PLASTICS	L	T	P	C
PRACTICUM		3	0	2	4

Syllabus Contents :

Theory Portion :		Periods
UNIT I	SPECIALIY AND HIGH PERFORMANCE PLASTICS	9
Chapter 1.1 Speciality plastics: Polyphenylene oxide (PPO), Polyphenylenesulphide (PPS), polysulfones (PSU), Poly ether ether ketone (PEEK), Polyamide-imides (PAI), Polyether imides (PEI) – Raw materials needed , structure, properties, processing behavior and applications		
Practical Exercises:		
1.Determination of Burning characteristics of specialty and high performance plastics		2
UNIT II	THERMOSETTING RESINS	9
Chapter 2.1 :Phenolic plastics - Novolaks - Resols - resin manufacture – Phenol formaldehyde moulding powder preparation – compounding ingredients - properties of Phenolic mouldings and applications. Chapter 2.2 :Amino plastics: Urea formaldehyde resins – theories of resinification - moulding powders - properties - applications Melamine formaldehyde - resinification – moulding powders - properties and applications. Chapter 2.3 Epoxy resins - preparation of resins from Bis-phenol A - structure and properties of cured resins – Applications.		
Practical Exercises:		
2.Preparation of Urea Formaldehyde		2
UNIT III	MECHANICAL PROPERITES OF PLASTICS	Periods
Chapter 3.1 : Importance of testing - Test specimen preparation of plastics - Equipments used for Preparation - Introduction to ASTM standards and need for ASTM standards. Chapter 3.2 : Short-term mechanical properties: Tensile strength – Stress Strain curve - Equipment (UTM) and testing procedure – Factors affecting tensile Strength.Impact strength (Izod and Charpy impact tests only) Chapter 3.3 :Long-term mechanical properties: Creep-Equipment and procedure – Factors affecting creep. Chapter 3.4 : Mechanical properties of surfaces: Measurement of Hardness (Rockwell only) – Factors affecting Hardness.Abrasion-Taber abrasion-equipment and procedure		9
Practical Exercises:		
3.Determination of Tensile properties.		12
4.Determination of IZOD Impact strength		
5.Determination of Hardness using Rockwell Hardness testing machine.		
6.Determination of Taber Abrasion Resistance.		

8235130	ADVANCED PLASTICS MATERIALS AND TESTING OF PLASTICS	L	T	P	C
PRACTICUM		3	0	2	4

UNIT IV	THERMAL AND ELECTRICAL PROPERTIES OF PLASTICS	Periods
Chapter 4.1 :Thermal properties: - Determination of temperature of deflection under load - Heat distortion Temperature (HDT) - Vicat Softening Point (VSP) - Melt Flow Index (MFI) - Significance and method of determination Chapter 4.2 : Electrical properties: Introduction – Requirements of an insulator - Di- electric strength - Measurement of Di-electric strength - Factors affecting Di-electric strength. - Arc resistance - Measurement of Arc resistance		9
Practical Exercises: 7.Determination of Melt Flow Index (MFI). 8.Determination of Vicat Softening Temperature (VSP). 9.Determination of Break Down Voltage and Dielectric strength		6
UNIT V	OPTICAL PROPERTIES OF PLASTICS AND PRODUCT TESTING	Periods
Chapter 5.1 : Optical Properties Significance and method of determination of Light Transmittance and Gloss Chapter 5.2 : Product Testing Significance of product testing. Pipe testing - PVC and HDPE Pipes - Test Methods. Testing of Blow moulded containers – All quality control tests Test for Films – All quality control tests		9
Practical Exercises 10.Determination of Light transmittance, Opacity and Gloss Value of Plastic samples 11.Short term and long term Hydraulic tests for PVC Pipes 12.Determination of Bursting strength for Plastic Films		8
Total Periods		75

Suggested List of Students Activity:

- Activity 1:** Study the maintenance of various testing equipments available in testing laboratory. Prepare a detailed maintenance schedule
- Activity 2:** Four students can be grouped as a batch to collect information about the various factors affect the test results during testing.
- Activity 3:** List the various equipments used for Mechanical. Thermal Electrical and product testing.

Text Books and Reference Books:

1. Vishu shah - Handbook of Plastic Testing Technology – Wiley Inter-science Publications - 1998
2. A.S. Athalye–Identification and testing of plastics - Multitech publishers - 1992.
3. How to identify plastics - CIPET Publication- 2003.
4. Paul Kluckow-Rubber and Plastics Testing – Chapman & Hall, London – 1963.
5. L.E.Nielsen -Mechanical properties of Plastics – Reinhold, New York – 1962.
6. J.H.Collins -Testing and Analysis of Plastics – Plastics Institute – 1955.
7. R. P. Brown - Handbook of plastic testing methods - 1971
8. M.E.Baird - Electrical Properties of polymeric materials – Plastics and Rubber Institute, London .

8235130	ADVANCED PLASTICS MATERIALS AND TESTING OF PLASTICS	L	T	P	C
PRACTICUM		3	0	2	4

Web based / Online Resources :

1. <https://testingofplastics.com>
2. <https://mechanicalproperties.com>
3. <https://plasticselectricalproperties.com>
4. <https://filmtesting.com>
5. <https://containertesting.com>

SCHEME OF EVALUATION**Model practical examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by lot
- Observation should be submitted for the examination.

Part	Description	Marks
A	Aim	5
B	Procedure and Tabular column	25
C	Formula and calculation	30
D	Result	5
E	Observation	30
F	Viva voce	5
Total Marks		100

8235130	ADVANCED PLASTICS MATERIALS AND TESTING OF PLASTICS	L	T	P	C
PRACTICUM		3	0	2	4

Equipments / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Universal Testing Machine	1
2	Rockwell's Hardness Testing Machine	1
3	Impact Testing Machine	1
4	Taber Abrasion Tester	1
5	MFI Apparatus	1
6	VSP Apparatus	1
7	AC High Voltage Tester	1
8	Opacity Tester	1
9	Pipe Testing Apparatus	1
10	Consumables	Sufficient

8235130 ADVANCED PLASTICS MATERIALS
AND TESTING OF PLASTICS

Model Question

Time – Three Hours
Maximum Marks: 100

N.B:

1. Answer any ten questions under Part – A. Each question carries 2 marks
2. Answer all questions, choosing any two sub-divisions from each question under Part-B. Each sub-division carries 8 marks

PART – A

(10 X 2 = 20 Marks)

1. Write the structure of PPO and PPS.
2. Write the applications of PPS
3. State the preparation PPO.
4. What are Amino plastics?
5. Write the applications of PF
6. State the differences between Novolac and Resol
7. Write the importance of testing
8. Define Abrasion resistance
9. Name the standards used in testing
10. Define HDT and give its unit
11. Write the determination of melt flow rate
12. What is Arc resistance?
13. Write the importance of product testing
14. What is WVTR?
15. Define Light Transmittance

PART – B

(5 X16 = 80 Marks)

16. (a) Discuss the Properties of PPS.
(b) Discuss the preparation of PEEK.
(c) Explain properties of Polyether imides.
(d) Write notes on processing and applications of PAI
17. (a) Discuss the preparation of PF moulding powder.
(b) Explain the properties of urea formaldehyde
(c) Discuss the preparation of melamine formaldehyde.
(d) Explain properties and applications of Epoxy resin
18. (a) Discuss the various methods of test specimen preparation.
(b) Explain the determination of Tensile properties
(c) Write the significance and determination of Hardness.
(d) Define Creep. Write the determination of creep
19. (a) Discuss the determination of MFI.
(b) Explain the measurement of VSP.
(c) Discuss the determination of Dielectric strength.
(d) Explain the properties of glycerol
20. (a) Discuss the tests performed to assess the quality of Pipes.
(b) Discuss the tests performed to assess the quality of Blow moulded containers.
(c) Explain the tests performed to assess the quality Films.
(d) Explain the determination of Gloss

8235230	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	C
PRACTICUM		3	0	2	4

Introduction:

In the Indian Economy, Industries and enterprises always find a prominent place. After globalization, the government of India has announced a liberalization policy of starting an enterprise which resulted in the mushroom growth of industries. The present day students should be trained not only in manufacturing processes but also in managing activities of industries. Training must be imparted to students not only to shape them as technicians but also as good managers. The knowledge about plant, safety, work study techniques, personnel management and financial management will definitely mould the students as managers to suit the industries. Due to the presence of such personalities the industries will leap for better prosperity and development.

Course Objectives:

The objective of this course is to enable the student to

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control systems.
- To study engineering ethics and human values.

Course Outcomes:

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

CO1: Select the plant layout by incorporating plant safety procedure

CO2: Apply work study principles as a tool for plant management

CO3: Describe the principles of management used in industries

CO4: Apply various inventory control techniques in material management

CO5: Describe modern management techniques used in shop floor

Pre-requisites:

Basic knowledge of industries(through Industrial Visits)

CO/PO Mapping:

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

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

8235230	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	C
PRACTICUM		3	0	2	4

Instructional Strategy:

- Conduct group discussions on plant safety
- Encourage students to know about the share market details(BSE,NSE)
- Use powerpoint presentations.

Syllabus Contents:

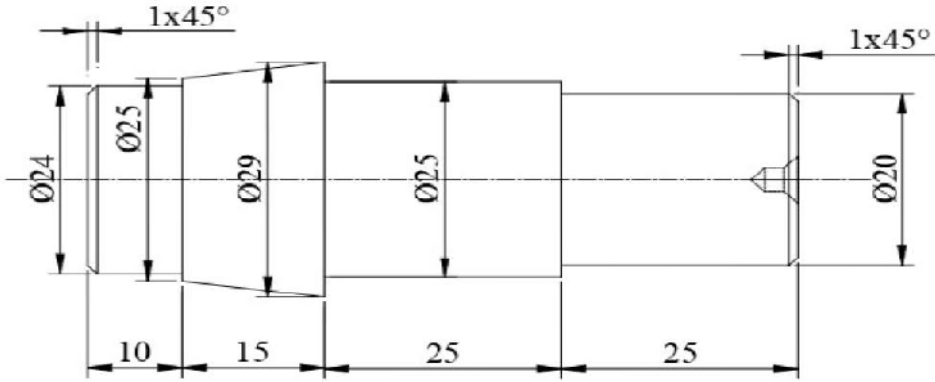
UNIT I	PLANT ENGINEERING AND PLANT SAFETY	Periods
Chapter 1.1	Plant Engineering: Plant – Selection of site of industry – Plant layout – types – process, product and fixed position – Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.	9
Chapter 1.2	Plant Safety: Importance – Industrial safety and procedure-Improper handling- accident - causes and cost of an accident - accident proneness - prevention of accidents-Settlement of industrial disputes - Indian Factories Act 1948 and its provisions related to health, welfare and safety.	
UNIT II	METHOD STUDY AND WORK MEASUREMENT	
Chapter 2.1	Method Study: Definition – Ergonomics-Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart- Man machine chart.	9
Chapter 2.2	Work Measurement: Definition – Basic procedure in making a time study – Cycle time and Total Time-Techniques of work measurement - Ratio delay study, Synthesis from standard data, analytical estimating, Predetermined Motion Time System(PMTS).	
UNIT III	PRINCIPLES OF MANAGEMENT	
Chapter 3.1	Principles of Management: Definition of management – Administration - Organization – F.W. Taylor’s and Henry Fayol’s Principles of Management - Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training - wages and salary administration – Components of wages.	9
UNIT IV	FINANCIAL AND MATERIAL MANAGEMENT	
Chapter 4.1	Financial Management: Resources of capital – shares-preference and equity shares – debentures-Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit –. Depreciation – Causes –Methods - Straight line, sinking fund and percentage on diminishing value method	9
Chapter 4.2	Material Management: Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level - Economic order quantity – problems –Supply chain Management - Purchasing Procedure- Bin card.	
UNIT V	MODERN MANAGEMENT TECHNIQUES	
Chapter 5.1	5S concept - Just in Time(JIT) - Kaizen - ERP - Kanban - SQC - SPC - PPC - TPM - TQM - Quality tools - 7QC Tools - PDCA Cycle Six sigma - Industry 4.0 – Internet of things(IoT) - Cloud computing - AI and Machine Learning-Management Information System(MIS).	9

8235230	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	C
PRACTICUM		3	0	2	4

PRACTICAL EXERCISES :

Ex.No	Name of the Exercise	Periods
1.	<p>TO STUDY AND PREPARE OPERATION PROCESS CHART (OPC)FOR GIVEN ASSEMBLY AND SITUATION.</p> <p>Assemble a Pedestal Electric Fan with Following Parts</p> <ul style="list-style-type: none"> ● Base, ● pedestal , ● motor head , ● switch set, ● rear guard, ● front guard, ● guard ring lock, ● blade, ● screws 	5
2.	<p>To Study & Prepare Flow Process Chart (FPC) for the given assembly.</p> <p>Construct a Flow Process Chart for the following:</p> <ul style="list-style-type: none"> ● Move bar stock from store to hacksaw Dist. 8 meter ● Cutting of bar stock Time 4 min ● Move to lathe machine Dist. 6-meter ● Turning Process Time 5 min ● Move to milling machine Dist. 7-meter ● Wait for milling machine Time 2 min ● Milling keyway Time 10 min 	5
3.	<p>To study & Prepare Man-Machine (Multiple Activity) Chart for the given situation</p> <p>A chamfering, turning and threading operation is done on a job on lathe machine. Information of that operation is recorded as under. Show this information on man and machine chart.</p> <ul style="list-style-type: none"> ● Carry bar stock from the store. 1 min ● To fix the job in lathe chuck. 2 min ● To carryout manual turning of the job. 1.5 min ● To carryout chamfering operation on job 1 min ● To carry out threading operations on the job. 2 min ● To bring the saddle back and rearrange it 0.5 min ● To carry out threading work on the job. 1.5 min ● Inspection of the job. 1 min ● To remove the job from the lathe chuck. 0.5 min ● Carrying completed work piece to store 1 min 	5
4.	<p>To study & Calculate coefficient of correlation for time study person using performance rating technique.</p> <p>Find actual rating using basic time. Plot a graph of actual rating v/s observed rating.</p> <ul style="list-style-type: none"> ● At a time one student will walk a distance of 25 feet in a normal way. ● Another student (time-keeper) will note down the time taken for that 	5

8235230	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	C
PRACTICUM		3	0	2	4

	<p>student to walk.</p> <ul style="list-style-type: none"> • All the remaining students will assign ratings to the student walking in the observation table. • Time-keeper will give time for that student to all the students. • Repeat the same procedure changing the time-keeper and the student walking • Find basic time using observations 	
5.	<p>To study & Calculate standard time for the given job.</p>  <p>Basictime = Observedtime × Ratingofworker / StandardRating Work Content= Basic time + Relaxation & Incidental Allowances Standard Time= Work Content + Other Allowances</p>	5
6.	<p>To Draw Two Handed Process Chart For Bolt, Washer & Nut Assembly To draw left and right hand process charts and to conduct time study for the bolt, washer & nut assembly of present and improved methods.</p> <p>$\% \text{ TIME SAVED} = \frac{\text{Average Time Taken for an assembly old method} - \text{Average time taken for new method}}{\text{Average Time Taken for an assembly old method}}$</p>	5
Total Periods		75

8235230	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	C
PRACTICUM		3	0	2	4

Suggested List of Students Activity:

- Presentation/seminars by the students on modern management techniques.
- Explore various plants during industrial visits.
- Find the selling price of a product using ladder diagrams.
- Find depreciation values of vehicles.
- Find standard time for a particular job (in lathe) using stop watch time study methods.

Text Books and Reference Books:

1. S.C.Sharma & T.R. Banga, Industrial Engineering and Management, 2nd Edition, Khanna Book Publishing, 2022.
2. S.Chand, Industrial Engineering and Production Management, 3rd Edition, S. Chand Publishing, 2018.
3. M.P.Poonia & S.C.Sharma, Industrial Safety and Maintenance Management, 1st Edition, Khanna Publishing, 2021.

Web-based / Online Resources:

1. <https://youtu.be/jFDWlKayrTc?si=oe4glWk9Qb18wxUx>
2. <https://youtu.be/yhywrCChJBQ?si=7eXkcTyAsH8TNP6x>

SCHEME OF EVALUATION**Model Practical Examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Observation should be submitted for the examination.

Part	Description	Marks
A	Aim	10
B	Procedure / steps	20
C	Explanation	20
D	Report	15
E	Observation	30
F	Viva Voce	5
Total Marks		100

8235230	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	C
PRACTICUM		3	0	2	4

Equipments / Facilities required to conduct the Practical

S No.	Name of the Machine / Equipment / Instrument/Material	Quantity Required Nos
1	Stop watch	3
2	Brass spindles	Sufficient
3	Nylon washers	Sufficient
4	Lock washers	Sufficient
5	Hexagonal nuts	Sufficient

8235230 INDUSTRIAL ENGINEERING AND MANAGEMENT

Model Question

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. What is meant by Plant Layout?
2. What is meant by preventive maintenance?
3. What is accident proneness?
4. What is operation process chart?
5. Define Work Measurement.
6. What is Cycle Time?
7. Define Management.
8. Define Administration.
9. What is component of Wages?
10. Define Shares
11. Define Profit.
12. What is Bin card?
13. What Just in Time?
14. What is SQC?
15. What is IoT?

PART – B

(5 × 16 = 80 Marks)

16. (a) Explain the various factors to be considered for selection of site of industries.
(b) Explain types of Layout.
(c) Discuss the various methods of settlement of industrial disputes.
(d) State the important provision of factories act 1948 governing safety of workers.
17. (a) Explain the basic procedure for conducting method study.
(b) Explain the left hand and right hand process chart.
(c) Explain the basic procedure for conducting method study.
(d) Write brief notes on Radio delay study.
18. (a) Explain in details about Taylor's scientific management with principles.
(b) Discuss the selection procedure followed by Human Resources department
(c) Explain on the job training.
(d) Explain the wages and salary administration?
19. (a) Explain by means of block diagram how the selling price of a product is determined
(b) Explain the causes of depreciation.
(c) Explain how total cost of inventory can be efficiently controlled by "ABC Analysis" technique.
(d) Explain in details about Procurement and consumption cycle.
20. (a) Explain 5S Concept.
(b) Explain PDCA Cycle.
(c) Explain Industry 4.0.
(d) Explain AI and Machine learning.

8235311	PLASTICS MOULD AND DIE DESIGN	L	T	P	C
THEORY		3	0	0	3

Introduction

Key to the injection-molding process, the injection mold forms the molten plastic into the desired shape, provides the surface texture, and determines the dimensions of the finished molded article. In facilitating mold-cavity filling and cooling, the mold also influences the molding cycle and efficiency as well as the internal stress levels and end-use performance of the molded part. The success of any molding job depends heavily on the skills employed in the design and construction of the mold. This plastics mould and die design course will provide the students an opportunity to skill themselves in various moulds and their parts design techniques available in the industry and also how to select the mould materials for engineering applications.

Course Objectives

The objective of this course is to enable the student,

- To identify the various mould components and their design procedure for injection mould.
- To acquire knowledge about various types of ejection system and feed system for injection mould.
- To understand the various mould cooling circuit design for injection mould.
- To know the various types of injection moulds, compression moulds and transfer moulds.
- To familiarize the various types of extrusion dies and blow heads.

Course Outcomes

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

- CO1: Identify the various mould components and their design procedure for injection mould.
 CO2: Acquire knowledge about various types of ejection system and feed system for injection mould.
 CO3: Understand the various mould cooling circuit design for injection mould.
 CO4: Know the various types of injection moulds, compression moulds and transfer moulds.
 CO5: Familiarize the various types of extrusion dies and blow heads.

Pre-requisites:

Plastics processing and Plastics Materials.

8235311	PLASTICS MOULD AND DIE DESIGN	L	T	P	C
THEORY		3	0	0	3

CO/PO Mapping

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

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

Instructional Strategy:

- It is advised that teachers take steps to students 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 to enhance engagement and provide additional learning opportunities.
- All demonstrations / Hand-on practices may be followed in the real environment as far as possible.

Syllabus contents

UNIT I	PRODUCT AND MOULD DESIGN FUNDAMENTALS	
	<p>Chapter 1.1 Need for plastics product design. General product design - Wall thickness – Parting lines - Design of Flow and shape - Ribs - Bosses - Gussets - Radii - Fillets - Draft - Holes - Threaded holes - Drilled and Tapped holes - Venting - Tolerance. Undercuts - Internal - External.</p> <p>Chapter 1.2 General mould construction - Basic terminology and mould construction. Cavity and core - Integer cavity- Integer core - Insert cavity - Insert core - Methods of Fitting Inserts. Guide pillar and Guide bush - Function of Guide pillars - Positioning of guide pillars. Sprue bush - Spherical seating Sprue bush - Flat seating Sprue bush. Register ring - Sprue bush mounted register ring - Front plate mounted register ring. Mould plate fastening.</p>	9
UNIT II	EJECTION SYSTEM & FEED SYSTEM	
	<p>Chapter 2.1 Design features of Ejection mechanism - Ejector grid - Types of Ejector grid - Ejector plate assembly. Types of Ejection - Pin Ejection - Stepped Ejection pin - “D” shaped Ejection pin - Sleeve Ejection - Blade ejection - Valve Ejection - Air Ejection - Stripper plate Ejection - Actuation of stripper plates- Sprue Pullers.</p>	9

8235311	PLASTICS MOULD AND DIE DESIGN	L	T	P	C
THEORY		3	0	0	3

Chapter 2.2 Design of Feed system - Sprue - Runner - Runner cross section shape - Runner size - Runner Layout - Balancing of runners. Design of gate system - Gates - Positioning of gates - Types of gate - Sprue gate - Edge gate - Overlap gate - Fan gate - Tab gate - Diaphragm gate - Ring gate - Film gate - Pin point gate - Submarine gate - Winkle gate.		
UNIT III	PARTING SURFACE & COOLING SYSTEM	
Chapter 3.1 Parting surface - Flat parting surface - Non-Flat Parting surface - Stepped parting surface - Profiled parting surface - Angled parting surface. Chapter 3.2 Design of cooling system - Cooling of Integer type cavity plate - "U" circuit - Rectangular circuit - "Z" circuit. Cooling of Integer type core plate - Angle hole system - Baffled straight hole system - Cooling of Insert type cavity plate - Rectangular cavity insert - "U" circuit - Copper pipe system. Circular cavity Insert - Coolant annuals method - Coolant sleeve method. Cooling of Insert type core plate - Baffled hole system - Bubbler system.		9
UNIT IV	MOULD TYPES	
Chapter 4.1 Types of injection moulds - General arrangement of Two plate and Three plate moulds - Single-impession moulds - Multi-impession moulds - Single-daylight moulds - Multi-daylight moulds - Under feed moulds - Split mould -Finger Cam -Dog leg Method - Mould for threaded components - Hot runner mould- Standard Mould Systems - Advantages- Limitations. Chapter 4.2 Compression moulds-Flash type- Positive type - Semi-Positive type compression moulds - Advantages - Limitations and applications. Transfer moulds -Pot type- Plunger type - Transfer plunger - Cull pick up - Transfer pot - Clamping pressure -Transfer pressure.		9
UNIT V	EXTRUSION DIE AND BLOW MOULD DESIGN	
Chapter 5.1: General features of dies - Die geometry - Approach section - Land section. Designing of Solid dies - Designing of pipe die - In-line type. Design of blown film dies - Side fed die - Centre fed die. Design of sheet dies - Coat hanger type - " T " type die - Fishtail type.-Wire and Cable coating dies. Chapter 5.2: Blow mould- Die and mandrel design - Side fed head - Spider or axial flow head - Accumulator head - Parting line - Pinch off design - Neck pinch off - Base pinch off - Flash pockets - Venting - Cooling.		9
Total periods		45

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course
- MCQ have to be conducted for all the five units.
- Blended learning activities to explore the recent trends and developments in the field.

8235311	PLASTICS MOULD AND DIE DESIGN	L	T	P	C
THEORY		3	0	0	3

Text Books and Reference Books:

1. Injection mould design - R.G.W. Pye
2. Plastic mould engineering handbook - J. Harry Dubois & Waying I. Prible
3. Plastic mould design - R.H.Bebb (Compression & Transfer mould)
4. Extrusion dies design - M.V. Joshi.
5. Blow moulding handbook - Donald V.Rosato.
6. Product Design - Ronald D. Beck.

Web Based / Online Resources :

1. <https://www.youtube.com/playlist?list=PLbV7gX-YQEk3eBCxoKWiJtsa3GH-JuWCo>
2. <https://www.youtube.com/playlist?list=PLVFLcxFx-YUbj3DfH-9RgUIgihTnK1a1S>
3. <https://www.youtube.com/playlist?list=PLPCUCPfhlyTMAfMtgNa0azQs3FbNIqRow>

8235311 PLASTICS MOULD AND DIE DESIGN

Model Question

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any Ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. What is meant by parting line?
2. Define the term "Undercuts".
3. Write the functions of Register ring.
4. Define the term "Sprue".
5. What is the role of Ejector grid in injection mould?
6. What do you understand about balancing of runner?
7. What is meant by "Parting surface"?
8. What is meant by "Z circuit cooling"?
9. What is the necessity of bubbler cooling?
10. Define the term "Multi-daylight moulds".
11. What is meant by "Standard mould systems"?
12. What for Transfer pot used in transfer mould?
13. Define the term "Approach section".
14. What is meant by "solid dies"?
15. Write the functions of "Pinch off".

PART – B

(5 × 16 = 80 Marks)

16. (a) Write short notes on (i) Ribs (ii) Bosses.
- (b) Explain the methods of fitting inserts with diagram.
- (c) Explain the construction of standard guide pillar and guide bush.
- (d) With neat sketch, Explain the construction of Sprue bush mounted register ring.
17. (a) Explain the working principle of "Ejector plate assembly".
- (b) With neat diagram, Explain the working principle of "Sleeve ejection".
- (c) Explain the working principle of "Pin ejection".
- (d) Write short notes on (i) Edge gate (ii) Tab gate.
18. (a) Explain the stepped parting surface with neat diagram.
- (b) Explain the angle hole cooling system for integer type core plates.
- (c) Explain the coolant sleeve cooling method for circular cavity insert.
- (d) Explain the baffled hole cooling system for insert type core plate.
19. (a) Explain the general arrangements of two plate injection mould.
- (b) With neat diagram, explain the construction of under feed mould.
- (c) Explain the flash type compression mould with diagram.
- (d) Explain the pot transfer mould with neat diagram.
20. (a) Explain the construction of die geometry with diagram.
- (b) Explain the working principle of In-line type pipe die with neat diagram.
- (c) Explain the wire and cable coating die with neat diagram.
- (d) Explain the construction of "Accumulator head" with diagram.

8235312	PLASTICS PACKAGING TECHNOLOGY	L	T	P	C
THEORY		3	0	0	3

Introduction:

It gives the students the knowledge of basic methods by which packaging materials can be tested. Packaging materials play a major role in our day to day life. Packaging materials are exposed to various mechanical, Thermal, Electrical forces. Also optical property is very important for many packaging materials which need transparency. These exercises will make the students to become familiar in various Mechanical, Thermal, Electrical, optical and product testing of packaging materials

Course Objectives:

On completion of the units of syllabus contents the students must be able to know about

- ❖ Various test conducted for packaging materials
- ❖ Mechanical properties of packaging materials
- ❖ Electrical properties of packaging materials
- ❖ Thermal and optical properties of packaging materials
- ❖ Various product tests carried for packaging materials

Course Outcomes:

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

CO1	Have an idea on various packaging materials
CO2	Understand the different packaging materials
CO3	Know the types of packaging materials
CO4	Describe the fabrication and Decoration of packaging materials
CO5	Understand the testing of packaging materials

Pre-requisites: Plastic Materials and identification of plastics

CO/PO Mapping

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

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

8235312	PLASTICS PACKAGING TECHNOLOGY	L	T	P	C
THEORY		3	0	0	3

Instructional Strategy:

- It is advised that teachers take steps to students 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 to enhance engagement and provide additional learning opportunities.
- All demonstrations / Hand-on practices may be followed in the real environment as far as possible.

Syllabus contents :

UNIT I	INTRODUCTION TO PACKAGING			
Chapter 1.1 Introduction: History, Definition of Packaging, Function of Packaging, Its advantages. Introduction to packaging laws and regulations. Packaging hazards and its control				9
UNIT II	PACKAGING MATERILS			
Chapter 2.1 Packaging Materials: Criteria for selection of plastics packaging materials, origin, types, properties and limitations of plastics packaging materials., different packaging material and their properties including barrier properties, strength properties, optical properties etc				9
UNIT III	TYPES OF PACKAGES			
Chapter 3.1 Flexible Packaging: Package design, factors influencing design / product package relationship. Flexible packaging and forms of flexible packaging laminated packaging and reportable pouches and biodegradable packaging material				9
UNIT IV	FABRICATION AND DECORATION OF PACKAGES			
Chapter 4.1 Fabrication & Decorative Techniques: Cutting, sealing, welding, adhesive bonding, metalizing, embossing, labeling, painting, lacquering, foil in lay moulding, hot stamping, In mould decoration				9
UNIT V	PRINTING AND TESTING OF PACKAGING MATERILS			
Chapter 5.1 Printing: Surface Treatment, Printing Processes, and Printing inks, Packaging quality control, Criteria, physical, Chemical, Mechanical test procedure for packaging materials and packaged products				9
Total Periods				45

8235312	PLASTICS PACKAGING TECHNOLOGY	L	T	P	C
THEORY		3	0	0	3

Suggested List of Students Activity:**Activity 1:**

Study the maintenance of various testing equipments available in testing laboratory. Prepare a detailed maintenance schedule

Activity 2:

Four students can be grouped as a batch to collect information about the various factors affect the test results during testing.

Activity 3:

List the various equipments used for Mechanical. Thermal Electrical and product testing. For packaging materials

Text Books and Reference Books:

1. Vishu shah - Handbook of Plastic Testing Technology – Wiley Inter-science Publications - 1998
2. A.S. Athalye–Identification and testing of plastics - Multitech publishers - 1992.
3. How to identify plastics - CIPET Publication- 2003.
4. Paul Kluckow-Rubber and Plastics Testing – Chapman & Hall, London – 1963.
5. L.E.Nielsen -Mechanical properties of Plastics – Reinhold, New York – 1962.
6. J.H.Collins -Testing and Analysis of Plastics – Plastics Institute – 1955.
7. R. P. Brown - Handbook of plastic testing methods - 1971
8. M.E.Baird - Electrical Properties of polymeric materials – Plastics and Rubber Institute, London – 1973.

Web based / Online Resources

1. <https://testingofplastics.com>
2. <https://mechanicalproperties.com>
3. <https://plasticselectricalproperties.com>
4. <https://filmtesting.com>
5. <https://containertesting.com>

8235312 PLASTICS PACKAGING TECHNOLOGY

Model Question

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any Ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. State the importance of packaging
2. Define the term "Packaging".
3. Write the history of packaging
4. State the origin of packaging materials
5. Name the types of packaging materials
6. Define Light transparency of packaging films
7. Write significance of flexible packages
8. Name some flexible packaging materials
9. What are reportable pouches?
10. Name few fabrication methods of packages
11. What is metalizing?
12. Write notes on embossing
13. Write the various printing inks used in packaging
14. Name the various physical tests for packages
15. Name the tests performed to assess the quality of packages

PART – B

(5 × 16 = 80 Marks)

16. (a) Write short notes on packaging laws and regulations.
(b) Explain about packaging hazards and control.
(c) Explain the advantages of packaging.
(d) Explain about function of packages.
17. (a) Explain the criteria for selection of packaging materials".
(b) Explain the different packaging materials
(c) Discuss the properties of packaging materials
(d) Explain the optical properties packaging materials.
18. (a) Explain the factors influence the design of packages
(b) Explain about laminated packages.
(c) Explain the Flexible packaging materials.
(d) Write notes on bio degradable packages.
19. (a) Write notes on Welding of packages.
(b) Write notes on Adhesive bonding of packages..
(c) Explain about hot stamping in packages.
(d) Explain about In mould decoration.
20. (a) Write notes on surface treatment for printing of packages.
(b) Explain the Chemical tests carried in packages
(c) Discuss the mechanical tests carried for packages.
(d) Explain the printing process of packages.

8235440	PLASTICS PROCESSING PRACTICAL II	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

Plastic processing deals with almost all advanced processing techniques. Which helps the students to enrich technical knowledge towards the industrial calibration Compounding of plastics materials with other additives and essential ingredients to meet the performance and manufacturing requirement at the lowest cost with the requirement of ancillary equipment are well explained. Composite materials are generally used for bridges and structure such as boat hulls, race car bodies etc. Nearly all types of plastics can be recycled, however the extent to which they are recycled depends upon technical, economic and logistic factors. As a valuable and finite resource, the optimum recovery route for most plastic items at the 'end-of-life' is to be recycled, preferably back into a product that can then be recycled again and again and so on.

Course Objectives:

On completion of the units of syllabus contents the students must be able to know about

- Basic principles, process and application of Advanced proceeding methods
- Acquire knowledge about Compounding equipments Study about Ancillary equipments, Types of Dryers, Dehumidifying dryer
- Process involved in Composites reinforced plastics and laminates
- Knowledge of Recycling. types of recycling ,Advantages of recycling and recycling of codes
- Decoration of plastics - Preparation for decorating - Printing - Silk screen printing - Pad printing

Course Outcomes:

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

CO1	Understand the basic principles, process and application of Advanced proceeding methods
CO2	Acquire knowledge about Compounding equipments Study about Ancillary equipments, Types of Dryers, Dehumidifying dryer
CO3	Explain the Process involved in Composites reinforced plastics and laminates
CO4	Acquire Knowledge of Recycling. types of recycling ,Advantages of recycling and recycling of codes
CO5	Describe decoration of plastics - Preparation for decorating - Printing - Silk screen printing - Pad printing

Pre-requisites:

Plastics Processing and Plastics processing Practical I

8235440	PLASTICS PROCESSING PRACTICAL II	L	T	P	C
PRACTICUM		1	0	4	3

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	2	-	1	1
CO2	3	1	1	2	-	1	1
CO3	3	1	1	2	-	1	1
CO4	3	1	1	2	-	1	1
CO5	3	1	1	2	-	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.
- Incorporate formative and summative assessments to gauge student progress and provide targeted feedback.
- 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 may be followed in the real environment as far as possible.

8235440	PLASTICS PROCESSING PRACTICAL II	L	T	P	C
PRACTICUM		1	0	4	3

Syllabus contents

Theory :		
UNIT I	ADVANCED PLASTIC PROCESSING, COMPOUNDING AND ANCILLARY EQUIPMENTS	
Chapter 1.1	Advanced Plastic Processing: Basic principles, process and application of Gas Assisted Moulding- Thin wall Moulding	8
Chapter 1.2	Compounding equipments - two roll mills - Banbury mixer - Twin screw extruder - Sigma mixer.	
Chapter 1.3	Ancillary equipments - Types of Dryers - Tray Dryer,— Hopper dryer – Vacuum hopper loader - Granulator - Mould temperature controller – Chilling plant – Colour blender - Magnetic grills.	
Practical Exercises:		
Ex. No.	Name of the Experiment	
1	Operation on Automatic Vacuum forming machines	30
2	Operation on Automatic sheet extruder.	
3	Operation on Automatic Blown Film Extrusion Machines.	
4	Operation on twin screw extruder	
5	Operation on semi automatic blow moulding machine.	
UNIT II	POLYMER COMPOSITES, PLASTICS RECYCLING, SECONDARY OPERATION ON PLASTICS	
Chapter 2.1	Composites - Definition - Basic process - Types - Hand lay-up and spray lay-up process- Filament winding - SMC, DMC – Applications	7
Chapter 2.2	Recycling - types of recycling -advantages of recycling - recycling of codes – Granulators - Pulverization process. Recycling of PET bottle	
Chapter 2.3	Decoration of plastics - Preparation for decorating - Printing - Silk screen printing - Pad printing - Vacuum metalizing.	
Chapter 2.4	Welding of plastics - Ultrasonic welding - Heat sealing	
6	Operation on Ultrasonic welding	30
7	Operation on FRP hand layup process.	
8	Operation on Reprocessing Unit	
9	Operation on Automatic Pad printing machines	
10	Operation on Compression moulding machine	
Total Periods		75

8235440	PLASTICS PROCESSING PRACTICAL II	L	T	P	C
PRACTICUM		1	0	4	3

Suggested List of Students Activity:**Activity 1:**

Collect the various plastic waste material from the campus .

Activity 2:

Segregate the collected waste material by simple floatation process and Plastics recycling code..

Text Books and Reference Books:

1. Decorative of plastics - James – ES-Margolis
2. Plastic Technology - William J. Patton
3. Polymer Processing - D.H. Marton., Jones
4. Injection Moulding - A.S. Athalye
5. Practical Injection Moulding of Plastics - Walter Mink
6. Polymer Processing - D.H. Morton Jones
7. Plastic Processing Data Handbook - Dominick Rosato.
8. Injection Moulding - Irvin Rubin
9. Plastic Processing Technology - Edward. A. Maccio.

Web Based / Online Resources

1. <https://www.youtube.com/watch?v=Nee00dT2EfA>
2. <https://www.youtube.com/watch?v=oGe8IrmDAoU>

SCHEME OF EVALUATION**Model practical examination and End practical examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by lot
- Record of work done should be submitted for the examination with a Bonafide Certificate.

Part	Description	Marks
A	Aim	5
B	Procedure and Tabular column	30
C	Formula ,calculation and Product	35
D	Result	5
E	Theory Questions (10×2 Marks Covering all Units)	20
F	Viva voce	5
Total Marks		100

8235440	PLASTICS PROCESSING PRACTICAL II	L	T	P	C
PRACTICUM		1	0	4	3

Equipments / Facilities required for conducting the Practical

S.No	Name of the Equipment's	Quantity Required Nos
1.	Automatic Vacuum forming machines	1
2.	Automatic sheet extruder.	1
3.	Automatic Blown Film Extrusion Machines.	1
4.	Twin screw extruder	1
5.	PET bottle manufacturing machine.	1
6.	Ultrasonic welding	1
7.	FRP hand layup process.	Sufficient
8.	Reprocessing Unit	1
9.	Automatic Pad printing machines	1
10.	Compression moulding machine	1

8235521	PLASTICS MOULD DESIGN DRAWING PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Introduction

The success of any molding job depends heavily on the skills employed in the design and construction of the mold. An injection mold is a precision instrument yet must be rugged enough to withstand hundreds of thousands of high-pressure molding cycles. The added expense for a well-engineered and constructed mold can be repaid many times over in molding efficiency, reduced down time and scrap, and improved part quality. This will provide the students an opportunity to skill themselves in various moulds and their parts design techniques available in the industry and also how to select the mould materials for engineering applications.

Course Objectives

The objective of this course is to enable the student,

- To understand the single cavity injection mould design for a particular application.
- To ability to design of multi cavity injection mould.
- To know the design procedure of under feed mould for a particular product.
- To acquire knowledge about the design procedure of stripper plate injection mould.
- To familiarize the design method of split mould for a external undercut product.

Course Outcomes

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

CO1: Understand the single cavity injection mould design for a particular application.

CO2: Ability to design of multi cavity injection mould.

CO3: Know the design procedure of under feed mould for a particular product.

CO4: Acquire knowledge about the design procedure of stripper plate injection mould.

CO5: Familiarize the design method of split mould for a external undercut product.

Pre-requisites: Plastics Mould and Die Design

CO/PO Mapping

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

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

8235521	PLASTICS MOULD DESIGN DRAWING PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

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.

Syllabus contents

Introduction	
Calculation of number of impression ,plasticizing capacity, Clamping tonnage required, Shot weight required, Selection of injection moulding machine.	02
Practical Exercises-Not for End examination	
Introduction to mould basic components. 1. Guide pillar and Guide bush - Concept and drawing practice. 2. Sprue bush - Concept and drawing practice. 3. Register ring - Concept and drawing practice. 4. Screws and Dowels - Concept and drawing practice. 5. Ejection assembly - Concept and drawing practice. 6. Hand injection mould for given product - Concept and drawing practice.	18
Practical Exercises- For End Examination	
7. Design of Two-plate single cavity injection mould with all system. 8. Design of Two-plate multi cavity injection mould with all system. 9. Design of Three plate injection mould (Stripper plate mould). 10. Design of under feed mould.	40
Total Periods	60

Suggested List of Students Activity:

1. Study the various hand moulds and their components.
2. Study the various mould components and their functions.
3. Practices to get good quality moulds for injection moulding machines.
4. Study the design and safety parameters for mould components.

8235521	PLASTICS MOULD DESIGN DRAWING PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Text Books and reference Books

1. Injection mould design - R.G.W. Pye
2. Plastic mould engineering handbook - J. Harry Dubois & Waying I. Prible
3. Plastic mould design - R.H.Bebb (Compression & Transfer mould)
4. Extrusion dies design - M.V. Joshi.
5. Blow moulding handbook - Donald V.Rosato.
6. Product Design - Ronald D. Beck.

Web Based / Online Resources :

1. <https://www.youtube.com/playlist?list=PLbV7gX-YQEk3eBCxoKWiJtsa3GH-JuWCo>
2. <https://www.youtube.com/playlist?list=PLVFLcxFx-YUbj3DfH-9RgUIgihTnK1a1S>
3. <https://www.youtube.com/playlist?list=PLPCUCPfhlyTMAfMtgNa0azQs3FbNIqRow>

END SEMESTER EXAMINATION – PRACTICAL EXAM.

- Note: 1. Duration of examination is 8 Hours.
2. Examiner should set the question paper for any product drawing covering only from experiment 7 to 10.
3. Students are allowed to choose by lot

Part	Description	Marks
A	Mould design calculation	10
B	Elevation (or) Sectional elevation	40
C	Plan I	20
D	Plan II (or) Inverted Plan	20
E	Title Block & Bill of Materials	05
F	Viva voce	05
Total Marks		100

Equipments / Facilities required to conduct Practical

S.No	Name of the Equipments	Quantity Required Nos
1	UNIVESAL DRAFTING MACHINE	Sufficient

8235522	PLASTICS PACKAGING TECHNOLOGY PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

It gives the students the knowledge of basic methods by which packaging materials can be tested. Packaging materials play a major role in our day to day life. Packaging materials are exposed to various mechanical, Thermal, Electrical forces. Also optical property is very important for many packaging materials which need transparency. These exercises will make the students to become familiar in various Mechanical, Thermal, Electrical, optical and product testing of packaging materials

Course Objectives:

On completion of the units of syllabus contents the students must be able to know about

- ❖ Various test conducted for packaging materials
- ❖ Mechanical properties of packaging materials
- ❖ Electrical properties of packaging materials
- ❖ Thermal and optical properties of packaging materials
- ❖ Various product tests carried for packaging materials

Course Outcomes:

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

CO1	Determine the mechanical properties of plastics
CO2	Study the thermal properties of plastics
CO3	Determine the electrical properties of plastics
CO4	Determine optical properties of plastics
CO5	Do the product tests for packaging materials

Pre-requisites: Plastic Materials and identification of plastics

CO/PO Mapping

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

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

8235522	PLASTICS PACKAGING TECHNOLOGY PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Instructional Strategy:

- Make chart of various plastic materials used in packaging applications.
- Simple identification tests to find the type packaging materials
- Simple laboratory preparation of various packaging materials.
- List the various testing equipments for used for the testing of packaging materials.

Syllabus contents

Ex.No	Name of the Experiment	Periods	
MECHANICAL PROPERTIES TESTS			
1.	Determination of Tensile properties of Plastic Films	60	
2.	Determination of Bursting strength of films		
3.	Determination of falling weight impact strength of films		
4.	Determination Tear strength of films		
THERMAL, ELECTRICAL AND OPTICAL PROPERTIES TESTS			
5.	Determination of Shrinkage value of packaging materials		
6.	Determination of Flammability value of plastic films		
7.	Determination of Dielectric strength of films		
8.	Determination of light transmittance and opacity of films		
9.	Determination of Gloss value of Films		
PRODUCT TESTING			
10.	Determination WVTR value of plastics	60	
Total Periods			

Suggested List of Students Activity:

1. Study the physical nature of various packaging materials
2. Compare the thickness of various films used in packaging
3. Collect various packaging materials and study their properties
4. Study the flexibility of various packaging materials
5. Study the Burning behavior of packaging materials.

Text and Reference Books:

1. J.A. Brydson - Plastic Materials –7th Ed-Butterworths-Heinemann-London (1999)
2. Vishushah – Handbook of Plastic Testing Technology–WileyInter-science Publications-1998
3. How to identify plastics – CIPET Publication - 2003..
4. J.H.Collins-Testing and Analysis of Plastics–Plastics Institute–1955.
5. R.P.Brown-Handbook of plastic testing methods-1971

8235522	PLASTICS PACKAGING TECHNOLOGY PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Web Based / Online Resources

1. <https://plasticsidentification.com>
2. <https://testing.com>
3. <https://plasticspackaging.com>
4. <https://plasticsanalysis.com>
5. <https://plasticsfilms.com>

SCHEME OF EVALUATION

Model practical examination and End practical examination

Note:

All the exercises should be given in the question paper and students are allowed to select by lot

Record of work done should be submitted for the examination with a Bonafide Certificate.

Part	Description	Marks
A	Aim & Apparatus Required	5
B	Procedure and Tabular column	25
C	Formula and calculation	25
D	Result	10
E	Observation	30
F	Viva voce	5
Total		100

8235522	PLASTICS PACKAGING TECHNOLOGY PRACTICAL	L	T	P	C
PRACTICAL		0	0	4	2

Equipment / Facilities required to conduct the Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Universal testing machine	1
2	Falling weight Impact testing machine	1
3	Tear strength tester.	1
4	AC High voltage tester	1
5	Opacity tester	1
6	WVTR Apparatus	1
7	Gloss Meter	1
8	Bursting strength tester	1

8235660	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 objective of this course is to enable the students

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

Course Outcomes:

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

- CO 1: Differentiate between Innovation and Start-ups
- CO 2: Explain the importance of IPR, Patents and Copyrights.
- CO 3: Describe the methodology to be adopted for preparing the Business Plan
- CO 4: Gain practical experience by Industrial training and visiting the nearby industry
- Co 5: Explore and identify various funding facilities available from Government and Non-Government Schemes for Start-ups

Pre-requisites:

There are no specific prerequisites for this course, although a basic understanding of business and technology concepts would be beneficial.

8235660	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2

CO/PO Mapping:

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

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

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	Periodical Test*	Week14	Week15	
Mode	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	60	20	30	100
Converted to	10	10	20	60
Marks	10	10	20	60

*Periodical Test will be conducted during PT- II schedule.

8235660	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2

Continuous Assessment - 40 marks

S. No	Description	Marks
Periodical Test	Unit – I,II & III- Assessment (60 marks) Written Examination –Periodical Test Question pattern Part A – 6 Questions x 2 marks = 12 Marks Part B – 6 Questions x 8marks = 48 Marks ----- 60 Marks ----- In Each Unit Part – A (2 Questions) and Part – B (2 Questions)	10
Week 14	Unit IV Seminar Presentations (20 marks- each topic carries 10 marks) Students should present any two topics with PPTs	10
Week 15	Unit V Submission of Industry Visit Project Report - (30 marks)	20
Total Marks		40

Syllabus Contents:

UNIT I	INTRODUCTION TO INNOVATION	Periods
	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

8235660	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2

UNIT IV	SEMINAR TOPICS	
<p>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</p> <ol style="list-style-type: none"> 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. 12. How to start a start-up in India. 		9
UNIT V	EXPOSURE TO INDUSTRY	
<p>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.</p>		18
Total Periods		45

8235660	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2

End Semester Examination - Project Exam		
Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Principal and Chairman Awards Committee.		
Detailed Allocation of Marks		
S. No	Description	Marks
PART A PART B	Written Examination – Unit –I,II & III Theory Questions 3 Questions x 2 marks = 6 Marks 3 Questions x 8marks = 24Marks ----- 30 Marks ----- In Each Unit Part – A (1 Question) and Part – B (1 Question)	30
PART C	Presentation of Industry Visit Project Report	50
PART D	Interaction and Evaluation	20
Total Marks		100

A hand written Project report of 10 pages containing the titles in Unit -V along with a bonafide certificate should be submitted by the students.

VSNMPC

8235750	INDUSTRIAL TRAINING	Summer Vacation	C
PROJECT / INTERNSHIP			2

Introduction:

Industrial training is a crucial component of the diploma engineering curriculum, designed to bridge the gap between theoretical knowledge and practical application. Typically conducted during vacation periods, this two-week training program provides students with hands-on experience in their respective engineering fields. The primary objectives are to enhance practical skills, familiarize students with industry standards, and prepare them for future employment.

Two-week industrial training during vacation periods is an invaluable part of diploma engineering education. It not only equips students with practical skills but also provides a comprehensive understanding of the industry, preparing them for successful engineering careers.

Objectives:

1. **Practical Exposure:** Students gain direct exposure to real-world engineering practices, tools, and technologies.
2. **Skill Enhancement:** The training helps in developing technical and soft skills that are essential for professional growth.
3. **Industry Insight:** Students learn about the working environment, operational procedures, and challenges faced by industries.
4. **Professional Networking:** The training offers opportunities to interact with industry professionals, which can be beneficial for career prospects.
5. **Application of Knowledge:** It allows students to apply classroom knowledge to solve practical problems, enhancing their understanding and retention of engineering concepts.

Structure of the Training Program:

- **Orientation:** Introduction to the company, its operations, and safety protocols.
- **Project Assignment:** Students are assigned specific projects or tasks relevant to their field of study.
- **Supervision and Mentorship:** Industry 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.

8235750	INDUSTRIAL TRAINING	Summer Vacation	C
PROJECT / INTERNSHIP			2

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.

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PROJECT / INTERNSHIP			2

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.

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.

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PROJECT / INTERNSHIP			2

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.

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PROJECT / INTERNSHIP			2

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.

8235750	INDUSTRIAL TRAINING	Summer Vacation	C
PROJECT / INTERNSHIP			2

Scheme of Evaluation

Internal Assessment

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

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Report and Presentation	20
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 Principal and Chairman Awards committee after the completion of industrial training. The marks scored will be converted to 60 marks for the End Semester Examination.

Scheme of Evaluation

Sl. No.	Description	Marks
A	Daily Activity Report and Attendance certificate	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department	30
C	Presentation by the student at the end of the Internship	30
D	Viva Voce	20
Total		100

C236111	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 :

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

CO1: Find eigen values and corresponding eigen vectors of a square matrix.

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

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

CO4: Solve ordinary differential equations using various techniques.

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

PRE-REQUISITES :

Matrices, Determinants, Differentiation, Integration and Vector Algebra

CO/PO MAPPING :

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

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

C236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
THEORY		3	0	0	3

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.

Syllabus contents :

UNIT I	EIGEN VALUES AND EIGEN VECTORS	
Chapter 1.1	Characteristic equation – Eigen - values of 2×2 and 3×3 real matrices –Eigen-vectors of 2×2 real matrices–Properties of eigen-values (excluding proof) – Cayley - Hamilton theorem (excluding proof) –Simple problems.	9
UNIT II	FUNCTIONS OF SEVERAL VARIABLES	
Chapter 2.1	Partial derivatives of two variable and three variable functions (upto second order) –Homogeneous functions and Euler’s theorem (excluding proof) – Jacobian matrix and determinant – Maxima and minima of functions of two variables – Simple problems.	9
UNIT III	VECTOR CALCULUS	
Chapter 3.1	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.	9
UNIT IV	DIFFERENTIAL EQUATIONS	
Chapter 4.1	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.	9
UNIT V	LAPLACE TRANSFORMS	
Chapter 5.1	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.	9
Total Periods		45

C236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
THEORY		3	0	0	3

SUGGESTED LIST OF STUDENTS ACTIVITIES :

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

Text Books and Reference Books :

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

Web-based/online resources :

1. <https://www.khanacademy.org/math/>
2. <https://www.mathportal.org/>
3. <https://openstax.org/subjects/math>
4. <https://www.mathhelp.com/>
5. <https://www.geogebra.org/>
6. <https://www.desmos.com/>
7. <https://phet.colorado.edu/>

VSVNPC

C236111 ADVANCED ENGINEERING MATHEMATICS

Model Question

Time - Three Hours

(Maximum Marks : 100)

- N.B.** 1. Answer any Ten questions under PART-A, Each question carries 2 Marks. .
2. Answer all questions, choosing any two sub-divisions from each question under PART-B. Each sub-division carries 8 Marks.

PART-A**(10 × 2=20 Marks)**

1. Find the characteristic equation of $\begin{pmatrix} 2 & 4 \\ -1 & 2 \end{pmatrix}$
2. Find the eigen values of $\begin{pmatrix} 1 & 3 & -1 \\ 0 & 4 & 8 \\ 0 & 0 & -5 \end{pmatrix}$
3. State Cayley Hamilton theorem.
4. Find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$ if $u = x^3 + y^3 - 3xy$.
5. State Euler's theorem.
6. Write the conditions for the function $f(x,y)$ to be maximum at (a,b) .
7. Find $\nabla\phi$ if $\phi = x + y + z$
8. Find the divergence of $x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$
9. Write the formula to find the curl of a vector point function.
10. Form the differential equation for which $y = ax$ is a solution.
11. Find the order and degree of the differential equation $y' = 3x^2 - 7$
12. Find the Particular integral of $(D^2 - 4)y = e^{3x}$
13. Write the formula to find the Laplace transform of $y = f(x)$
14. Find the Laplace transform of $f(x) = x^3$
15. Write the inverse Laplace transform of $F(s) = \frac{1}{s^2+a^2}$

PART – B

(5 X 16 = 80 Marks)

16. a) Find the eigen values of $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$

b) Find the eigen values and eigen vectors of $\begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$

c) Find the inverse of $A = \begin{pmatrix} 1 & 1 & 2 \\ 9 & 2 & 0 \\ 5 & 0 & 3 \end{pmatrix}$ using Cayley-Hamilton theorem

d) Find A^{-1} for $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{pmatrix}$ using Cayley-Hamilton theorem

17. a) if $u = \log(x^2 + y^2)$, then find $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$

b) Find the Jacobian matrix of $u = x^2y$, $v = 5x + \sin y$.

c) Find the stationary points of $f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$

d) Find the maxima and minima value of $f(x,y) = x^2 - xy + y^2 - 2x + y$

18. a) Find the directional derivative of $\phi = 3x^2 + 2y - 3z$ at the point (1,1,1) in the direction of $2\vec{i} + 2\vec{j} - \vec{k}$

b) Find the curl(\vec{f}) if $\vec{f} = x^2z\vec{i} - 2y^3z^2\vec{j} + xy^2z\vec{k}$

c) Find the value of m if $(x + 2y)\vec{i} + (my + 4z)\vec{j} + (5z + 6x)\vec{k}$ is a solenoidal vector.

d) Show that $\vec{F} = yz\vec{i} + zx\vec{j} + xy\vec{k}$ is irrotational.

19. a) Solve: $\frac{dy}{dx} + \frac{1+y^2}{1+x^2} = 0$

b) Solve: $\frac{dy}{dx} + 2xy = 2e^{-x^2}$

c) Solve: $\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x$

d) Solve: $(D^2 + 3D + 2)y = 2e^{-2x}$

20. a) Find the Laplace transform of $f(x) = x^2e^{-4x}$

b) Find the inverse Laplace transform of $F(s) = \frac{s^2 - 3s + 4}{s^3}$

c) Find the inverse Laplace transform of $F(s) = \frac{s+1}{s^2+2s+2}$

d) Solve $y' + 3y = e^{-2x}$, $y(0) = 4$ using Laplace transform.

* * *

C236112	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 aspirations 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 promote 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 ensuring good means of living for every individual, providing jobs and developing the Indian economy.

Course Objectives:

After completing this subject, the student will be able to

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

Course Outcomes:

CO1: Explain the process of entrepreneurship

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

CO3: Familiarization of various financial and non financial schemes

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

CO5: Learn the preparation of project feasibility report

Pre-requisites

Knowledge of basics of Engineering and Industrial engineering

CO/PO Mapping

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

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

C236112	ENTREPRENEURSHIP	L	T	P	C
THEORY		3	0	0	3

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice- activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

Syllabus Contents

UNIT I	ENTREPRENEURSHIP – INTRODUCTION AND PROCESS	
	Chapter 1.1: 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.	9
UNIT II	BUSINESS IDEA	
	Chapter 2.1 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,	9

C236112	ENTREPRENEURSHIP	L	T	P	C
THEORY		3	0	0	3

UNIT III	BANKING			
Chapter 3.1 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.				9
UNIT IV	PRICING AND COST ANALYSIS			
Chapter 4.1 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.				9
UNIT V	BUSINESS PLAN PREPARATION			
Chapter 5.1 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
Total periods				45

Suggested list of Students Activity.

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

C236112	ENTREPRENEURSHIP	L	T	P	C
THEORY		3	0	0	3

8. 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.

Text Books and Reference Books:

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

Web Based / On line Resources :

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

C236112 ENTREPRENEURSHIP

Model Question

Time- Three Hours
Maximum Marks: 100

N.B:

1. Answer any ten questions under Part-A. Each question carries 2 marks
2. Answer all questions, choosing any two sub-division from each question under Part-B. Each sub-division carries 8 marks.

PART A

(10x2=20marks)

1. Define Entrepreneurship.
2. Explain the need for entrepreneurship.
3. Write any three characteristics of entrepreneur.
4. Write short notes on Stake holders.
5. What do you mean by Patent and Copy right?
6. What is the difference between Business idea and Business opportunity?
7. What do you mean by Small Scale industries?
8. What are the importance of financial institutions for entrepreneurs?
9. Specify the role of government policy on entrepreneurs.
10. What do you mean by Variable cost?
11. Write short notes on Goods and services tax..
12. Define the term Pricing.
13. What do you mean by Technical analysis?
14. Write short notes on sales strategy.
15. What do you mean by Branding?

PART B

16. (a) Explain in detail about Pros and Cons of Entrepreneurship.
(b) Describe about the Entrepreneurship Process.
(c) State the difference between Employee and Entrepreneur.
(d) Discuss in detail about Entrepreneurial values and attitudes.
17. (a) Describe the types of business and explain it.
(b) Explain in detail about the types of resources.
(c) Describe about the causes and remedies of business failure.
(d) How to classify the business risks and explain it?
18. (a) What are the types of business on the basis of capital?
(b) Explain in detail about the government policy for Entrepreneurship.
(c) State the incentive schemes of state government for entrepreneur.
(d) Describe about the incentive scheme of central government for entrepreneur.
19. (a) Discuss in detail about the Cash Inflow and Cash Outflow.
(b) State the importance and preparation of Income statement.
(c) How to calculate Break Even Point for single product with example?
(d) What are the factors affecting pricing?
20. (a) Explain in detail about the feasibility of Report.
(b) Describe about the Market Research.
(c) State the concept of Digital Marketing.
(d) Discuss in detail about Business Plan.

C236113	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,

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

Course Outcomes

CO 1: Explain the principles of Project Management

CO 2: Create and manage project schedules.

CO 3: Create structure and manage the project commitments.

CO 4: Acquire to Gain enterprise support.

CO 5: Prepare a Detailed Project Report (DPR).

Pre-requisites

Basic Knowledge about Industrial Engineering

C236113	PROJECT MANAGEMENT	L	T	P	C
THEORY		3	0	0	3

CO/PO Mapping

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

Syllabus Contents :

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.	9
UNIT II	Various Stages and Components of Project Feasibility Studies, Phases of a Project, Stages in Project Life Cycle and Project Constraints	

C236113	PROJECT MANAGEMENT	L	T	P	C
THEORY		3	0	0	3

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.		9
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.		9
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.		9
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.		9
Total periods		45

Suggested list of Students Activity:

Project Simulation and Role-Playing:

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

C236113	PROJECT MANAGEMENT	L	T	P	C
THEORY		3	0	0	3

Case Study Analysis:

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

Project Plan Development:

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

Group Project:

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

Project Management Software Training:

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

Text Books and Reference Books:

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

Web Based / Online Resources

1. <https://youtu.be/pc9nvBsXsuM>
2. NPTEL Courses
3. https://youtu.be/PqQqTAu_FiM

C236113 PROJECT MANAGEMENT

Model Question

Time- Three Hours
Maximum Marks: 100

N.B:

1. Answer any ten questions under Part-A. Each question carries 2 marks
2. Answer all questions, choosing any two sub-division from each question under Part-B. Each sub-division carries 8 marks.

PART A

(10x2=20marks)

1. What do you mean by project management?
2. What is project roll up?
3. What is Portfolio management?
4. What are the steps in defining project?
5. Explain about the Project Planning phase.
6. What do you mean by Feasibility Study?
7. Write a note on Project evaluation under certainty.
8. An investor made an investment of Rs.5000 in property and gets back Rs.5700 the next year. If the rate of return is 10%. Calculate Net present Value.
9. What do you mean by Internal Rate of Return?
10. Explain the term CPM.
11. Write a short note on PERT.
12. What is Project Control?
13. Explain about the social network building.
14. What do you mean by project stakeholders?
15. Explain the role of Project manager?

PART B

(5 x 16 = 80marks)

16. (a) Describe the Classification in project management.
- . (b) State the importance of Project Management.
- (c) Discuss about the appropriate Project Management Structure.
- (d) Explain the external causes of delay and internal constraints.
17. (a) Discuss about the types of Project feasibility studies.
- (b) Explain the Phases of Project Life Cycle.
- (c) Explain the project resource flow.
- (d) Discuss in detail about project constraints.
18. (a) Explain in detail Project evaluation under uncertainty .
- . (b) Describe the Methodology for project evaluation.
- (c) Discuss about the Social Cost Benefit Analysis.
- (d) Explain the social and National profitability in Project management..
19. (a) Explain the Components of CPM/PERT Networks in detail.
- . (b) Describe the various types of Project control process.
- (c) Discuss about the Steps in Project Appraisal Process.
- (d) Explain the types of Project Audit in Project Management.
20. (a) State the different qualities of project manager.
- (b) Describe the Five Stage Team Development Model.
- (c) What are the situational factors affecting team development?
- (d) Discuss about the Project team pitfalls.

C236114	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 profitability

Course Outcomes

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

CO1: Manage financial resources effectively to achieve personal goals

CO2: Explain the procedure for Business Funding

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

CO4: Differentiate the types of budgeting and allocate the resources

CO5: Apply the idea of marginal costing in decision making

Pre-requisites

Knowledge of basic mathematics

CO/PO Mapping

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

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

C236114	FINANCE FUNDAMENTALS	L	T	P	C
THEORY		3	0	0	3

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice- activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

Syllabus Contents :

UNIT I	PERSONAL FINANCE	
Chapter 1.1	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).	9
UNIT II	BUSINESS FUNDING	
Chapter 2.1	Sources: Personal Savings – Borrowings - Venture Capital – Venture Capital Process – Commercial Banks – Government Grants and Scheme.	9
UNIT III	FINANCE LANGUAGE	
Chapter 3.1	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 – Shareholders fund: Equity Share capital, Preference Share Capital, Reserve & Surplus – Borrowings: Debentures, Bank Loan, Other Loan – Depreciation – Reserve Vs Provision.	9
UNIT IV	BUDGETING	
Chapter 4.1	Budgetary Control – Meaning – Preparation of various budgets – Purchase budget – Sales Budget – Production budget – Cash Budget – Flexible budgets.(With Problems)	9
UNIT V	MARGINAL COSTING	
Chapter 5.1	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
Total Periods		45

C236114	FINANCE FUNDAMENTALS	L	T	P	C
THEORY		3	0	0	3

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.

Classroom Discussions and Debates:

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

Text Books and Reference Books:

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

Web Based / Online Resources :

1. <https://www.youtube.com/watch?v=bq6nZ3LnBpA>
2. <https://www.youtube.com/watch?v=ny5sciZoyHc>

C236114 FINANCE FUNDAMENTALS

Model Question

Time- Three Hours

Maximum Marks: 100

N.B:

1. Answer any ten questions under Part-A. Each question carries 2 marks
2. Answer all questions, choosing any two sub-division from each question under Part-B. Each sub-division carries 8 marks.

PART – A

(10 x 2 = 20 Marks)

1. Write a short note on personal finance?
2. Define the bank deposit
3. What do you mean by the time value of money?
4. Write the short note on venture capital.
5. Explain the commercial banks.
6. Explain the venture capital process in business funding
7. Explain the meaning of fictitious assets
8. What do you mean by current asset?
9. What do you mean by current liability?
10. Write a short note on cash budget.
11. What do you mean by budgetary control?
12. Write about the types of budgets.
13. Marginal cost Rs.2,400 Sales Rs.3,000 Calculate P/V ratio.
14. Write a short note on Key factor
15. Explain the term breakeven point.

PART – B

(5 x 16 = 80 Marks)

16. (a) Explain the different modes of personal saving.
 (b) Difference between the Returns Vs Risk
 (c) Enumerate the advantages of personal finance
 (d) State the objectives of personal finance
17. (a) Bring out a Government grants and scheme in sources of business funding.
 (b) Write the short note on i) Personal savings ii) Borrowing in Business funding
 (c) Discuss about the stages of raising in venture capital
 (d) Brief explain the types of commercial bank
18. (a) Write the short notes on
 i) Equity share capital
 ii) Preference share capital
 iii) Reserve & Surplus
 (b) Difference between the Reserve Vs provision
 (c) Write a short note on
 i) Debentures
 ii) Bank loan
 iii) Other loan
 (d) Difference between the Revenue Vs Capital items
19. (a) A factory is presently working at 50% capacity and incurs the following expenditure:
 . Materials Rs 1,50,000 , Wages Rs 70,000 , Fixed overheads Rs 80,000 ,
 Variable overheads Rs 20,000 , Semi-variable overheads (60% Fixed)Rs 30,000
 Prepare a flexible budget for 75% and 100 %
- (b) From the following forecasts of income and expenditure prepare a cash budget for the three months commencing 1st June, when the bank balance was Rs.1,00,000.

Month	Sales Rs.	Purchases Rs.	Wages Rs.	Factory Expenses Rs.	Admin and selling expenses Rs.
April	80,000	41,000	5,600	3,900	10,000
May	76,500	40,500	5,400	4,200	14,000
June	78,500	38,500	5,400	5,100	15,000
July	90,000	37,000	4,800	5,100	17,000
August	95,000	35,000	4,700	6,000	13,000

A sales commission of 5 per cent on sales, due two months after sales, is payable in addition to selling expenses. Plant valued at Rs.65,000 will be purchased and paid for in August and the dividend for the last financial year of Rs.15,000 will be paid in July. There is a two month credit period allowed to customers and received from suppliers.

- (c) A manufacturing company submits the following of a product for the first quarter of 2006:

Sales (in units)	January	30,000
	February	25,000
	March	35,000

Selling price per unit Rs.20

Target of 1st quarter 2007:

Sales quantity increase 10%

Sales price increase 10%

Prepare sales budgets for the first quarter of 2007.

- (d) Prepare a production budget of X ltd., from the following information:

Products	Sales as per sales budget (in units)	Estimated stock(in units)	
		1.7.2007	31.6.2007
A	4,88,000	10,000	12,000
B	3,75,000	20,000	45,000
C	6,00,000	50,000	25,000

- 20.(a) Difference between Marginal costing Vs Absorption costing.

- (b) From the following details find out (a) P/V Ratio (b) B.E.P (c) margin of safety

Sales	Rs. 1,00,000
Variable costs	60,000
Fixed costs	20,000
Net profit	20,000

- (c) A company has the capacity to produce 20,000 units. Its variable expenses are Rs.13.

Fixed expenses are Rs.4. Due to trade depression, only 2,000 units may be sold at Rs.20 in the next year. Fixed cost can be reduced to Rs.33,000. If the factory is closed, addition cost will be Rs.12,000. State whether the factory can be closed.

- (d) From the following information calculate

- i) Break-Even point
ii) Sales required to earn a profit of Rs.10,000

Sales	Rs.30,000
Variable expenses	Rs.14,000
Fixed expenses	Rs.13,000

8236115	PLASTICS WASTE MANAGEMENT AND RECYCLING	L	T	P	C
THEORY		3	0	0	3

Introduction:

Plastics play a very important role in our daily life. Products made out of metal, wood, glass are replaced almost by plastics. But the problem with plastics is, it is not biodegradable. It can be either used again and again by recycling them. This subject deals with management of plastics waste and recycling of them. Students must be aware the various methods of recycling and use of recycled materials. Complete overview on waste plastics management and recycling,

Course Objectives:

On completion of the units of syllabus contents the students must be able to know about

- ❖ The recycling methods
- ❖ Different methods by which waste materials can be identified
- ❖ Different methods of separation of waste materials
- ❖ Various methods of recycling
- ❖ Applications of recycled materials

Course Outcomes:

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

CO1	Understand the recycling methods
CO2	Identify the various plastic waste materials
CO3	Describe the various recycling and separation techniques
CO4	Describe the various methods of recycling
CO5	Understand the applications of recycled materials

Pre-requisites: Plastics Materials and Plastics Processing

CO/PO Mapping

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

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

8236115	PLASTICS WASTE MANAGEMENT AND RECYCLING	L	T	P	C
THEORY		3	0	0	3

Instructional Strategy:

- It is advised that teachers take steps to student's 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 to enhance engagement and provide additional learning opportunities.
- All demonstrations / Hand-on practices may be followed in the real environment as far as possible.

Syllabus Contents :

UNIT I	INTRODUCTION TO PLASTIC WASTE MANAGEMENT AND RECYCLING METHODS			
Chapter 1.1	Plastic waste generation source, composition, quantities, need and benefits Municipal solid waste and composition- recycling of plastics from urban solid wastes, household waste – industrial sector, Plastics recycling classification code of practice. Circular economy and plastic pollution control rules. Recycling methods - Primary, Secondary, tertiary recycling of plastics.			9
UNIT II	IDENTIFICATION OF VARIOUS PLASTIC WASTE MATERIALS			
Chapter 2.1	Plastic identification methods physical, chemical, flotation, solvent separation and melt filtration Plastic production and composition,			9
UNIT III	SEPARATION TECHNIQUES AND PROCESSING OF COMMINGLED PLASTIC WASTE			
Chapter 3.1	Separation of resin from fiber in waste FRP. Size reduction of recycled plastics- cutting/shredding, densification, pulverization and chemical size reduction of recycled plastics. Processing of commingled/mixed plastic waste-super wood, plastic lumber			9
UNIT IV	RECYCLING OF VARIOUS PLASTICS			
Chapter 4.1	Recycling of polyolefins based products- Recycling of PET based products – PVC recycling, Recycling of polycarbonate, Nylon and ABS, Recycling of thermoset plastic waste, pyrolysis and energy recovery			9
UNIT V	SINGLE USE PLASTICS RECYCLING AND APPLICATIONS OF RECYCLED PLASTICS			
Chapter 5.1	Single use plastics recycling - Use of recycled plastics in healthcare - Use of recycled plastics in food packaging - Use of recycled plastics in construction and architecture.			9
Total Periods				45

8236115	PLASTICS WASTE MANAGEMENT AND RECYCLING	L	T	P	C
THEORY		3	0	0	3

Suggested List of Students Activity:**Activity 1:**

Study the different equipments available in testing laboratory to identify waste plastics

Activity 2:

Four students can be grouped as a batch to collect information about the various waste plastic materials

Activity 3:

List the various products manufactured using recycled plastics

Text Books and Reference Books:

1. Anthony L. Andrady (Ed.), "Plastics and the Environment", Wiley Interscience, New York, 2003.
2. Francesco Paolo La Mantia, "Recycling of Plastic Materials (Ed)", Chem Tech Publishing.
3. Nabil Mustafa, "Plastics Waste Management, Disposal Recycling and reuse", Marcel Dekker, inc. New York, 1993.
4. Nabil Mustafa, Marcel Dekker, "Plastics Waste Management (Ed)", New York, 1995
5. John Scheirs, "Polymer recycling, science, technology and applications", John Wiley & Sons, England, 1988.
6. Ann Christine Albertson and Samuel J. Huang, Marcel Dekker, "Degradable polymer, recycling and Plastic waste management (Eds), New York.

Web based / Online Resources

1. <https://wasteplastics.com>
2. <https://recyclingplastics.com>
3. <https://plasticselectricalproperties.com>
4. <https://plasticswastemanagenet.com>

8236115 PLASTICS WASTE MANAGEMENT AND RECYCLING

Model Question

Time – Three Hours
(Maximum Marks: 100)

N.B.

1. Answer any Ten questions under Part – A. Each question carries 2 Marks.
2. Answer all questions, choosing any two sub-divisions from each question under Part – B. Each sub-division carries 8 Marks.

PART – A

(10 × 2 = 20 Marks)

1. State the importance of recycling
2. Name various recycling codes.
3. What is the need for waste management?
4. State the importance of identification of waste plastics
5. Name the plastics can be segregated by floatation test
6. Write a note on physical identification of plastics
7. Write significance of recycling of FRP
8. Name the various techniques by which size reduction of FRP can be done
9. What is shredding?
10. Name the thermoset materials can be recycled
11. What is Pyrolysis?
12. Write notes on energy recovery
13. State the plastics used in food packaging
14. Name any five single use plastic products
15. Give the significance of plastics in construction field

PART – B

(5 × 16 = 80 Marks)

16. (a) Write short notes on recycling of plastics from urban waste.
- (b) Explain the various recycling methods.
- (c) Discuss the advantages of recycling of plastics.
- (d) Explain about various pollution control rules on recycling.
17. (a) Explain the separation of plastics by waste separation method.
- (b) Explain the various chemical tests used for the identification of waste plastics
- (c) Discuss melts filtration method of waste plastics identification
- (d) Narrate the identification waste plastics by preliminary tests
18. (a) Explain the separation of resin from FRP Products
- (b) Explain the various size reduction methods of FRP.
- (c) Explain the processing of mixed plastics waste.
- (d) Write notes on Pulverisation.
19. (a) Discuss the recycling of polyolefin based products.
- (b) Explain the recycling of PET based products
- (c) Explain the recycling of Nylon products.
- (d) Narrate recycling of Thermoset products.
20. (a) Write notes on recycling of single use plastic products.
- (b) Explain the role of recycled plastics in health care applications
- (c) Discuss the role of recycled plastics in food packaging.
- (d) Explain the role of recycled plastics in Construction and architecture.

8236241	PLASTICS MOULD MAKING PRACTICAL	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

Mold making is the process of designing and creating molds that serve as the blueprint for producing identical copies of a particular object or part. Mold-making techniques have been on the rise ever since, as manufacturers using advanced manufacturing techniques such as injection molding, thermoforming, or casting continue to rely on molds to create the majority of plastic parts. These molds, crafted with high precision and attention to detail, are used in various manufacturing processes to replicate products in materials ranging from metals and plastics to ceramics and composites. The essence of mold making lies in its ability to produce high volumes of parts with uniformity, efficiency, and intricate detail, making it a cornerstone in the manufacturing sector.

Course Objectives:

The objective of this course is to enable the student to

- To identify various methods of making injection mould components
- To use tool room machines for making blow mould.
- To acquire knowledge of heat treatment process and measuring instruments.
- To develop hands-on skills to assemble mould elements.

Course Outcomes:

On successful completion of the course, the students will be able to

CO1: Acquire fundamental skill on machining mould elements.

CO2: Develop knowledge in making injection mould components.

CO3: Make blow mould components.

CO4: Develop and assemble injection mould and blow mould.

CO5: Acquire knowledge in heat treatment and measuring instruments.

Pre-requisites:

Mould making technology and Tool Room Special Machines Practical

CO/PO Mapping:

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

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

8236241	PLASTICS MOULD MAKING PRACTICAL	L	T	P	C
PRACTICUM		1	0	4	3

Instructional Strategy:

- Utilize a blended approach with lectures on fundamentals of mould making and machines used to make mould elements.
- Incorporate hands-on sessions for mould assembly.
- Assignments focus on creating detailed drawings of mould parts, transitioning to CAD drawing to mould elements, modification and improvement in design.
- Encourage peer collaboration and feedback.

Syllabus Contents

Theory :			
UNIT 1	HEAT TREATMENT METHODS	Periods	
	Chapter 1.1 Heat Treatment: Purpose – procedures – applications of various heat treatment process – Iron carbon equilibrium diagram- Annealing – Normalizing hardening – tempering –quenching medium – different types of quenching medium.	8	
UNIT II	MEASURING INSTRUMENTS	Periods	
	Chapter 2.1 Linear Measuring Instruments – Vernier caliper, Micrometer, Vernier height gauge, Depth Micrometer, slip gauges. Angular measuring instruments – Bevel protractor, Angle gauges, Precision level, Sine bar, Measurement of Screw threads – Single element measurements – Pitch Diameter, Lead and Pitch.	7	
Practical Exercises:			
Ex. No.	Name of the Experiment	Periods	
MAKING OF HAND INJECTION MOULD			
1	Machining of insert core plate. Check the dimension.	60	
2	Machining of insert cavity plate. Check the dimension.		
3	Machining of core/cavity retainer plate. Check the dimension.		
MAKING OF BLOW MOULD			
4	Machining of Mould Halves. Check the dimension.		
5	Machining of Guide Pin and bottom plate. Check the dimension.		
MAKING OTHER MOULD COMPONENTS			
6	Engraving of Letters and Numbers on mould plates (Forward & Reverse)		
7	Machining of sprue bush		
8	Machining of Register ring.		
9	Assembly of HAND INJECTION MOULD AND BLOW MOULD using the above mould components. (Not for End Exam).		
Total Periods		75	

8236241	PLASTICS MOULD MAKING PRACTICAL	L	T	P	C
PRACTICUM		1	0	4	3

Suggested List of Students Activity:

- Distinguish between metals and non-metals. Identify ferrous and non-ferrous metals
- Define common terms used in heat treatment operation
- Identify various special machines used in mould making.
- Take product from the mould made by students.

Text Books and Reference Books:

1. Galyer, J.F.W. Charles Reginald Shotbolt, "Metrology for Engineers", Cengage Learning EMEA; 5th revised edition, 1990.
2. Heat Treatment: Principles and Techniques T.V.Rajan, C.P.Sharma and Ashok Sharma PHI Learning Private Limited
3. Injection mould design - R.G.W. Pye
4. Plastic mould engineering handbook - J. Harry Dubois & Waying I. Prible

Web-based / Online Resources:

1. www.nikonmetrology.com
2. <https://www.simcon.com/cadmould>
3. <https://community.ptc.com/t5/3D-Part-Assembly-Design/Injection-Mould-Models/td-p/381899>

SCHEME OF EVALUATION**Model Practical Examination and End Semester Practical Examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafide certificate.

Part	Description	Marks
A	Aim	5
B	Procedure	10
C	Machining and Dimensioning	55
D	Result	5
E	Theory Questions 10 × 2 Marks Covering all Units	20
F	Viva Voce	5
Total Marks		100

8236241	PLASTICS MOULD MAKING PRACTICAL	L	T	P	C
PRACTICUM		1	0	4	3

Equipment / Facilities required to conduct Practical

S.No	Name of the Equipments	Quantity Required Nos
1	Lathe	2
2	Shaper	2
3	Drilling machine	1
4	Horizontal Milling machine	1
5	Vertical Milling machine	1
6	Surface Grinding machine	1
7	Cylindrical Grinding machine	1
8	Slotter	1
9	Pantograph Engraving machine	1
10	Measuring instruments	Sufficient

8236242	COMPOSITES TECHNOLOGY	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

Composites play a very important role in the engineering applications. Composites have the unique property that they have excellent strength with less weight and volume. Composites role in medical and aero space applications is enormous. The excellent corrosion resistance property of composites make them an essential product in construction field. Composites made using aramid fibers have the strength much more than the strength of steel. This subject will be an eye opening for the students to get exposure in the field of fibre reinforced materials

Course Objectives:

On completion of the units of syllabus contents the students must be able to know about

- ❖ The different composite materials
- ❖ Different methods by which composites can be processed
- ❖ Different methods of manufacture of composites
- ❖ Various resins used in the manufacture of composites
- ❖ Various fillers used in the manufacture of composites
- ❖ Applications of composites
- ❖ Testing of composites

Course Outcomes:

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

CO1	Understand the resin and reinforcing materials
CO2	Know the fabrication of moulds and processing
CO3	Understand the testing and applications of composites
CO4	Manufacture composites using different resins
CO5	Understand the manufacture of laminates by different methods

Pre-requisites: Plastic Materials

CO/PO Mapping

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

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

Instructional Strategy:

- It is advised that teachers take steps to student's attention and boost their curiosity to learn.

8236242	COMPOSITES TECHNOLOGY	L	T	P	C
PRACTICUM		1	0	4	3

- Implement task-based learning activities where students work on specific tasks or projects.
- Incorporate technology tools and resources to enhance engagement and provide additional learning opportunities.
- All demonstrations / Hand-on practices may be followed in the real environment as far as possible.

Syllabus contents :

UNIT I	RESIN AND REINFORCEMENT MATERIALS			
Chapter 1.1 Basic concept of fiber reinforced plastics – Comparison of fiber reinforced plastics and metals – Resins used, unsaturated polyester resin, vinyl ester resins and epoxy resins Chapter 1.2 Fibre Reinforcements – Glass fibre and its types, carbon, aramid, natural fibres and Ceramic Fibers Chapter 1.3 Miscellaneous additives used, catalyst, accelerator, fillers, pigments and mould release agents				5
UNIT II	FABRICATION OF MOULDS, PROCESSING AND POST PROCESSING METHODS			
Chapter 2.1 Basic concept of fabrication of moulds for fiber reinforced plastics – Selection of mould materials Chapter 2.2 Processing method of fiber reinforced plastics – Hand lay up – Spray up – Vacuum bag – Pressure bag – Compression moulding – Injection moulding – Auto clave moulding – Centrifugal casting – Filament winding – Pultrusion – Matched die moulding and resin transfer moulding. Chapter 2.3 Post processing methods – Cutting – Trimming – Machining – Joining – Filling - grinding – buffing – drilling – turning and slitting				5
UNIT III	APPLICATIONS & TESTING OF COMPOSITES			
Chapter 3.1 Applications of FRP – Household applications -- Building and Construction applications - Land transportation applications – Automobile applications - Rail transport applications- Marine applications – Aero space applications – Medical applications				5
Contents: Practical				
1. Preparation of moulding compound (any one) 2. Preparation of Glass fiber reinforced thermoset laminate 3. Preparation of Natural fiber reinforced thermoset laminate 4. Preparation of thermoset laminate using particulate filler 5. Preparation of Thermoplastic Composites 6. Preparation of adhesives for composites 7. Manufacture of a simple FRP product by Hand lay-up technique (UPE / Epoxy resin) 8. Determination of Tensile strength and Hardness of manufactured product				60
Total Periods				75

8236242	COMPOSITES TECHNOLOGY	L	T	P	C
PRACTICUM		1	0	4	3

Suggested List of Students Activity:

Activity 1: Study the different equipments available in laboratory to prepare composites

Activity 2: Four students can be grouped as a batch to collect information about the various composite materials

Activity 3: List the various composites used in medical applications.

Text Books and Reference Books:

1. L.Holloway - Composite materials – Elsevier, Amsterdam, 1966.
2. Gibbs & Cox – Marine Design Manual for FRP- McGraw Hill Book Co. – 1960.
3. P.Ghosh – Fiber science and technology – Tata McGraw Hill, New Delhi, 2004
4. Geoffery Pritchard – Reinforced Plastics Durability – Wood head Publilshing – 2000.
5. R.H.Sonneborn - Fiberglass Reinforced Plastics – Reinhold, New York, 1954
6. R.T.Schwartz & N.S. Schwartz - Fundamental aspects of FRP composites – Wiley, 1968

Web based references

1. https://testing_of_composite.com
2. https://mechanical_properties_of_composites.com
3. https://hand_layup_process.com
4. https://composite_resins.com

SCHEME OF EVALUATION**Model practical examination and End practical examination****Note:**

- All the exercises should be given in the question paper and students are allowed to select by lot
- Record of work done should be submitted for the examination with a Bonafide Certificate.

Part	Description	Marks
A	Aim & Apparatus Required	5
B	Procedure	20
C	Product and Finishing	45
D	Result	5
E	Theory Questions (10×2 Marks Covering all Units)	20
F	Viva voce	5
Total Marks		100

8236242	COMPOSITES TECHNOLOGY	L	T	P	C
PRACTICUM		1	0	4	3

Equipment / Facilities required for to conduct the Practical.

S.No	Name of the Equipment	Quantity Required Nos
1.	Universal Testing Machine	1
2.	Rockwell Hardness Testing Machine	1
3.	Air Circulating Oven	1
4.	Mechanical Stirrer-	1.
5.	Analytical Balance	1
6.	Rollers for hand layup process	1
7.	Hot air gun	1
8.	Chemicals, Glassware and fibres	1

C236249	NANO AND SOLAR ENGINEERING	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

Nano and Solar Engineering is an emerging field in engineering. The Nano technology has a wide field of application. The ideas on nano particle synthesis, characterization and applications upgrade the diploma technicians to shine in the emerging field of Nano technology.

Solar engineering concepts in the field of energy production, supply and installation of equipments creates lots of opportunities for diploma technicians. This elective Course creates an avenue to shine in the technological field.

Course Objectives:

The objective of this course is to enable the student

- To understand the basics of Nano technology.
- To synthesis the Nano particles.
- To understand the application of Nano Material.
- To understand Solar cell technology.
- To understand the various components in the solar power generation and distribution systems.
- To provide training to the technicians capable of working and willing to work on solar energy systems.

Course Outcomes:

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

CO1: Understand the basics of Nano technology - properties, behavior and materials.

CO2: Acquire knowledge about synthesis, characterization and applications of Nano Material.

CO3: Acquire knowledge on Solar energy and understand the various types of solar cells.

CO4: Acquire knowledge about the various components of solar Modules.

CO5: Able to understand the various types of solar system.

Pre-Requisites: Nil

CO/PO Mapping:

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

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

Instructional Strategy:

- 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.

C236249	NANO AND SOLAR ENGINEERING	L	T	P	C
PRACTICUM		1	0	4	3

- Incorporate formative and summative assessments to gauge student progress and provide targeted feedback.
- 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 may be followed in the real environment as far as possible.

Syllabus Contents:

UNIT I	NANO ENGINEERING	Periods
Chapter 1.1	Nano technology-Properties of materials- Top-Down approach Methods- Ball Milling- Bottom-Up approach Methods-Sol-gel processing- Spin Coating Method, Dip Coating Method. Characterization of Nano Particles- Spectroscopic reflectometer, PV Characteristics of Nano Thin Films using 4 probe methods. Application of Nano Technology.	8
Practical Experiments:	<ol style="list-style-type: none"> 1. Preparation of Nano particles using Ball Mill. 2. Synthesis of Nano thin film on one side of substrate by Spin coating method. 3. Synthesis of Nano thin film on two sides of substrate by Dip coating method. 4. Measurement of Nano film thickness using Spectroscopic reflectometer. 5. Measurement of VI Characteristics of Nano film. 6. Comparison of Hydrophobic Characteristics of Natural and Synthetic Nano Materials. 	36
UNIT II	SOLAR ENGINEERING	
Chapter 2.1	Solar energy- Advantages of solar energy- Types of Solar cells - Solar Modules - Blocking Diode - By-pass Diode - Solar Array - Isolation Diode. TYPES OF SOLAR SYSTEM-Stand alone PV system - Grid connected PV System - Hybrid solar PVsystem.	7
Practical Experiments:	<ol style="list-style-type: none"> 7. I-V and P-V Characteristics of series connection of PV modules. 8. I-V and P-V Characteristics of parallel connection of PV modules. 9. Effect of Shading on the output of Solar panel. 10. Working of diode as blocking diode. 	24
Total Periods		75

Suggested List of Students Activity:

1. Measurement of Solar Radiation using Solarimeter and Lux Meter.
2. I-V and P-V Characteristics of PV module with varying radiation.
3. Effect of variation in tilt angle on PV module power.
4. Power flow calculation of standalone PV system of AC load with battery.
5. Power flow calculation of standalone PV system of DC load with battery.
6. Find the MPP manually by varying the resistive load across the PV panel.

C236249	NANO AND SOLAR ENGINEERING	L	T	P	C
PRACTICUM		1	0	4	3

Text Books and Reference Books:

1. "Nano Technology" – N.Arumugam, SaraS Publication.
2. Pradeep.T, Fundamentals of Nanoscience and Nanotechnology, Mc GrawHill,2012.
3. 3. Sukhatme .S.P, Nayak .J.K, "Solar Energy", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4. Unit III to Unit V *Training Manual For Engineers on Solar PV System* published by Government of Nepal, Ministry of Environment, Science and Technology.
5. Solar photovoltaic systems technical training manual by Herbert A Wade UNESCO publishing.
6. C.P.Poole, Jr. Frank J.Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
7. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital PublishingCompany).
8. K.K. Chattopadhyay and A.N. Banerjee, Introduction to Nanoscience & Technology(PHI Learning Private Limited).
9. Chetan Singh Solanki., *Solar Photovoltaic: "Fundamentals, Technologies and Application"*, PHI Learning Pvt., Ltd., 2009.
10. John R. Balfour, Michael L. Shaw, Sharlave Jarosek., "Introduction to Photovoltaics", Jones & Bartlett Publishers, Burlington, 2011.
11. R. S. Sedha, "A Textbook of Electronic Circuits", S. Chand & Company Ltd.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Practical Examination

Note:

- All the exercises should be given in the question paper and students are allowed to select by a lot.
- Record of work done should be submitted for the examination with a bonafied certificate.

Part	Description	Marks
A	Aim & Apparatus Required	10
B	Procedure	35
C	Observation/Calculation	20
D	Result	10
E	Multiple Choice Question 20x1 Mark Covering all units	20
F	Viva-voce	5
Total Marks		100

C236249	NANO AND SOLAR ENGINEERING	L	T	P	C
PRACTICUM		1	0	4	3

Equipments / Facilities required to conduct the Practical

S. No.	Name of the Machine / Equipment / Instrument	Quantity Required Nos
1	Muffle Furnace	1
2	Magnetic Stirrer	1
3	Ultra Sonicator	1
4	Spin Coating Machine	1
5	Dipping Machine	1
6	Spectroscopic Reflectometer	1
7	Four Probe Method	1
8	Contact Angle Meter	1
9	Digital Weighing Machine	1
10	Double Distillation Water Still	1
11	Ball Mill	1
12	Solar panel PV training system	1
13	Solar Panel 100W(Mono – 1, Poly – 2)	3
14	Battery-12V	1
15	DC Voltmeter	2
16	DC Ammeter	2
17	AC / DC Digital tong tester	2
18	Rheostat	1

8236390	IN - HOUSE PROJECT	P	C
PROJECT / INTERNSHIP		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 six students**, and the viva voce by an external examiner

Course Objectives

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

- **Integration of Knowledge:** Consolidate and integrate theoretical knowledge acquired in coursework to solve practical engineering problems.
- **Skill Development:** Enhance technical skills related to the specific field of engineering through hands-on experience and application.
- **Problem-Solving Abilities:** Develop critical thinking and problem-solving abilities by addressing complex engineering issues within a defined scope
- **Project Management:** Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.
- **Teamwork and Collaboration:** Foster 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.

8236390	IN - HOUSE PROJECT	P	C
PROJECT / INTERNSHIP		540	12

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.

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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 six 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.

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- 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.

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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 Marks (40 Marks)*		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 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 coordinator as an internal examiner.

End Semester (100 Marks)#		
Report Submission (30 Marks)	Demo (50 Marks)	Viva voce (20 Marks)

The marks scored will be converted to 60 Marks.

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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

Course 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.

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Course Outcomes

CO 1: Demonstrate improved skills.

CO 2: Exhibit increased professional behavior.

CO 3: Apply theoretical knowledge and principles in real-world practices.

CO 4: Develop and utilize assessment tools to evaluate the learning and practices.

CO 5: Engage in reflective practice to continually improve their learning and professional growth.

Facilitating the Interns by an Internship Provider.

Orient intern in the new workplace. Give interns an overview of the organization, Explain the intern's duties and introduce him or her to co-workers.

Develop an internship job description with clear deliverables and timeline.

Allow the interns in meetings and provide information, resources, and 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.

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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 reports in the form of a 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 8th Week and 15th Week. The total marks (50 + 50) scored shall be converted to 40 marks for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Ability to solve practical problems. Sense of responsibility	10
D	Self expression / communication skills. Interpersonal skills / Human Relation.	10
E	Report and Presentation.	10
Total		50

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End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Principal and Chairman awards Committee after the completion of internship period (Dec - May). The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		100

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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.

Course 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.

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- 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.

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- **Innovative Thinking:** Select a project that encourages creativity and innovative problem-solving. Projects that push the boundaries of traditional engineering approaches can be particularly rewarding.
- **Societal Impact:** Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

Guidelines to select Fellowship

- Ensure the program is accredited by a recognized accrediting body and has a strong reputation for quality education in engineering.
- Ensure it covers core engineering principles that align with your interests and career goals.
- Investigate the qualifications and experience of the faculty mentor. Look for programs with faculty who have strong academic backgrounds, industry experience, and active involvement in research.
- Check if the program provides adequate hands-on training opportunities, such as laboratory work, workshops, and access to modern engineering facilities and equipment.
- Assess the program's connections with industry. Strong partnerships with companies can lead to valuable internship opportunities, industry projects, and exposure to real-world engineering challenges.
- Explore the availability of research opportunities. Participation in research projects can enhance your learning experience and open doors to innovative career paths.
- Look for programs that offer professional development resources, such as workshops, seminars, and networking events with industry professionals and alumni.
- Ensure the program provides robust support services, including academic advising, career counseling, mentorship programs, and assistance with job placement after graduation.
- Consider the cost of the program and available financial aid options, such as scholarships, grants, and fellowships. Evaluate the return on investment in terms of career prospects and potential earnings.
- Research the success of the program's alumni. High employment rates and successful careers of past graduates can indicate the program's effectiveness in preparing students for the engineering field.

Duties Responsibilities of the Faculty Mentor

Each student should have a faculty mentor for the Institute.

- Get the approval from the Chairman Board of Examinations with the recommendations of the HOD/Principal for the topics.
- Provide comprehensive academic advising to help fellows select appropriate specializations, and research projects that align with their interests and career goals.
- Guide fellows through their research projects, offering expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful 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.

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- 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.

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- **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. Review I & II.

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.

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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.

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INTERNAL MARKS - 40 Marks

As per the rubrics each topic should be considered for the Review I and Review II. 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 30 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 Principal and Chairman Awards Committee 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