DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus III to IV Semester

Outcome Based Education

(Academic Year 2024-2025)

Department of Mechanical Engineering

3rd & 4th Semester B.E

ABOUT THE INSTITUTE

Dayananda Sagar Academy of Technology and Management- DSATM was established in 2011 with 5 UG Programmes and 1 PG Program, the programmes are approved by All India Council for Technical Education (AICTE) New Delhi, Affiliated to Visvesvaraya Technological University (VTU), Belagavi and DSATM is an autonomous institute from 2023-2024.

The Dayananda Sagar Institutions is one of pioneer institutions in India and abroad with six decades of excellence in Academic and Research. The newer campuses were necessary to accommodate the growing need of the technology and innovation.

DSATM nurtures the students in academic, research, sports, cultural and extracurricular activities.

- Creating an academic environment to nurture and develop competent entrepreneurs, leaders and professionals who are socially sensitive and environmentally conscious.
- Integration of Outcome Based Education and cognitive teaching and learning strategies to enhance learning effectiveness.
- Developing necessary infrastructure to cater to the changing needs of Business and Society.
- Optimum utilization of the infrastructure and resources to achieve excellence in all areas of relevance.
- Adopting learning beyond curriculum through outbound activities and creative assignments.
- Imparting contemporary and emerging techno-managerial skills to keep pace with the changing global trends.
- Facilitating greater Industry-Institute Interaction for skill development and employability enhancement.
- Establishing systems and processes to facilitate research, innovation and entrepreneurship for holistic development of students.
- Implementation of Quality Assurance System in all Institutional processes.

VISION OF THE INSTITUTE

To strive at creating the institution a center of highest caliber of learning, so as to create an overall intellectual atmosphere with each deriving strength from the other to be the best of engineers, scientists with management & design skills.

MISSION OF THE INSTITUTE

- To serve its region, state, the nation and globally by preparing students to make meaningful contributions in an increasing complex global society challenge.
- To encourage, reflection on and evaluation of emerging needs and priorities with state-of-the-art infrastructure at institution.
- To support research and services establishing enhancements in technical, economic, human and cultural development.
- To establish interdisciplinary centre of excellence, supporting/ promoting student's implementation.
- To increase the number of Doctorate holders to promote research culture on campus.
- To establish IIPC, IPR, EDC, innovation cells with functional MOU's supporting student's quality growth.

QUALITY POLICY

Dayananda Sagar Academy of Technology and Management aims at achieving academic excellence through continuous improvement in all spheres of Technical and Management education. In pursuit of excellence cutting – edge and contemporary skills are imparted to the utmost satisfaction of the students and the concerned stakeholders.

ABOUT THE DEPARTMENT

The Department of Mechanical Engineering was established in the year 2011 to impart high quality mechanical skills to the blooming engineers of DSATM under the umbrella of "Dayananda Sagar Institutions". The Department is committed to well-being and all-round development of its students and faculty. Research and Development center was established in the year 2016 which offers Ph.D. program Affiliated to VTU, Belagavi, facilitating research and consultancy works. The strength of the department lies in its highly qualified and experienced teaching faculty besides its supportive and excellent non-teaching staff, with state-of-the-art laboratory facilities. The department is engaged in sponsored research, consultancy and testing in the areas of advanced material's development, processing, design, and their characterization and has a dedicated platform called MAKER SPACE where the students can execute their innovative ideas. The focus of our curriculum to the students is to promote technical competence, problem solving skills and innovation of new technologies like such as advanced composites, 3D Printing.

VISION OF THE DEPARTMENT

To endeavor the best quality of teaching and learning in advanced fields of mechanical engineering to cater the industrial demands and social needs.

MISSION OF THE DEPARTMENT

M1: To provide the students with an academic environment of excellence, leadership, ethical guidelines for a successful career.

M2: To empower the students with personality development programs for advancement in their professional career.

M3: To impart practical oriented educational programs for the students which tend to promote the intellectual pursuit.

M4: To develop alliances with industry and alumni for excellence in teaching, research, and consultancy practices.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

PEO 1:	The graduates will be able to apply practical knowledge and career-based objectives to survive in advanced technological world
PEO 2:	The graduates are acquired with additional knowledge on interdisciplinary subjects and skills, leadership qualities to become a successful entrepreneur
PEO 3:	The graduates will be able to pursue their higher studies in specialized areas and advances of mechanical engineering & explore possible profession as an researchers, academicians, or self-employment
PEO 4:	All Graduates are made to undergo to do additional certified courses in the field of advanced technologies and interdisciplinary software's

PROGRAM OUTCOMES (PO's)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's)

ME PSO1	An ability to find out, articulate the local industrial problems and solve with the use of mechanical engineering tools for realistic outcomes.
ME PSO2	Ability to collaborative learning to find out cost-effective, optimal solution for social problems.

PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

Sl.No	Semester	No. of Credits
1	1st Semester	20
2	2nd Semester	20
3	3rd Semester	21
4	4th Semester	21
5	5th Semester	22
6	6th Semester	22
7	7th Semester	20
8	8th Semester	14
	Total	**160**

PROPOSED UG SCHEME

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total	
				L	T	P	S	(Hrs/week)	
1	IPCC-1	ME	ME	3	0	2	0	5	4
2	IPCC-2	ME	ME	3	0	2	0	5	4
3	PCC-1	ME	ME	2	2	0	0	4	3
4	PCC-2	ME	ME	2	2	0	0	4	3
5	ETC	ME	ME	3	0	0	0	3	3
6	PCCL	ME	ME	1	0	2	0	3	2
7	AEC	ME	ME	0	0	0	2	2	1
8	SCR	ME	ME	0	0	2	0	2	1
9	NCMC	NSS / YOGA / PED							
10	AICTE Activity Points								
								Total	**21**

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 3rd & 4th Sem

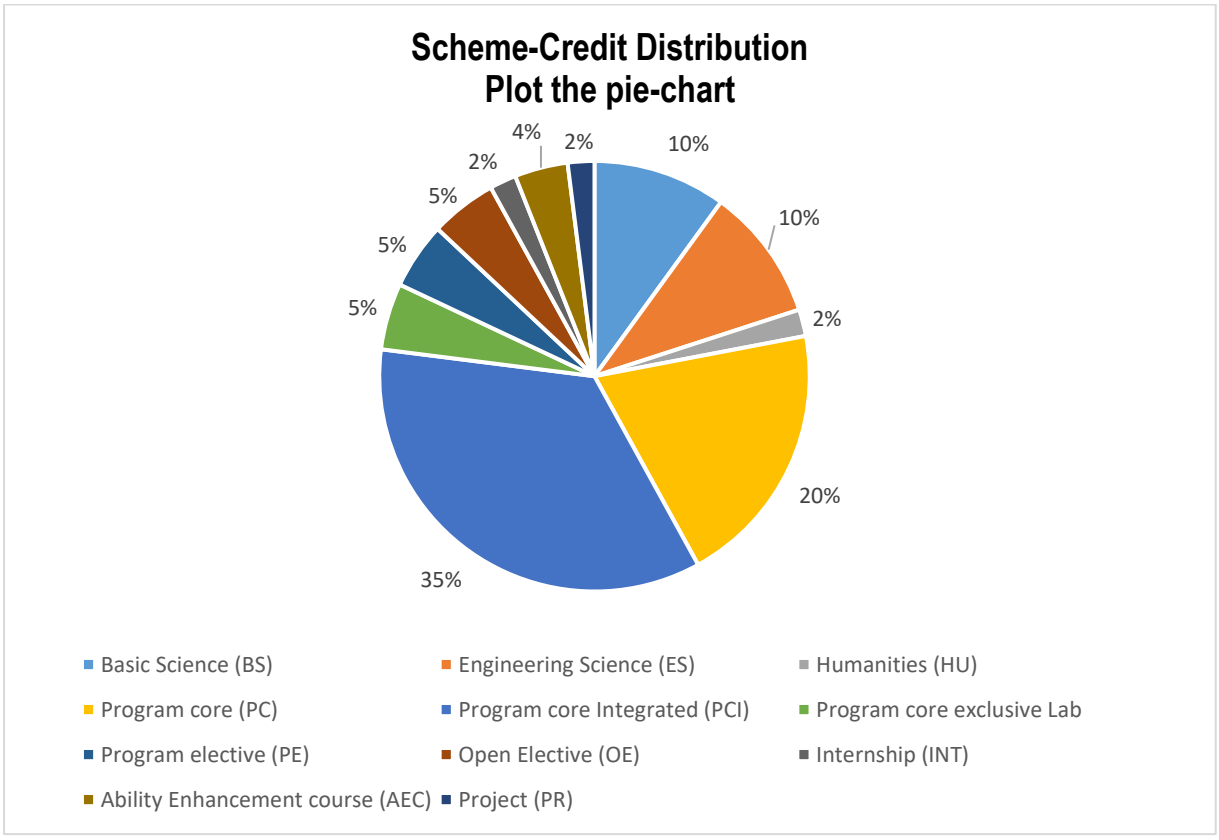
3rd Sem & 4th Sem

Sl. No	Course Category	Component			
		Theory	Practical	Outreach	YOGA/SPORTS
1	IPCC-1	60%	40%	--	--
2	IPCC-2	60%	40%	--	--
3	PCC-1	100%	--	--	--
4	PCC-2	100%	--	--	--
5	ETC	100%	--	--	--
6	PCCL	--	100%	--	--
7	AEC	--	100%	--	--
8	SCR	--	--	100%	--
9	NCMC	--	--	--	100%
	Total Percentage	**46.66%**	**31.11%**	**11.11%**	**11.11%**

Scheme Distribution

Department of Mechanical & Engineering

Course Component	Credits	% of Credits
Basic Science (BS)	16	10
Engineering Science (ES)	16	10
Humanities (HU)	2	2
Program core (PC)	35	20
Program core Integrated (PCI)	55	35
Program core exclusive Lab	8	5
Program elective (PE)	8	5
Open Elective (OE)	8	5
Internship (INT)	4	2
Ability Enhancement course (AEC)	5	4
Project (PR)	4	2
Total	**160**	**100**



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

Course Category	Semester								Total Credits
	1st	2nd	3rd	4th	5th	6th	7th	8th	
Basic Sciences (BSC)	8	8	0	0					
Engineering Sciences (ESC)	3	3	0	0					
Engineering Technological Course (ETC)	3	3	3	3					
Humanities, Social Sciences and Management (HSMC)	2	2	0	0					
Ability Enhancement Course (AEC)	1	1	1	1					
Core Engineering Course (CEC)	3	3	0	0					
Universal Human Values (UHV)	0	0	0	1					
Professional Core Courses (PCC)	0	0	6	6					
Integrated Professional core Course (IPCC)	0	0	8	8					
Professional Core Course Lab (PCCL)	0	0	2	2					
Social Connect and Responsibility (SCR)	0	0	1	0					
Professional Elective Course (PEC)	0	0	0	0					
Institutional Open Elective Courses (IOE)	0	0	0	0					
Internship (INT)	0	0	0	0					
Mini Project / Project Work (PW)	0	0	0	0					
Non-credit Mandatory Courses (NCMC)	0	0	0	0					
Total Credits	20	20	21	21					

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Affiliated to VTU
Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MECH, CIVIL)

Scheme of Teaching and Examinations – 2024
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2024-25)

3rd SEMESTER: Mechanical Engineering (ME)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
1	BME301	Material Science and Engineering	IPCC	ME	ME	3	0	2	0	5	4	3	50	50	100
2	BME302	Measurements and Metrology	IPCC	ME	ME	3	0	2	0	5	4	3	50	50	100
3	BME303	Mechanics of Materials	PCC	ME	ME	2	2	0	0	4	3	3	50	50	100
4	BME304	Thermodynamics	PCC	ME	ME	2	2	0	0	4	3	3	50	50	100
5	BME305	Fundamentals of Mechatronics	ETC	ME	ME	3	0	0	0	3	3	3	50	50	100
6	BME306	Introduction to CAD Modeling	PCCL	ME	ME	1	0	2	0	3	2	3	50	50	100
7	BME307	Intelligent Systems	AEC	ME	ME	0	0	0	2	2	1	3	50	50	100
8	BME308	Social Connect and Responsibility	SCR	ME	ME	0	0	2	0	2	1	1	50	50	100
					Total					28	21				

4th SEMESTER: Mechanical Engineering (ME)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
1	BME401	Metal Casting and Welding	IPCC	ME	ME	3	0	2	0	5	4	3	50	50	100
2	BME402	Fluid Mechanics and Machines	IPCC	ME	ME	3	0	2	0	5	4	3	50	50	100
3	BME403	Theory of Machines	PCC	ME	ME	2	2	0	0	4	3	3	50	50	100
4	BME404	Hydraulics and Pneumatics Systems	PCC	ME	ME	3	0	0	0	3	3	3	50	50	100
5	BME405	Fundamentals of Artificial intelligence	ETC	ME	ME	3	0	0	0	3	3	3	50	50	100
6	BME406	Assembly Modeling	PCCL	ME	ME	1	0	2	0	3	2	3	50	50	100
7	BME407	Machine Learning Using Python	AEC	ME	ME	0	0	0	2	2	1	3	50	50	100
8	BME408	Universal human values course	UHV	ME	ME	1	0	0	0	1	1	1	50	50	100
					Total					26	21				

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PBL: Project Based Learning

AEC: Ability Enhancement Course,

NCMC: Non-Credit Mandatory Course

L: Lecture,

T: Tutorial,

P: Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

Integrated Professional Core Course (IPCC): Refers to Integrated Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Non Credit Mandatory Course (NCMC) - National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Newly introduced subjects in the syllabus

		3rd Semester	4th Semester
1.	**List of Existing Elective Courses**	-	-
2.	**List of New Existing Elective Courses**	-	-
3.	**List of New Industry Aligned Courses**	1) Fundamentals of Mechatronics System 2) Intelligent Systems	1) Fundamentals of Artificial Intelligence 2) Machine Learning using Python

Percentage of Change in the Syllabus

3rd Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	23MEMS31	Material Science and Engineering	Nil	Nil	20%	-
2	23MEMM32	Measurements and Metrology	Measurements	Machining Science	-	Measurements & Metrology and Manufacturing Courses separated
3	23MEME33	Mechanics of Materials	Nil	Nil	-	-
4	23METD34	Thermodynamics	Concepts of Applied Thermodynamics	Nil	-	Combined ATD & BTD
5	23MEMT35	Fundamentals of Mechatronics	Fundamentals of Electro Mechanical Systems	Concepts of Micro Systems	20%	For prerequisites for Micro Systems
6	23MECM36	Introduction to CAD Modeling	2D Drawings Retained	3D Modeling Removed and Included in Next Part	-	For balancing the content
7	23MEIS37	Intelligent Systems	-	Smart Materials	20%	Smart Materials to be included in Further Courses
8	23CCSR38	Social Connect and Responsibility	Nil	Nil	-	-

4th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	23MEMW41	Metal Casting and Welding	Nil	Nil	-	-
2	23MEFM42	Fluid Mechanics and Machines	Concepts of Machines	-	20%	Applications are Included
3	23METM43	Theory of Machines	-	-	-	Shifted from Higher Semester
4	23MEHP44	Hydraulics and Pneumatics Systems	-	-	-	Shifted from Higher Semester
5	23MEAI45	Fundamentals of Artificial intelligence	Nil	Nil	-	Introduction to AI & ML is Split into PBL
6	23MEAM46	Assembly Modeling	3D Modeling Included	2D Drawings Removed	-	For balancing the huge the content
7	23MEML47	Machine Learning Using Python	Nil	Nil	-	Introduction to AI & ML is Split into PBL
8	23CCHV48	Universal human values course	Nil	Nil	-	-

3rd SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours of Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment (CCA) methods.
- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.

	• The students have to answer 5 full questions, selecting one full question from each module. • Marks scored by the student shall be proportionally scaled down to 50 Marks. • The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. • Questions mentioned in the SEE paper may include questions from the practical component. **Continuous and Comprehensive Assessment (CCA):** Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks**. • CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics. • CCA as project-based learning, o CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission. o The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report Total score for CCA is **10 Marks** Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks** **Possible Continuous and Comprehensive Assessment (CCA):** • Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom, • The assessment of these techniques shall be in rubrics. • The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	6	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**10**	4	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**25**	10	Scale down Marks of IAT and CCA to 25

CIE	**Practical**	Conduction of Experiments	Performance-Continuous Evaluation of each experiment	05	15	Average of all Experiments	15	4	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)
			Record	05					
			Observation book	05					
		Practical Test	Write up	15	50	----	05	4	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
						Total CIE Practical	**25**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

- The Minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks – 25) in the Practical component.
- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Note: If few of the 3 Credit Courses are Integrated course type, for such courses the method suggested for 4 Credit IPCC Course shall be followed

3rd Semester

Course-1

IPCC-1

Material Science and Engineering

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd**				
Course Title	**:**	**Material Science and Engineering**				
Course Code	**:**	**BME301**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs (T) + 20 Hrs (P)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Understanding the basic materials and concepts of geometrical crystallography, crystal structure and imperfections in Solids.
2	To study the mechanical properties of metals and to Impart knowledge of various fracture modes of materials.
3	To understand the importance of phase diagrams and the phase transformations.
4	To understand modifications of material properties by heat treatment processes
5	To explore the mechanical properties, composition and applications of ferrous & non-ferrous metal

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module 1: Crystal Structures** Introduction to Engineering materials, Structure of crystalline & Non-crystalline solids, Crystal Geometry, Crystal structure, Coordination number, Atomic packing factors, Numerical. Crystal Imperfections, Types of crystal imperfections, Diffusion in crystal structures, diffusion mechanisms, Fick's laws of diffusion, factors affecting diffusivity, Numerical	8
Pedagogy	**Demonstration, PPT, Video Lectures**	
2	**Module 2: Mechanical Behavior of Materials** Introduction, Concept of Stress-strain, Mechanical properties of materials, Stress-strain behavior of materials, true stress & true strain, Plastic deformation in single crystal, Numerical. Introduction to failure of materials, Modes of failure, Fracture of materials, Fatigue failure of materials, Creep failure of materials, Numerical	8
Pedagogy	**Hands on Sessions, Experimental Learning**	
3	**Module 3: Physical Metallurgy** Introduction, Concept of solidification, mechanisms of solidification, cast metal structure, Solid solutions, Hume-Ruthery's rule. Introduction to phase diagram, Gibbs phase rule, types of phase diagram, Lever rule, Iron-carbon Diagrams, cooling cures, Numerical	8
Pedagogy	**Demonstration, Video Lectures, Case Studies**	
4	**Module 4: Heat Treatment** Introduction to heat treatment, Temperature-Time-Transformation(TTT) diagram, Continuous cooling transformation(CCT) diagrams, Critical cooling rate, Types of heat treatment, Annealing, Normalizing or air quenching, Hardening, Tempering, Surface hardening.	8
Pedagogy	**Demonstration, Hands on Sessions**	
5	**Module 5: Ferrous and Non-Ferrous Materials** Introduction, steel, Carbon steels, Alloy steels, Stainless steel, tool steels. Steel Designation: Cast iron, the light alloys, aluminum alloys, Copper & its alloys, brasses, Copper- zinc, Partial phase diagram, Bronzes. Applications of Ferrous and Non-Ferrous Materials, Advantages and Limitations of Ferrous and Non-Ferrous Materials	8

Pedagogy	Hands on Sessions, Experimental Learning, Case Studies

List of Experiments:

Sl. No.	Experiments/Programs	COs
1	To determine the tensile strength, modulus of elasticity, yield stress, % of elongation and % of reduction in area of Cast Iron, Mild Steel/Brass/ Aluminum using universal material testing machine.	CO4
2	To conduct a wear test on Mild steel/ Cast Iron/Aluminum/ Copper to find the volumetric wear rateand coefficient of friction.	CO4
3	To determine the hardness values of Mild Steel/ Aluminum by Rockwell hardness/Vickers Hardness	CO4
4	To determine the hardness values of Copper/ Brass by Brinell's Hardness testing machine	CO4
5	Study the heat treatment processes (Hardening and tempering) of steel/Aluminum specimens.	CO4
	Open ended Experiments/Programs	
1	Specimen preparation for macro and micro structural examinations and study the macrostructure andmicrostructure of a sample metal/ alloys	CO4
2	To study the crystal structure of a given Cast Iron, Mild steel, Aluminum and Copper/Brass specimens and study the crystal imperfections in a given Cast Iron, Mild steel and Aluminium specimens.	CO4
3	To explore or observe chart for grain shape, size and grain boundaries of ferrous & non-ferrous metal.	CO4
4	Computer Aided Selection of Materials: Application of GRANTA Edu packs for material selection:Case studies based on material properties. **Demonstration**	CO4

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Foundations of Materials Science and Engineering, Smith, McGraw-Hill, 4thEdition, 2009.
2	Material science and Engineering and Introduction, William D.Callister, Wiley, 2006
Reference Books	
1	Materials Science, Shackle ford.,& M.K. Muralidhara, Pearson Publication, 2007

2	Materials Science and Engineering, V. Raghavan, PHI, 2002
3	Elements of Materials Science and H.VanVlack, Addison- Wesley Edn, 1998.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Demonstrate an understanding of the fundamental principles of materials science and engineering	Understand	L2
CO2	Apply principles of materials science to solve the problems related to the structure and mechanical behaviour of various engineering materials	Apply	L3
CO3	Analyze the relationship between the microstructure, properties, and performance of materials, and interpret the given data to understand how different factors influence material behaviour	Analyze	L4
CO4	Evaluate the Mechanical behavior, effects of heat treatment processes, and structural properties of Ferrous and Non-Ferrous materials.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/5nBBUahtz-c
2	https://youtu.be/2rxbxNem1iI?list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ
3	https://youtu.be/a2TKAa-uaTk
4	https://youtu.be/Izhv87GIL4U

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory				Practical
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	
Remember	-	-	-	-	-
Understand	10	10	-	-	-
Apply	20	20	-	-	-
Analyse	20	20	-	-	-
Evaluate	-	-	50	50	50
Create	-	-	-	-	

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

3rd Semester

Course-2

IPCC-2

Measurements and Metrology

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd**				
Course Title	**:**	**Measurements and Metrology**				
Course Code	**:**	**BME302**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs (T) + 20 Hrs (P)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the scope of measurements.
2	Gather knowledge on various systems of measurements.
3	Acquire a basic understanding of metrology.
4	Accomplish the working principle of various measurement and metrology instruments.
5	To provide insights on recent advances in the field of metrology and measurements.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module 1: Standards of Measurement** **Introduction -** Metrology, Standards of Measurement, Standards of length – International Prototype Metre, Imperial Standard Yard, Light wave (Optical) length standard, Metre as of today, subdivision of Standards. **Line standards, end standards and Slip Gauges (Johansson Gauges) or Gauge blocks:** Line standards, end standards, NPL method of deriving end standard from line standard, calibration of end bars, slip gauges, Numericals.	8
Pedagogy	**Demonstration, PPT, Video Lectures**	
2	**Module 2: Limits, Fits, Tolerances and Gauging** **Limits and Fits:** Introduction, concepts of limits and tolerances, specifying tolerances in an assembly, terminology of shaft and hole system, concepts of fits, geometrical tolerances, system of fits, Numericals. **Gauges:** Introduction to gauges, Taylor's principle of gauge design, gauge maker's tolerance, Numericals.	8
Pedagogy	**Hands on Sessions, Experimental Learning**	
3	**Module 3: Comparators and Angular Measurements** **Comparators:** Introduction, mechanical comparators, Optical comparators, electrical and electronic comparators, pneumatic comparators. **Angular measurements:** Introduction, Vernier Bevel protractor (Universal Bevel protractor), optical bevel protractor, Sine bar, Sine centre, angle gauges, numerical problems, Clinometers.	8
Pedagogy	**Demonstration, Video Lectures, Case Studies**	
4	**Module 4: Measurement and Measurement Systems** **Measurement:** Introduction, The Generalized measurement system, measurement terminology, errors in measurement. **Measurement Systems:** Introduction to measurement systems, transducers, types of transducers, intermediate modifying devices, terminating devices.	8
Pedagogy	**Demonstration, Hands on Sessions**	

5	**Module 5: Measurement of Force, Torque, Pressure, Temperature and Strain** **Measurement of Force, Torque and Pressure: Force –** Introduction, measurement of force, torque measurement, pressure measurement, methods of measurement of force, torque and pressure. **Measurement of Temperature and Strain:** Introduction, methods of temperature measurement, thermocouples, introduction to strain measurement, strain gauges, methods of strain measurement.	**8**
Pedagogy	**Hands on Sessions, Experimental Learning, Case Studies**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to unders8tand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Experiments:

Sl. No.	Experiments/Programs	COs
1	Calibration of pressure gauge.	**CO4**
2	Calibration of load cell.	**CO4**
3	Determination of modulus of elasticity of a mild steel specimen using strain gauges.	**CO4**
4	Measurements using optical protractor	**CO4**
5	Measurements using toolmaker's microscope.	**CO4**
6	Measurement of angle using Sine bar/ Sine centre.	**CO4**
Open ended Experiments/Programs		
1	Calibration of LVDT.	**CO4**
2	Calibration of thermocouple.	**CO4**
3	Measurement of screw thread parameters using two-wire and three-wire methods.	**CO4**
4	Measurement of gear tooth profile using gear tooth Vernier/ gear tooth micrometer.	**CO4**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	A Text Book of Engineering Metrology, I C Gupta, Dhanpat Rai Publications, 8th Revised Edition, 2015.

2	Mechanical Measurements and Instrumentation, Er. R K Rajput, Katson Books, S K Kataria & Sons, 2013 Edition
Reference Books	
1	Mechanical Measurements, R S Sirohi and H C Radha Krishna, new age international (P) Ltd. Publishers, 3rd Edition
2	Principles of Engineering Metrology, Rega Rejendra, Jaico Books, 2010 Edition.
3	Text book of Mechanical Measurements and Metrology, Dr. T Chandrashekar, Subhas Stores

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Demonstrate a comprehensive understanding of the fundamental concepts and principles of mechanical measurements and metrology, including measurement techniques, tools, and standards.	Understand	L 2
CO2	Effectively apply measurement and metrology principles to various mechanical systems	Apply	L 3
CO3	Analyze the operational principles and performance characteristics of different measurement and metrology systems	Analyze	L 4
CO4	Critically evaluate the performance metrics and calibration needs of measurement and metrology systems	Evaluate	L 5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc24_me99/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory				Practical
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	
Remember	-	-	-	-	-
Understand	10	10	-	-	-
Apply	20	20	-	-	-
Analyse	20	20	-	-	-
Evaluate	-	-	50	50	50
Create	-	-	-	-	

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

3rd Semester

Course-3

PCC-1

Mechanics of Materials

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3rd**				
Course Title	:	**Mechanics of Materials**				
Course Code	:	**BME303**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ME**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**2:2:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs (T)**		**SEE Duration**	:	**3 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To provide a fundamental understanding of the basic concepts and principles of strength of materials.
2	To develop the ability to calculate stresses and deformations of objects subjected to external loads.
3	To enable the application of strength of materials knowledge in solving engineering applications and design challenges.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module 1: Simple stress and strain Bars simple and compound** **Simple stress and strain**: Definition/derivation of normal stress, shear stress, and normal strain and shear strain – Stress strain diagram for brittle and ductile materials, Generalised Hook's law. **Bars:** Deformation of simple and compound bars, Elastic constants – relationship between elastic constants, Poisson's ratio & volumetric strain.	8
Pedagogy	**Problem solving Techniques, PPT, Video Lectures**	
2	**Module 2: Bi-axial Stress system & Thick and Thin cylinders** **Bi-axial Stress system**: Introduction, plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, graphical method - Mohr's circle for plane stress. **Thick and Thin cylinders**: Stresses in thin cylinders, Lame's equation for thick cylinders subjected to internal and external pressures, Changes in dimensions of cylinder (diameter, length and volume), and simple numerical.	8
Pedagogy	**Problem solving Techniques , PPT ,Simulation, Video Lectures**	
3	**Module 3: Bending moment and Shear forces in beams** **Bending moment and Shear forces in beams:** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads and combination of these loads – Point of contra flexure.	8
Pedagogy	**Problem solving Techniques , PPT, Simulation, Video Lectures**	
4	**Module 4: Theory of simple bending & Design of simple beam sections** **Theory of simple bending** – Assumptions – Derivation of bending equation - Neutral axis Determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T and Channel sections **Design of simple beam sections**, Shear Stresses in I, and T sections.	8
Pedagogy	**Problem solving Techniques, PPT, Simulation, Video Lectures.**	
5	**Module 5: Torsion of circular shafts &Theory of columns** **Torsion of circular shafts**: Introduction, pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts, power transmitted by solid and hollow circular shafts. **Theory of columns** – Long column and short column - Euler's formula – Rankine's formula	8

	Problem solving Techniques ,Hands on Sessions, Simulation, Video Lectures

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Strength of Materials, Bhavikatti S.S ,Publisher: Vikas Publishing House,4th Edition, ISBN:978-9325971578,2018
2	Mechanics of Materials, S.I. Units, Ferdinand Beer & Russell Johnstan, 7th Ed, TATA ,McGrawHill-2014
Reference Books	
1	Strength of Materials, R.K. Bansal ,Laxmi Publications,, ISBN: 78-93-517-0119-9, 2010.
2	Strength of Materials, U. C. Jindal, 1st Edition, Pearson Publications, ISBN: 978-8131759097,2012

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the behavior and properties of engineering materials under different loading conditions	Understand	L2
CO2	Apply the principles of mechanics to determine the various types of stresses and strains developed in members subjected to axial, bending, shear, torsion, and thermal loads for various applications in mechanical engineering.	Apply	L3
CO3	Analyze the behavior, stress, and strain leading to the failure of structures or materials.	Analyze	L4
CO4	Evaluate the stresses developed in different load-carrying structural and mechanical elements.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=GkFgysZC4Vc&list=PL27C4A6AEA552F9E6 (NPTEL)
2	https://static-archives.git-pages.mst.edu/mdsolids/(Practical based learning :Use Mdsolids)

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	10	10	-	-
Apply	20	20	-	-
Analyse	20	20	-	-
Evaluate	-	-	50	50
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

3rd Semester

Course-4

PCC-2

Thermodynamics

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd**				
Course Title	**:**	**Thermodynamics**				
Course Code	**:**	**BME304**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**2:2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs (T)**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the concepts of thermodynamic system and its equilibrium
2	State and apply the governing laws of thermodynamics to various Engineering processes
3	Analyze different concepts and principles of the pure substances and entropy, real & ideal gases
4	Accomplish the concepts of air standard, gas and vapour power cycles used in prime movers, refrigeration & psychometrics
5	To provide insights on recent **Advancements in Thermal Engineering.**

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module: 01 Introduction and Review of fundamental concepts:** **Zeroth law of thermodynamics**, Temperature; concepts, scales, international fixed points and measurement of temperature. Constant volume gas thermometer, constant pressure gas thermometer, mercury in glass thermometer, **Numericals.** **Work and Heat:** Mechanics, definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions for displacement work in various processes through p-v diagrams. **Numericals.**	08
Pedagogy	**Chalk & Talk, PPT, Video Lectures**	
2	**Module 2: First Law of Thermodynamics: Concepts on closed system, Problems related to First law of thermodynamics for closed system & Extension of first law to Control volume: Steady flow energy equation Numericals.** **Second law of thermodynamics: Introduction concepts, Kelvin - Planck statement & Clausius Statement of the Second law of Thermodynamics; PMMK II, Equivalence of two statements, Carnot cycle, Numericals. Entropy: Clausius Inequality statement proof, Entropy Definition, A property change of entropy, Entropy as quantitative test for irreversibility, Principle of increase in entropy, Entropy as a co-ordinate. Numericals.**	08
Pedagogy	**Chalk & Talk, PPT, Video Lectures**	
3	**Module: 03 Pure Substances:** P-T diagrams, triple point & critical points. Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and H-S diagrams, representation of various processes on these diagrams. Steam table & its use, Throttling Calorimeter, Separating & Throttling Calorimeter, **Numericals**. **Ideal Gases:** Ideal gases: Ideal gas mixtures, Daltons law of partial pressures, Amagat's law of additive volumes, evaluation of properties of perfect and ideal gases, Air- Water mixtures and related **Real gases –** Introduction, Van-der Waal's Equation of state, Van-der Waal's constants in terms of critical properties, Beattie-Bridgeman equation, Law of corresponding states, compressibility factor; compressibility chart.	08
Pedagogy	**Chalk & Talk, PPT, Video Lecture**	
4	**Module 4: Air standard and Gas power cycles:** Otto, Diesel, Dual and cycles, p-v and T -s diagrams, description, efficiencies. Comparison of Otto and Diesel cycles. Gas turbine (Brayton) cycle; description and analysis. Regenerative, Intercooling and reheating in gas turbine cycles	08

	IC engines: Combustion of SI engine and CI engine, Detonation, Performance analysis of I.C Engines, Heat balance, Morse test.	
Pedagogy	**Chalk & Talk, PPT, Case studies**	
5	**Module 5:** **Refrigeration Cycles:** Vapour compression refrigeration system; description, analysis, COP, Refrigerants and their desirable properties, alternate Refrigerants. Vapour absorption refrigeration system. **Psychometrics and Air-conditioning Systems:** Psychometric properties of Air. Psychometric Chart, Analyzing Air-conditioning Processes; Heating, Cooling, Dehumidification and Humidification.	**08**
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Basic and Applied Thermodynamics P.K.Nag, Tata McGraw Hill 2nd Ed., 2002.
2	Basic Engineering Thermodynamics A.Venkatesh Universities Press, 2008.
Reference Books	
1	Basic Thermodynamics, B.K Venkanna, Swati B. Wadavadagi PHI, New Delhi 2010.
2	Thermodynamics- An Engineer an Engineering Approach, Yunus A Cengel and Michael A Boles, Tata McGraw Hill 2nd Ed., 2002.
	I.C. Engines, M.L. Mathur & Sharma. Dhanpat Rai& sons-India

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamental principles and laws of thermodynamics, including concepts such as energy, work, heat, entropy, and the different thermodynamic cycles.	Understand	L2
CO2	Apply thermodynamic principles to solve practical engineering problems, including the analysis of energy systems, refrigeration cycles, and heat engines to optimize performance and efficiency.	Apply	L3
CO3	Analyze complex thermodynamic systems and processes, interpreting data and system behavior using thermodynamic models and equations.	Analyze	L4
CO4	Evaluate the performance and effectiveness of various thermodynamic systems and technologies, considering factors such as energy efficiency, environmental impact, and economic feasibility	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_me28/preview
2	https://archive.nptel.ac.in/courses/112/107/112107219/
3	https://nptel.ac.in/courses/112101098
4	https://onlinecourses.nptel.ac.in/noc21_me76/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	10	10	-	-
Apply	20	20	-	-
Analyse	20	20	-	-
Evaluate	-	-	50	50
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

EMERGING TECHNOLOGY COURSE (ETC)

ETC Course – Emerging Technology Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Emerging Technology Course (ETC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Emerging Technology Course (ETC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

3rd Semester

Course-5

ETC-1

Fundamentals of Mechatronics

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd**				
Course Title	**:**	**Fundamentals of Mechatronics**				
Course Code	**:**	**BME305**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**ETC**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs (T)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**03**				

Course Learning Objectives: Students will learn about:

Sl. No	Course Objectives
1	key elements of Mechatronics system, representation into block diagram
2	Principles of sensors, its characteristics, interfacing with DAQ microcontroller
3	Concepts of PLC system and its ladder programming, and significance of PLC systems in industrial application
4	The system modeling and analysis in time domain and frequency domain.
5	Control actions such as Proportional, derivative, and integral and study its significance in industrial applications

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module 1: Mechatronics systems** Introduction to Mechatronics, Elements of mechatronics system, Evolution of Mechatronics, Design process of Mechatronics system, Modelling of a Mechatronics System, Measurement System. Control systems, Open- and Closed-loop System, analogue and digital control systems, sequential controllers, programmable logic controllers, case studies on mechatronics and microprocessor-based applications	8
Pedagogy	**Demonstration, PPT, Video Lectures**	
2	**Module 2: Signal Conditioning** Introduction to Signal conditioning, Signal Conditioning processes, The operational amplifier, Protection, Filtering, Wheatstone bridge, Pulse modulation. Introduction to Digital Signals, comparison between analog and digital signals, Digital-to-analogue and Analogue to digital converters, and Data Acquisition, Digital Signal Processing	8
Pedagogy	**Hands on Sessions, Experimental Learning**	
3	**Module 3: Transducers and Sensors** Introduction to Transducers, Performance terminology, static and dynamic characteristics of Transducers. Introduction to Sensors, classifications, displacement, position and proximity sensors, velocity and motion sensors, force sensor, fluid pressure sensors, Temperature sensors, Light Sensors, selection of sensors	8
Pedagogy	**Demonstration, Video Lectures**	
4	**Module 4: Actuation Systems** Introduction to Mechanical actuation system, kinematic chains, Cams, Gears, Introduction to hydraulic and pneumatic actuation systems, directional control valves, pressure control valves, Cylinders. Introduction to electrical actuation systems, Switching devices, Solenoid-type devices, Drive systems	8
Pedagogy	**Demonstration, Hands on Sessions**	
5	**Module 5: Microprocessors** Introduction to Digital Logic, Boolean algebra, De morgan theorem, Digital Logic Gates, Logic gate networks, Logic Functions, Truth Table. Introduction to Microprocessor Systems, Evolution of Microprocessor, Internal architecture of a microprocessor, Microcontrollers, Programming, Programmable Logic Controllers	8
Pedagogy	**Hands on Sessions, Experimental Learning**	

Textbooks

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Mechatronics - Principles Concepts and Applications, Nitaigour Premchand Mahalik, McGraw Hill Education, July 2017 Edition.
2	Mechatronics–Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Pearson Education, 7th Edition, 2018.
Reference Books	
1	Mechatronics, HMT Ltd., Mc Graw Hill, July 2017 Edition. ISBN:978007 4636435
2	Mechatronics: Integrated Mechanical Electronic Systems, K.P. Ramachandran, G.K. Vijayaraghavan, M.S. Balasundaram, Wiley India Pvt. Ltd., New Delhi, 2008.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Develop a thorough understanding of the core principles of mechatronics, including the integration of mechanical engineering, electronics, control systems, and computer science.	Understand	L2
CO2	Apply mechatronic principles to design and implement integrated systems that combine mechanical components with electronic control and computational elements for effective automation and smart systems.	Apply	L3
CO3	Analyze the performance and functionality of mechatronic systems consisting mechanical, electronic, and software components, and issues related to system integration and operation.	Analyze	L3
CO4	Evaluate the efficiency and effectiveness of mechatronic systems and solutions, considering factors such as performance, reliability, and cost, and propose improvements to enhance system capabilities and functionality.	Evaluate	L4

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4												3		

Weblinks and Video Lectures (e-Resources)	
1	https://archive.nptel.ac.in/courses/112/107/112107298
2	https://archive.nptel.ac.in/courses/112/101/112101304/
3	http://engineering.nyu.edu/mechatronics/smart/html/resources/onlineResources.html

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	10	10	50	50
Apply	20	20	-	-
Analyse	20	20	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

PROFESSIONAL CORE COURSE LABORATORY (PCCL)

PCCL Course - Professional Core Course Laboratory

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course Laboratory (PCCL)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course Laboratory (PCCL) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

3rd Semester

Course-6

PCCL-1

Introduction to CAD Modelling

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd**				
Course Title	**:**	**Introduction to CAD Modelling**				
Course Code	**:**	**BME306**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Practical**				
Category	**:**	**PCCL**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L: T:P:S)	**:**	**1:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**10Hrs (T) + 20Hrs (P)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**02**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To equip students with the knowledge to explain the terminology and sectional views of different thread forms and fasteners.
2	To develop students' skills in applying orthographic projection techniques to produce accurate 2D representations, adhering to hidden line conventions and line precedence rules.
3	To enable students to analyze given solids and draw sectional views of solids using CAD software.
4	To guide students in designing suitable riveted joints for various engineering scenarios.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

COURSE CURRICULUM		
Module No.	**Topics**	**Hours**
1	**Introduction:** Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.	**1**
Pedagogy		
2	**Thread Forms:** Thread terminology, sectional views of threads. ISO Metric (Internal & External), BSW (Internal & External) square and Acme. Sellers thread, American Standard thread. **Fasteners:** Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.	**6**
Pedagogy		
3	**Orthography:** Conversion of pictorial views into orthographic projections of simple machine parts (with and without section). Hidden line conventions. Precedence of lines.	**4**
Pedagogy		
4	**Sections of Solids:** Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.	**9**
Pedagogy		
5	**Rivets:** Types-Types of riveted joints-Draw the sectional front view and top view of-single riveted lap joint, double riveted lap joint with chain riveting and zigzag riveting. Draw the sectional front view and top view of-single riveted butt joint with single and double cover plate -double riveted butt joint with chain riveting and zigzag riveting with double cover plate.	**10**
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Machine drawing, -K.R. Gopala Krishna Subhas Publishers, Bangalore

Reference Books	
1	Machine Drawing- N.D.Bhatt, Charotar Publication, Anand
2	Machine Drawing-Sidheshwar-Tata McGraw Hill
3	Production Drawing-L.K.Narayanan,P.Kannaich,- New Age International Publication

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the terminology and sectional views of different thread forms and fasteners.	Understand	L2
CO2	Apply orthographic projection techniques to produce accurate 2D representations, adhering to hidden line conventions and line precedence rules.	Apply	L3
CO3	Analyze the given solids and draw sectional views of solids using CAD software.	Analyze	L4
CO4	Design a suitable rivetted joint for a given scenario.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4			3											

Weblinks and Video Lectures (e-Resources)	
1	MIT Open Course Ware - Technical Drawing
2	Engineering Drawing and Sketching - Engineering.com
3	NPTEL - Engineering Drawing
4	Coursera - Introduction to Engineering Drawing

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand				
Apply	50			
Analyse		50		
Evaluate				
Create			50	50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-3	Module-4	Module-5		
CO1								
CO2		50					50	50%
CO3				50			50	50%
CO4								
CO5								
Total		50		50			100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (20% Theory+80% Practical Questions)
Remember	-
Understand	20
Apply	25
Analyse	25
Evaluate	-
Create	30

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	20					20	20%
CO2		25				25	25%
CO3			25			25	25%
CO4				30	30	30	30%
CO5							
Total							

ABILITY ENHANCEMENT COURSE (AEC)

AEC- Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:0:2
Total Hours of Pedagogy	20 hours – Project
Credits:	01
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

	CIE		**SEE**	
	Project Weekly Assessment		**Final Project Evaluation**	
Project	**Project Understanding**	05 Marks	**Write up**	10 Marks
	Technical Competence	10 Marks	**Presentation & Demonstration**	50 Marks
	Innovation	10 Marks	**Project report**	25 Marks
	Problem Solving	15 Marks	**Viva-Voce**	15 Marks
	Project Demonstration	10 Marks	**Total**	**100 Marks**
Total		**50 Marks**	**100 Marks Reduced to 50 Marks**	

1. Introduction

Project Based Learning is a model for classroom activity that shifts away from the classroom practices of short, isolated, teacher-centered lessons and instead emphasizes learning activities that are long-term, interdisciplinary, and student-centered.

A systematic teaching method that engages students in learning essential knowledge and life-enhancing skills through an extended, student-influenced inquiry process structured around complex, authentic questions and carefully designed products and tasks.

Project learning, also known as project-based learning, is a dynamic approach to teaching, in which students explore real-world problems and challenges, simultaneously developing cross-curriculum skills while working in small collaborative groups.

2. Characteristics of Project-Based Learning:

- Students making decisions within a framework
- A problem or challenge to be solved;
- Students designing the process for reaching a solution
- Students gathering and managing information
- Continuous Evaluation
- Students regularly reflecting on the process
- A final product to be evaluated for quality
- An atmosphere that tolerates error and change

3. Purpose

- Introducing project-based learning on the curriculum.
- To help students to gain in-depth knowledge of the subject via project.
- During this process, students will be able to learn and understand the various stages of project development.

4. Objectives

- Introducing mini project based on the curriculum.
- Develop in depth knowledge of the topic and technology.
- Use critical thinking skills and make real world connections
- Demonstrate and understand through products.
- Industry and concept-oriented learning.

5. Why Incorporate PBL?

- Promotes collaboration and interaction
- Learners communicate meaningfully and for authentic purposes
- Allows students with a variety of learning styles to demonstrate their acquired knowledge
- Students learn language, content, and skills simultaneously
- Increases learner autonomy
- Provides opportunities for students to pursue their own interests and questions and make decisions about how they will find answers and solve problems.
- Improves education for all students Facilitates student integration of the content of different subjects
- Teaches children to use their own minds well and applies what they learn in school to life-long endeavors.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

6. Benefits of PBL

- Offers multiple ways for students to participate and to demonstrate their knowledge.
- Accommodates different kinds of intelligences.
- Shifts students away from doing only what they typically do in a classroom Environment.

- Encourages the mastery of technological tools, thus preparing them for the workforce.
- Serves as a medium for students who don't usually participate.
- Prompts students to collaborate while at the same time support self-directed learning.
- Offers a learning experience that draws on the thinking and shared efforts of several individuals.
- Helps students develop a variety of social skills relating to group work and negotiation.
- Promotes the internalization of concepts, values, and modes of thought, especially those related to cooperation and conflict resolution.
- Establishes a supportive and non-competitive climate for students.
- Provides a means for transferring the responsibility for learning from teachers to students.
- Calls upon students to explain or defend their position to others in their project groups, so that learning is more apt to be personalized and valued.

7. Process

- Project batches will be formed after the commencement of 3rd semester.
- The Students Batch Comprising of 4 members in a batch should be formed by the Project Based Learning co-ordinator.
- Each Semester consists of 16 Weeks of Project based Learning.
- The Level of the Projects to be identified.

  Level 1- 2nd Year – 3rd Semester & 4th Semester

  Level 2- 3rd year – 5th Semester & 6th Semester

  Level 3 – Final Year Project
- The Faculty handling the respective Theory Subject will be the PBL Coordinator and all the three Batches to be handled by the PBL Coordinator with additional faculty.
- The List of Project Batches to be identified by the faculty assigned in consultation with HOD.
- The batch can select any topic from the list circulated by the PBL Coordinator
- The details of students Interaction with the guide shall be maintained by the guide in the prescribed format.
- The Students Project should be continuously evaluated and PBL Coordinator should submit weekly report to the HOD.
- The Rubrics for the PBL should be followed.
- The Students batches shall give the presentation on understanding of the topic and plan for implementation.
- The Evaluation of the Projects is done in Two Phases

7.1 Two phases for Assessment

Phase 1:

1. Phase 1 is for 4 weeks

2. During this phase, the students shall discuss about the Objectives, Literature Survey and plan for project execution.

Phase 2:

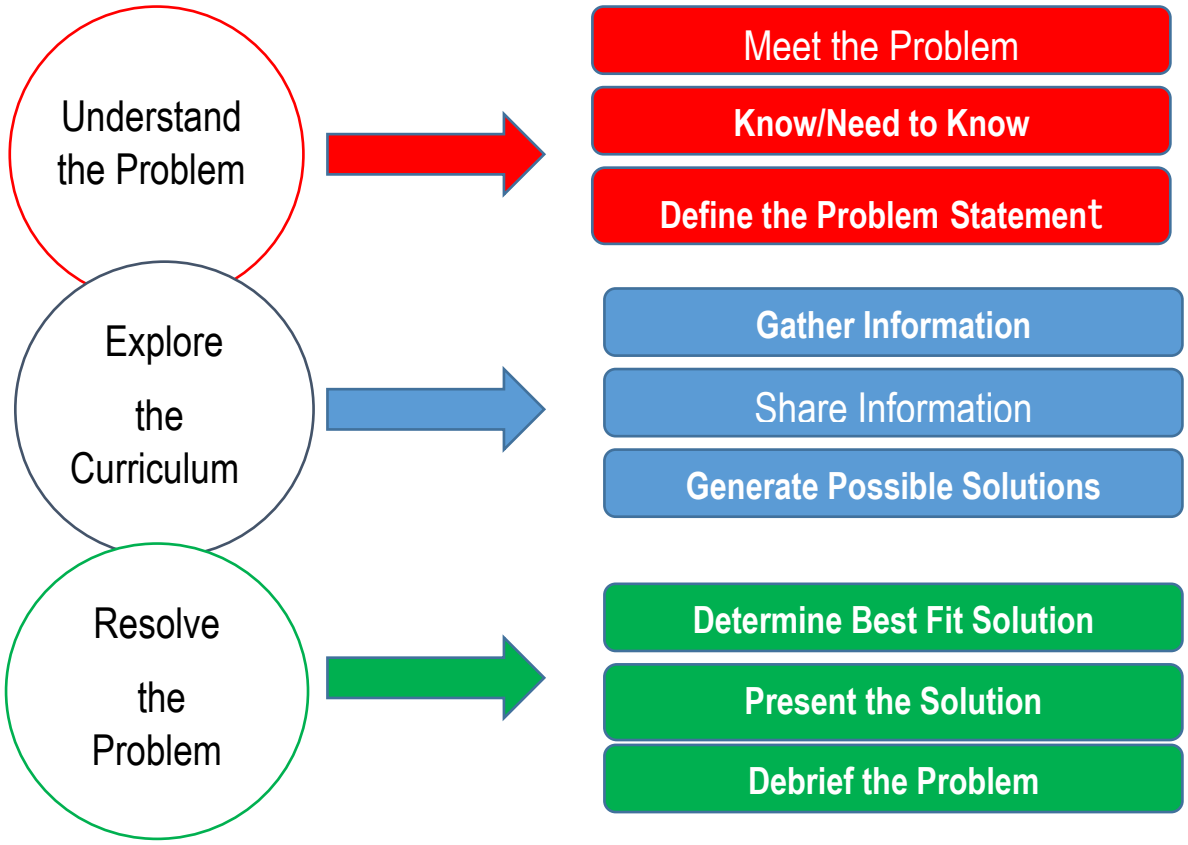
1. Phase 2 is for 11 Weeks

2. During this phase, the students shall carry out the project under regular supervision of the guide/subject expert, Implementation and give final presentation/demonstration with project documents.

The marks distribution for PBL Work:

1. Phase 1 – 25 Marks
2. Phase 2 – 25 Marks

8. PBL Teaching and Learning Template



9. Practice

- Every week 3 hour is exclusively dedicated to Project Based Learning.
- Assess their progress until they resolve the problem and summarise their learning.
- Provide opportunities for in-depth investigations of worthy topics.
- Allow learners to become more autonomous as they construct personally-meaningful artefacts that are representations of their learning.
- Motivate students by engaging them in their own learning. PBL affords students opportunities for development.
- Building communication, technical and management skills.

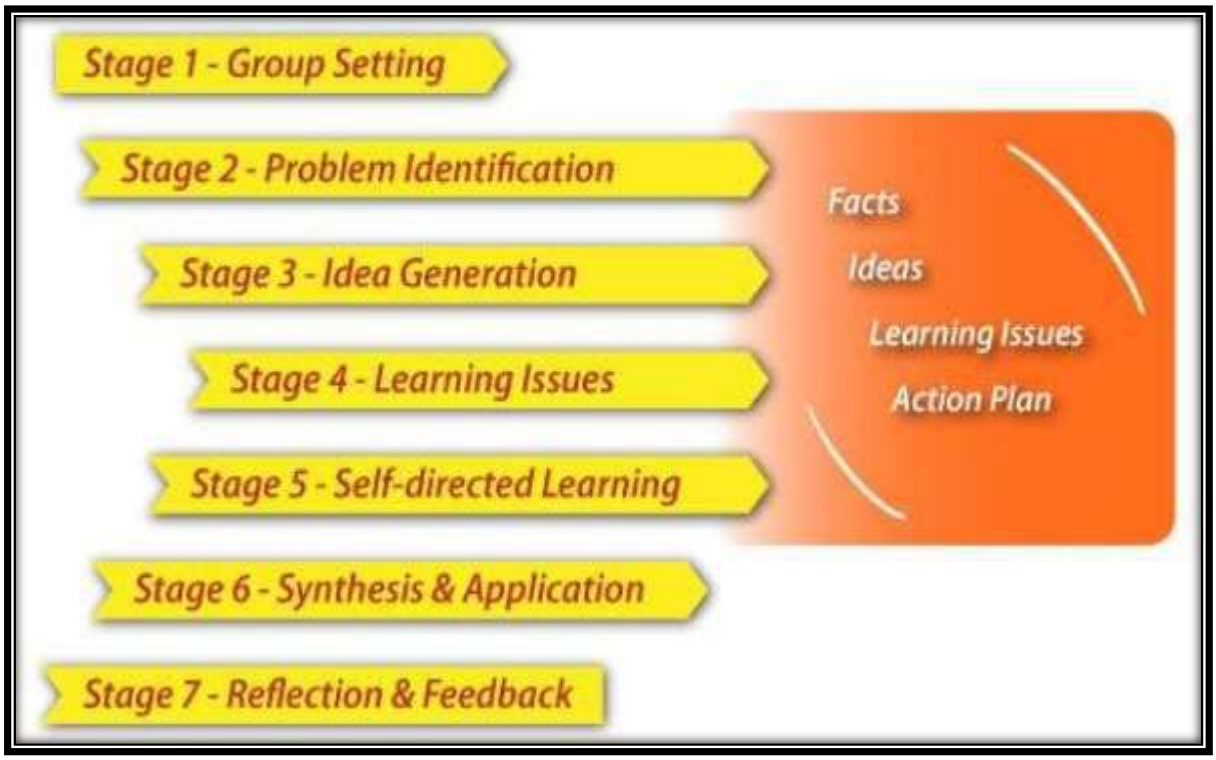
10. Obstacles/Gaps

- Lack of student's interest
- Lack of assessment
- Lack of Basic knowledge
- Lack of consistence attendance and monitoring.
- Lack of abundant time allotment and time management

11. How to Overcome?

- Periodic process – stage wise assessment has to be done.
- Basic Knowledge- A complete guidelines and videos will be provided by the faculty who is handling the respective subject and allotted guide.
- Regular evaluation and periodic monitoring is done by 2 stages.
- For Successful execution and demonstration of end-to-end system, exclusive 3hr/week project time is allotted.

12. Block diagram of PBL



13. Impact Analysis

- It encourages students to draw on their own creativity on problem solving and they learn the bridge gap between theory and practice.
- Final products resulting from project-based learning can be shared with the department at large, thus fostering ownership and technically strong with the subject scenario.

14. AEC – Guidelines

The guidelines are for successful completion of the project and to facilitate effective and uniform conduction of projects by the students. It is expected that these guidelines will help in overall improvement in the quality of the project.

14.1 Main phases of the project

Sl.No	Topics	Duration
Phase-1		
1.	Understanding of the project and preparing a project plan	**3 Weeks**
2.	Literature review	**1 Week**
3.	Planning	**1 Week**
Phase-2		
4.	Analysis and Design	**3 Weeks**
5.	Implementation	**6 Weeks**
6.	Testing	**1 Week**
7.	Writing the project report	**1 Week**
	Total	**16 Weeks**

14.2 Final Presentation Structure

1. Title of the project & Batch Information
2. Agenda / Topics
3. Problem Statement / Project Definition
4. Background / Literature Review
5. Methodology
6. Analysis and Design
7. Implementation
8. Testing
9. Conclusion and Scope for Future Works

14.3 Project Based Learning Report Structure

1. Cover Page
2. Certificate
3. Declaration
4. Acknowledgement
5. Table of Contents
6. List of Tables
7. List of Figures
8. Introduction
9. Background / Literature Review
10. Methodology / Solution
11. Analysis and Design
12. Implementation
13. Results
14. Conclusion and Future Works
15. Bibliography / References
16. Appendices

15. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom – 0.75".
- The total number of reports to be prepared are
    - One copy to the department.
    - One copy to the concerned guide
    - One copy to the candidate.
- Before taking the final printout, the approval of the concerned guide is mandatory and suggested corrections, if any, must be incorporated in the Final Report.
- For making copies dry tone Xerox is suggested.
- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

16. Outcome of the project

- Students will gain the knowledge and understand
- To think creatively, work collaboratively.
- Solve complex problems using digital technology.
- Students learn and desire to engage continuous gain about knowledge such as design, analysis, development, implementation and testing.
- Strong written communication skills and the ability to write technical documents that include specification, design, and implementation of a mini project.

3rd Semester

Course-7

AEC-1

Intelligent Systems

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3rd**				
Course Title	:	**Intelligent Systems**				
Course Code	:	**BME307**				
Course Type (Theory/ Practical/ Integrated)	:	**Project Based Learning**				
Category	:	**AEC**				
Stream	:	**ME**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**0:0:0:2**		**SEE**	:	**50 Marks**
Total Hours	:	**20 Hrs (P)**		**SEE Duration**	:	**3 Hours**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Gain a comprehensive understanding of the fundamental principles of intelligent systems, including their definitions, components, and applications
2	Learn to apply problem-solving techniques and algorithms commonly used in intelligent systems to address real world challenges.
3	Learn to design and develop intelligent systems capable of autonomous decision-making and adaptive behaviour in dynamic environments.
4	Work individually or collaboratively on projects to design, develop, and test intelligent systems, fostering teamwork and project management skills.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Arduino Microcontroller**- Overview of Arduino platform and its applications, Understanding Arduino boards and components, Setting up the Arduino Integrated Development Environment (IDE), Interfacing LEDs, Working with resistors and breadboards.	4
Pedagogy	**Hands-on Exercises using Arduino Kit or Simulation using Thinkercad, Video demonstration**	
2	**Ultrasonic Sensors**- Introduction to Ultrasonic Sensors, Principles of ultrasonic distance measurement, Types of ultrasonic sensors and their applications, Setting up and interfacing ultrasonic sensors with Arduino, Ultrasonic Sensors Programming -Writing code to read sensor data.	4
Pedagogy	**Hands-on Exercises using Arduino Kit or Simulation using Thinkercad, Video demonstration**	
3	**Infrared Sensors-** Introduction to Infrared Sensors, Principles of infrared sensing and detection,Types of infrared sensors: Active vs. passive, Interfacing infrared sensors with Arduino, Infrared Sensor Programming -Writing code to read sensor data.	4
Pedagogy	**Hands-on Exercises using Arduino Kit ,Simulation using Thinkercad, Video demonstration**	
4	**Servomotor- Introduction to Servomotors-**Principles of servomotor operation**,**Types of servomotors: Positional vs. continuous rotation**,**Interfacing servomotors with Arduino, Servomotor Programming- Writing code to control servomotor position and speed.	4
Pedagogy	**Hands-on Exercises using Arduino Kit ,Simulation using Thinkercad, Video demonstration**	
5	**Temperature Sensors-**Introduction to Temperature Sensors, Principles of temperature measurement, Types of temperature sensors: Thermistors, thermocouples, and digital sensors, Interfacing temperature sensors with Arduino, Temperature Sensor Programming**-** Writing code to read sensor data.	4
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications	

	• **Demonstration:** exhibits the implementation process

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Programming Arduino: Getting Started with Sketches, Simon Monk, McGraw Hill TAB, 2nd Edition, 2016
2	Arduino Workshop: A Hands-On Introduction with 65 Projects, John Boxall, No Starch Press,US, 2nd Edition,2013.
Reference Books	
1	Arduino Programming in 24 Hours, Sams Teach Yourself, Blum Richard, Sams Publishing, 2014
2	Automation Essentials using Arduino: Learn, Build and Innovate by Dr.Abhinav, Dr.S.Bhargavi, Dr.Manjunath K.V, Shashwat Publication, ISBN: 978-93 -6087-58-0, 1st Edition, 2024.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand various methods of knowledge representation in the development of intelligent systems.	Understand	L2
CO2	Apply the fundamental concepts and principles of intelligent systems to real world problems using appropriate programming languages	Apply	L3
CO3	Design and develop intelligent prototype/full scale intelligent systems capable of autonomous decision-making and adaptive behavior. Also, cultivate innovative thinking and creativity in designing and implementing intelligent systems.	Create	L6
CO4	Present and communicate the Design and Development process effectively	Understand	L2

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3			3											
CO4										3				

Weblinks and Video Lectures (e-Resources)	
1	https://www.arduino.cc/education/remotelearning/
2	https://www.tinkercad.com/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	Review-1	Review-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	20	20	-	-
Apply	30	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	30	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Review-1			Review-2				
CO1		20					20	20%
CO2		30					30	30%
CO3					30		30	30%
CO4					20		20	20%
CO5							-	-
Total		50			50		100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	-
Understand	40
Apply	20
Analyse	-
Evaluate	-
Create	40

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	-	-	-	-	-	20	20%
CO2	-	-	-	-	-	-	20	20%
CO3	-	-	-	-	-	-	40	40%
CO4	-	-	-	-	-	-	20	20%
CO5	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	100	100%

SOCIAL CONNECT
&
RESPONSIBILITY (SCR)

SCR- Social Connect & Responsibility

Teaching Hours/Week (L: T: P: S)	0:0:0:2
Total Hours of Pedagogy	40 hour Practical Session +15 hour Planning
Credits:	01
Programs / Experiments	12
CIE Marks	100
SEE Marks	------
Total Marks	100
Exam Hours	3
Examination nature (SEE)	No SEE only CIE For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept.

3rd Semester

Course-8

SCR-1

Social Connect and Responsibility

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3rd**				
Course Title	:	**Social Connect and Responsibility**				
Course Code	:	**BME308**				
Course Type (Theory/ Practical/ Integrated)	:	**Outreach**				
Category	:	**SCR**				
Stream	:	**Common**		**CIE**	:	**50 Marks**
Teaching hours/ week (L: T:P:S)	:	**0:0:0:2**		**SEE**	:	**50 Marks**
Total Hours	:	**30 Hrs**		**SEE Duration**	:	**100 Marks**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Provide a formal platform for students to communicate and connect to the surrounding.
2	create a responsible connection with the society.
3	Understand the community in general in which they work.
4	Identify the needs and problems of the community and involve them in problem –solving.
5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

Teaching-Learning Process

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
- State the need for activities and its present relevance in the society and Provide real-life examples.
- Support and guide the students for self-planned activities.
- You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
- Encourage the students for group work to improve their creative and analytical skills

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Contents:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.

The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Module No.	Topics	Hours
1	**Part I:** **Plantation and adoption of a tree:** Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.	
Pedagogy		
2	**Part II :** **Heritage walk and crafts corner:** Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives,Visit, case study, report, outcomes.	
Pedagogy		
3	**Part III :** **Organic farming and waste management:** Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus –Objectives,Visit, case study, report, outcomes.	
Pedagogy		
4	**Part IV:** **Water conservation:** Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.	
Pedagogy		

5	**Part V :** **Food walk:** City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study,report, outcomes.	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	
2	
Reference Books	
1	
2	

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Communicate and connect to the surrounding.		
CO2	Create a responsible connection with the society.		
CO3	Involve in the community in general in which they work.		
CO4	Notice the needs and problems of the community and involve them in problem –solving.		
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge		

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersionwith NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

Duration :

A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per guidelines of scheme & syllabus.

Continuous Internal Evaluation (CIE):

- After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period.
- The report should be signed by the mentor.
- The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50.
- Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing
- Considering all above points allotting the marks as mentioned below

Excellent	: 80 to 100
Good	: 60 to 79
Satisfactory	: 40 to 59
Unsatisfactory and fail: <39	

Pedagogy – Guidelines:

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl.No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc.…	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…..	Site selection /proper consultation/Contin uous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc.…	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers / campus etc…..	Site selection / proper consultation/Contin uous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
5.	Food walk: Practices in societ	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Governme nt Schemes officers/ campus etc…	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty

1 Credit Course – Practical + Planning

Assessment Details (both CIE and SEE)

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Plan of Action (Execution of Activities)	
Sl.No	**Practice Session Description**
1.	Lecture session in field to start activities
2.	Students Presentation on Ideas
3.	Commencement of activity and its progress
4.	Execution of Activity
5.	Execution of Activity
6.	Execution of Activity
7.	Execution of Activity
8.	Case study-based Assessment, Individual performance
9.	Sector/ Team wise study and its consolidation
10.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	**CIE – 100%**	• Implementation strategies of the project (NSS work). • The last report should be signed by NSS Officer, the HOD and principal. • At last report should be evaluated by the NSS officer of the institute.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study-based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5 = 25	25 Marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks	
Total marks for the course in each semester	100 Marks	
For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.		

Course - Skills Mapping Table

Sl.No	Name of the Course	Course Type	Course Category	Skills attained by the students
1	Material Science and Engineering	Theory + Practical	IPCC	Analyze the structure of Materials and suggest for an application
2	Measurements and Metrology	Theory + Practical	IPCC	Apply the skills of Metrology and Measurements in Engineering
3	Mechanics of Materials	Theory	PCC	Evaluate the Mechanical Properties of Materials
4	Thermodynamics	Theory	PCC	Analyze the Thermodynamic Systems
6	Fundamentals of Mechatronics	Theory	ETC	Apply the design concepts of Mechatronics systems
7	Introduction to CAD Modeling	Practical	PCCL	Design the 2D CAD Drawings
8	Intelligent Systems	Project Based Learning	AEC	Develop the Intelligent Systems
9	Social Connect and Responsibility	Outreach	SCR	Contribute to the Societal Development Activities

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Affiliated to VTU
Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MECH, CV)

Student - Skills Mapping Table

Sl.No	Name of the Student	USN	3rd Semester				4th Semester			
			Skill-1	Skill-2	Skill-3	Skill-4	Skill-1	Skill-2	Skill-3	Skill-4
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

4th SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment (CCA) methods.
- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.

	• Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks). • The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC. **The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).** **Continuous Internal Evaluation (CIE) for the practical component of the IPCC** • On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day. • The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks. • The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.** • The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce. Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks. • Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks. • The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC. **Semester End Examination (SEE) for IPCC Theory** SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours) • The question paper will have ten questions. Each question is set for 20 marks. • The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.** • There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.

	• The students have to answer 5 full questions, selecting one full question from each module. • Marks scored by the student shall be proportionally scaled down to 50 Marks. • The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. • Questions mentioned in the SEE paper may include questions from the practical component. **Continuous and Comprehensive Assessment (CCA):** Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks**. • CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics. • CCA as project-based learning, o CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission. o The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report Total score for CCA is **10 Marks** Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks** **Possible Continuous and Comprehensive Assessment (CCA):** • Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom, • The assessment of these techniques shall be in rubrics. • The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	6	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**10**	4	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**25**	10	Scale down Marks of IAT and CCA to 25

CIE	**Practical**	Conduction of Experiments	Performance-Continuous Evaluation of each experiment	05	15	Average of all Experiments	15	4	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)
			Record	05					
			Observation book	05					
		Practical Test	Write up	15	50	----	05	4	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
						Total CIE Practical	**25**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

- The Minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks – 25) in the Practical component.
- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Note: If few of the 3 Credit Courses are Integrated course type, for such courses the method suggested for 4 Credit IPCC Course shall be followed

4th Semester

Course-1

IPCC-1

Metal Casting and Welding

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th**				
Course Title	**:**	**Metal Casting and Welding**				
Course Code	**:**	**BME401**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs (T) + 20 Hrs (P)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understanding Fundamental Concepts involved in metal casting and welding processes
2	Gain the knowledge on Material Selection and Properties
3	Practical Skills and Applications
4	Design and analyze metal casting and welding processes
5	Problem-solving skills in metal casting and welding

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	. **Module-1 Introduction to Casting process** Introduction to manufacturing process, classification of manufacturing process, casting process, sand casting. Patterns, pattern allowances, Sand moulding, types of sand moulds, cores, concept of gating System. Definition and functions of the riser. Types of risers and their application	8
Pedagogy	**Demonstration, PPT, Experimental Learning**	
2	. **Module 2: Metal Mould Casting** Introduction to Metallic mould, gravity die casting, Pressure die casting, continuous casting, centrifugal casting, centrifuge casting. Procedural steps and applications of Squeeze casting, Slush casting, Thixo casting important moulding process: Sweep mould, CO_2 mould, shell mould, investment mould, plaster mould, cement bonded mould.	8
Pedagogy	**Demonstration, PPT. Video Lectures**	
3	**Module 3:** Melting Technology and Casting Defects Introduction to Melting furnaces, classification, working principle of gas fired, pit furnace, resistance furnace, electric arc furnace, cupola furnace. Solidification of molten metal, solidification variables, degasification in liquid metals, fettling of casting, casting defects.	8
Pedagogy	**Demonstration, Video Lectures, Case Studies**	
4	**Module 4: Joining Processes** Introduction to joining process, welding process, Classification of welding processes Arc welding, TIG welding, MIG welding, Solid State welding. Resistance welding, friction welding, Laser welding, EBM & other special welding process. Brazing, Soldering Principle of Operation, advantages, Limitations and application	8
Pedagogy	**Demonstration, Experimental Learning, Video Lectures**	
5	**Module 5 Metallurgical aspects and Welding Defects** Formation of different zones in welding, structure of welds, HAZ, shrinkage in welds, residual stress, effect of carbon content on the structure and properties of steel,	8

	Welding defects, Concept of distortion, Types of distortion causes and remedies for weld defects, testing and inspection of welding	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments	COs
1	Preparation of sand specimens and conduction of the following tests: Compression, Shear and Tensile tests on Universal Sand Testing Machine.	CO4
2	To determine permeability number for green sand	CO4
3	To determine AFS fineness no. and distribution coefficient of given sand sample.	CO4
4	To determine clay and moisture content on mould sand	CO4
5	Foundry Practice: Preparation of green sand molds using two molding boxes (hand cut molds).	
6	Foundry Practice: Preparation of green sand molds using patterns (Single piece pattern and Split pattern).	CO4
7	Use of Arc welding tools and welding equipment Preparation of welded joints using Arc Welding equipment L-Joint, T-Joint, Butt joint, Lap joints on M.S. flats	CO4
Open ended Experiments		
1	To study the defects of Welded components using Non-destructive tests like: a) Ultrasonic flaw detection b) Magnetic crack detection c) Dye penetration testing	CO4
2	Demonstration of material flow and solidification simulation using Auto-Cast software	CO4

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Principles of foundry technology, P L Jain, Tata McGraw Hill,4th edition, 2006
2	Metallurgical Modelling of Welding, Grong O. The Institute of Materials — 2nd Edition, 1997
Reference Books	
1	Manufacturing process, H.N Gupta, New Age International Publisher, Second,2009

2	Manufacturing process, H.S. Shan, Cambridge University Press, India, Second,2017
3	Manufacturing Engineering and Technology Serope Kalpakjian and Steven R. Schmid Prentice Hall, 7th Edition, 2013

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Demonstrate a comprehensive understanding of the fundamental principles and techniques of metal casting and welding, including process parameters, and the impact of various methods on metal quality	Understand	L2
CO2	Apply casting and welding techniques to design and fabricate metal components, utilizing appropriate materials, tools, and methods to achieve desired mechanical properties and structural integrity	Apply	L3
CO3	Analyze the working principles and performance of Casting and Welding Techniques, quality of cast and welded components, identifying and diagnosing issues such as defects, residual stresses, and thermal distortions, and understanding their impact on the final product.	Analyze	L4
CO4	Evaluate the performance parameters of Metal casting and Welding Processes such as sand formulation, mold design, and welding techniques to enhance the overall quality and efficiency of the manufacturing process	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://archive.nptel.ac.in/courses/112/107/112107083/
2	http://www.astm.org/DIGITAL_LIBRARY/JOURNALS/COMPTECH/PAGES/CTR10654J.htm
3	https://archive.nptel.ac.in/courses/112/103/112103263/
4	https://onlinecourses.nptel.ac.in/noc23_me48/preview
5	MOOCs: http://nptel.ac.in/courses/112105126/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory				Practical
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	
Remember	-	-	-	-	-
Understand	10	10	-	-	-
Apply	20	20	-	-	-
Analyse	20	20	-	-	-
Evaluate	-	-	50	50	50
Create	-	-	-	-	

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

4th Semester

Course-2

IPCC-2

Fluid Mechanics and Machines

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th**				
Course Title	**:**	**Fluid Mechanics and Machines**				
Course Code	**:**	**BME402**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs (T) + 20 Hrs (P)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To apply hydrostatic law, principle of mass and momentum in fluid flows, concepts in Euler's and Bernoulli equations.
2	To provide fundamental knowledge of fluids, its properties and behaviour under various conditions of internal and external flows.
3	To determine the losses in a flow system, flow through pipes, boundary layer concepts.
4	To familiarize the student with the various pumps and turbines.
5	To train students practically with the procedures in Flow and Hydraulic Machines.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	. **Fluid Statics and Buoyancy** **Definition of fluid**, Concept of continuum, Fluid properties, Rheological classification, Pascal's Law and Hydrostatic pressure and its measurement -Manometry. **Hydrostatic forces on Plane**, Inclined and Curved surfaces, Buoyancy, Condition of Equilibrium for Submerged and Floating Bodies, Centre of Buoyancy.	8
Pedagogy	**Demonstration, PPT, Video Lectures**	
2	. **Fluid Kinematics & Dynamics** **Description of fluid motion** – Lagrangian and Eulerian approach, Types of flows, Control volume, Material derivative and acceleration, Streamlines, Path lines and Streak lines, Stream function and velocity potential function, The Reynolds transport theorem. **The continuity equation**, The Euler and Bernoulli equations – venturi meter, orifice meter, Pitot tube, Momentum equation and its application – forces on pipe bends, moment of momentum, The Navier–Stokes Equations.	8
Pedagogy	**Hands on Sessions, Experimental Learning**	
3	**Viscous Flow in pipes & Dimensional Analysis** General Characteristics of pipe flow, Fully-developed laminar flow, Hagen Poiseuille equation, Turbulent flow, Darcy–Weisbach equation, Moody chart, major and minor losses, Multiple pipe systems **Dimensional homogeneity**, Rayleigh's method, Buckingham π theorem, non-dimensional numbers, Model laws and distorted models, Modelling and similitude.	8
Pedagogy	**Demonstration, Video Lectures, Case Studies**	
4	**Boundary layer flow & CFD** **Boundary layers**, Laminar flow and turbulent flow, Boundary layer thickness, Momentum integral equation, Drag and lift, Separation of boundary layer, Methods of preventing the boundary layer separation. **Introduction to CFD**: Necessity, limitations, philosophy behind CFD, applications.	8
Pedagogy	**Demonstration, Hands on Sessions**	
5	**Hydraulic Machines : Pumps & Turbines** **Introduction** - Centrifugal pumps – Work done - Head developed - Pump output and Efficiencies - priming - minimum starting speed - performance of multistage pumps - Cavitation - methods of prevention - Pump characteristics.	8

	Classification of hydraulic turbines - Pelton wheel - Francis turbine - Kaplan and Propeller turbines - - Specific speed - Theory of draft tube - Governing - Performance characteristics - Selection of turbines.	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	COs
1	Measurement of pressure using different Manometers for high- and low-pressure measurements (manometers using different manometric fluids).	CO4
2	Working principle of different flow meters and their calibration (orifice plate, venture meter, turbine, Rota meter, electromagnetic flow meter)	CO4
3	Determination of head loss in pipes and pipe fittings having different diameters	CO4
4	Impact of jet on flat and curved plates	CO4
5	Determination of drag and lift co-efficients of standard objects using wind tunnel.	CO4
6	Use any CFD package to study the flow over aerofoil/cylinder	CO4
7	To study the performance of a centrifugal pump.	CO4
8	Study the performance of a Pelton Turbine.	CO4
9	Study the performance of a Reciprocating Pump	CO4
10	Study the performance of a Francis Turbine	CO4
Open ended Experiments/Programs		
1		

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Fluid Mechanics-Fundamentals & Applications by Yunus A Cengel and John A Cimbala, 4th Edition, Tata McGraw Hill.
2	Fluid Mechanics and Fluid Machines, S K Som, Gautam Biswas, Suman Chakraborty, 3rd edition, Mc Graw Hill Education.
Reference Books	
1	A text book of Fluid Mechanics and Hydraulic Machines by Dr. R K Bansal, Laxmi Publications (P) Ltd,

2	Fluid Mechanics, Hydraulics and Fluid Machines by Ramamrutham, Dhanpat Rai Publications.
3	A Text Book of Fluid Mechanics and Hydraulic Machines by R K Rajput, S.Chand Publications, Multicolor Edition
4	Fluid mechanics and Turbo machines by Das, PHI

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the of fundamental principles in fluid mechanics and the operation of fluid machines, including concepts such as fluid properties, flow dynamics, and energy transfer.	Understand	L2
CO2	Apply fluid mechanics principles to fluid systems and machines, including pumps, turbines, and hydraulic systems, ensuring they meet specific performance and efficiency criteria	Apply	L3
CO3	Analyze the fluid flow problems and the performance of fluid machines using theoretical models, experimental data, and modern tools to identify key factors affecting system behavior and efficiency.	Analyze	L4
CO4	Evaluate the performance of fluid systems and machines by assessing their operational effectiveness, efficiency, and reliability	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Web links and Video Lectures (e-Resources)	
1	http://nptel.ac.in/courses/112104118/
2	http://nptel.ac.in/courses/112105171/
3	http://www.mooc-list.com/course/fluid-mechanics-saylororg
4	https://legacy.saylor.org/me201/Unit01/
5	https://nptel.ac.in/courses/112/105/112105269/
6	https://nptel.ac.in/courses/112/105/112105183/
7	http://nptel.ac.in/courses/112106200/
8	http://nptel.ac.in/courses/112106200/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory				Practical
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	
Remember	-	-	-	-	-
Understand	10	10	-	-	-
Apply	20	20	-	-	-
Analyse	20	20	-	-	-
Evaluate	-	-	50	50	50
Create	-	-	-	-	

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

4th Semester

Course-3

PCC-1

Theory of Machines

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4th**				
Course Title	:	**Theory of Machines**				
Course Code	:	**BME403**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ME**		**CIE**	:	**50 Marks**
Teaching hours/ week (L: T:P:S)	:	**2:2:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs (T)**		**SEE Duration**	:	**03 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the concept of machines, mechanisms, balancing of rotating masses, gear drives and vibrating systems.
2	To apply the concept of balancing of masses to rotating masses and reciprocating masses.
3	To analyze the force-motion relationship in components subjected to external forces and analysis of standard mechanism.
4	To evaluate the controlling force of governors and critical speed of vibrating systems.
5	To choose vibrating system based on critical speed and governors based on controlling force and average speed.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction:** Kinematic Link, Kinematic Pair, Kinematic Chain**,** Mechanism, Degrees of Freedom, motion and its types. **Mobility Mechanism:** Grubler's Criterion, Grashoff's criteria. **Kinematic inversions**- Inversions of Four-Bar Mechanisms, Inversions of Slider-Crank Mechanism.	**08**
Pedagogy	**PPT, Images, Animations, Chalk and Talk**	
2	**Velocity and Acceleration analysis of planar mechanisms:** Velocity and Acceleration Analysis of Mechanisms, Velocity and acceleration analysis of four bar mechanism, velocity and acceleration of slider crank mechanism. Mechanism illustrating Coriolis's component of acceleration. **Static force analysis and Dynamic force analysis**: Static equilibrium, Free Body Diagram, Static Force analysis of four bar mechanism, Static Force Analysis of slider crank mechanism.	**08**
Pedagogy	**Animations, Chalk and Talk, Software tool usage (Solid Edge)**	
3	**Spur Gears:** Introduction, gear terminology, law of gearing, path of contact, arc of contact, contact ratio of spur gear. Interference in involute gears, methods of avoiding interference, condition and expressions for minimum number of teeth to avoid interference. **Gear Trains:** Introduction, types of gear trains Simple gear trains, compound gear trains. Epicyclic gear trains: Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains, torque calculation in epicyclic gear trains.	**08**
Pedagogy	**PPT, Images, Animations, Chalk and Talk**	
4	**Balancing of Rotating Masses and Reciprocating Masses**: Static and Dynamic Balancing, Balancing of single rotating mass by balancing masses in same plane and in different planes. Balancing of several rotating masses by balancing masses in same plane and in different planes. **Governors:** Introduction, Types of Governors, working principle of governors, applications of governors, terminology of governors, Controlling Force, Stability, Sensitiveness, Isochronism, Effort and Power, Force Analysis of governors.	**08**

Pedagogy	**PPT, Images, Animations, Chalk and Talk, Laboratory demonstration**	
5	**Introduction to free vibrations:** Free vibrations, Basic elements of vibrating system, Types of free vibrations, D'Alembert's principle, Determination of natural frequency of single degree freedom systems, Damped free vibrations: Under damped, over damped and critically damped systems. Logarithmic decrement. **Forced vibrations:** Undamped forced vibration of spring mass system, Damped forced vibrations, Rotating unbalance, Reciprocating unbalance, Vibration isolation, Critical speed.	**08**
Pedagogy	**PPT, Images, Animations, Chalk and Talk**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Theory of Machines Rattan S.S Tata McGraw-Hill Publishing Company 2014
2	Theory of Machines Kinematics and Dynamics Sadhu Singh Pearson Third edition 2019
Reference Books	
1	Theory of Machines and Mechanisms - John J. Uicker, Jr.; Gordon R. Pennock; Joseph E. Shigley – 4th Editiion,2014 -Oxford University Press
2	Mechanisms and Machines- Kinematics, Dynamics and Synthesis Michael M Stanisic Cengage Learning 2016
3	Theory of Machines by Thomas Bevan, 3RD EDITION, Pearson Education, 2010

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamental concepts and principles of machine theory, including kinematics, dynamics, and the behavior of various mechanical systems.	Understand	L2
CO2	Apply the theoretical principles and mathematical models to solve practical problems related to machinery design, analysis, and operation	Apply	L3
CO3	Analyze complex mechanical systems to determine their performance characteristics, identify potential issues related to force and motions, and propose solutions for optimization	Analyze	L4
CO4	Evaluate the kinematic and dynamic performance of a mechanical designs and systems based on performance metrics, safety standards, and practical constraints	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://archive.nptel.ac.in/courses/112/106/112106270/
2	https://www.udemy.com/course/theory-of-machines-determine-degrees-of-freedom-in-a-system/
3	https://www.academia.edu/93255565/Theory_of_Machines_Notes
4	https://gateflix.in/app/subject/theory-of-machines-88
5	https://books.google.co.in/books/about/Theory_of_Machines.html?id=E-rmzLZ0gfIC

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	10	10	-	-
Apply	20	20	-	-
Analyse	20	20	-	-
Evaluate	-	-	50	50
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

4th Semester

Course-4

PCC-2

Hydraulic and Pneumatic Systems

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4th**				
Course Title	:	**Hydraulic and Pneumatic Systems**				
Course Code	:	**BME404**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**Mechanical Engineering**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs (T)**		**SEE Duration**	:	**3 hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To provide an insight into the capabilities of hydraulic and pneumatic fluid power.
2	To understand concepts and relationships surrounding force, pressure, energy and power in fluid power systems.
3	To examine concepts cantering on sources of hydraulic power, rotary and linear actuators, distribution systems, hydraulic flow in pipes, and control components in fluid power systems.
4	Exposure to build and interpret hydraulic and pneumatic circuits related to industrial applications.
5	To familiarize with logic controls and trouble shooting.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module 1: Introduction to Fluid Power System** **Fluid Power System:** Introduction to Fluid Components, Advantages And Applications. Transmission of Power At Static And Dynamic State, Pascal's Law And Its Applications, Types of Pipes, Hoses And Quick Acting Couplings, Pressure Drop in Hoses/Pipes. **Fluids for Hydraulic System:** Introduction to Types of Fluids, Properties And Selection, Additives, Effect of Temperature And Pressure on Hydraulic Fluid. Seals, Sealing Materials, Compatibility of Seal With Fluids, Fluid Conditioning and Contamination Control, Heat Exchangers.	8
Pedagogy	**Presentation, Videos, Case Studies**	
2	**Module 2: Pumps and Actuators** **Pumps & Accumulators:** Introduction to Pump & Accumulator, Classification of Pumps, Pumping Theory, Construction And Working, Performance Characteristics, Pump Selection Factors, Types and Applications of Accumulators, Types of Intensifiers, Pressure Switches /Sensor. **Actuators:** Introduction to Actuators, Classification of Cylinder And Hydraulic Motors, Hydraulic Cylinders, Single and Double Acting Cylinder, Mounting Arrangements, Cushioning, Special Types of Cylinders, Problems on Cylinders, Construction And Working of Rotary Actuators.	8
Pedagogy	**Presentation, Videos, Case Studies**	
3	**Module 3: Components And Hydraulic Circuit Design** **Components:** Introduction to Hydraulic Components, Classification of Control Valves, Symbolic Representation, Constructional Features of Directional Control Valves, Flow Control Valves and Pressure Control Valves. **Hydraulic Circuit Design:** Introduction to circuit Design, Control of Single And Double - Acting Hydraulic Cylinder, Regenerative Circuit, Pump Unloading Circuit, Counter Balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Hydraulic Circuit For Force Multiplication; Speed Control of Hydraulic Cylinder- Metering In, Metering Out and Bleed off Circuits. Pilot Pressure Operated Circuits.	8
Pedagogy	**Presentation, Videos, Case Studies**	
4	**Module 4: Pneumatic Power Systems** **Introduction to Pneumatic systems:** Introduction to Pneumatic Power System, Advantages, Limitations, Applications, Choice of Working Medium. Characteristics of Compressed Air, Structure of Pneumatic Control System, Fluid Conditioners-Dryers And FRL Unit.	

	Pneumatic Actuators and Control Valves: Introduction to Linear Cylinder – Types of Cylinders, Working, End Position Cushioning, Seals, Mounting Arrangements, and Applications. Rotary Cylinders- Types, Construction and Application, Symbols, Pneumatic Control Valves and Its Types (DCV, FCV, PCV	**8**
Pedagogy	**Demonstration – Hands On Sessions**	
5	**Module 5: Pneumatic control circuits** **Simple Pneumatic Control:** Direct and Indirect Actuation Pneumatic Cylinders, Speed Control of Cylinders - Supply Air Throttling and Exhaust Air Throttling, Signal Processing Elements: Use of Logic Gates. **Multi- Cylinder Application:** Coordinated And Sequential Motion Control, Motion and Control Diagrams. Signal Elimination Methods, Cascading Method- Principle, Practical Application Examples (Up To Two Cylinders) Using Cascading Method (Using Reversing Valves), Electro- Pneumatic Control Circuitry For Simple Signal Cylinder Application.	**8**
Pedagogy	**Demonstration – Hands On Sessions**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Fluid Power Engineering, Vinayak V Gayakwad, Technical Publications, 2020.
2	Fluid Power Systems, Patrick J. Klette, American Technical Publishers, 2nd Edition, 2014.
Reference Books	
1	Fluid Mechanics and Fluid Power Engineering, Kumar.D.S, Kataria and Sons, 2004.
2	Fluid Power with applications, Anthony Esposito, Pearson edition,2000 .

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamental working principles, components, and applications of hydraulic and pneumatic systems	Understand	L2
CO2	Apply the fundamental knowledge of Hydraulic and Pneumatic components, and circuit design concepts to a fluid power transmission system	Apply	L3
CO3	Analyze the performance and functionality of components and circuit design of a fluid power transmission system for a given application.	Analyze	L4
CO4	Evaluate the performance of components like pumps, actuators, and accumulators in fluid power systems by experimentation.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4				3										

Weblinks and Video Lectures (e-Resources)	
1	https://grabcads.com/library
2	50 SolidWorks Exercises: Learn by Practicing, by Mason Ilic
3	Solidworks 2018 Learn by doing - Part 1, by Tutorial Books.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	10	10	-	-
Apply	20	20	-	-
Analyse	20	20	-	-
Evaluate	-	-	50	50
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

EMERGING TECHNOLOGY COURSE (ETC)

ETC Course – Emerging Technology Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Emerging Technology Course (ETC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Emerging Technology Course (ETC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

4th Semester

Course-5

ETC-1

Fundamentals of Artificial Intelligence

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4th**				
Course Title	:	**Fundamentals of Artificial Intelligence**				
Course Code	:	**BME405**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**ETC**				
Stream	:	**ME**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs (T)**		**SEE Duration**	:	**3 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the basics of artificial intelligence and its subfields.
2	Explore real-world applications of AI across different industries.
3	Gain insights into the ethical, social, and economic implications of AI.
4	Develop an appreciation for the potential of AI to drive innovation and transformation.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	. **Module 1: Artificial Intelligence** Introduction, The Turing Test, The cognitive modeling, The "laws of thought," The rational agents, Foundations of Artificial Intelligence, Applications of AI. Intelligent Agents, Agents and Environments, The Concept of Rationality, The Nature of Environments, The Structure of Agents, Problem-Solving, Knowledge, reasoning, and planning	8
Pedagogy	Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another	
2	. **Module 2: Supervise learning, Unsupervised Learning** Introduction to Machine Learning, Forms of Learning, Supervised Learning, Model Selection and Optimization, Linear Regression and Classification, Ensemble Learning, Unsupervised Learning, Clustering, Mixture of densities, K means Clustering, Expectation-Maximization Algorithm, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters	8
Pedagogy	Problem Solving: encourages cognitive thinking and enables creative problem solving	
3	**Module 3: Deep Learning and Reinforcement Learning** Introduction to deep learning, Neural network, Simple feedforward Network, Computation Graphs for Deep Learning, Convolutional Networks, Learning Algorithms, Recurrent Neural Networks, Applications. Introduction to Reinforcement learning, Learning from Rewards, Passive Reinforcement Learning, Active Reinforcement Learning, Applications of Reinforcement Learning.	8
Pedagogy	Problem Solving: encourages cognitive thinking and enables creative problem solving	
4	**Module 4: Communicating, perceiving, and acting** Natural Language Processing, Language Models, Text Classification, Information Retrieval, Information Extraction, Machine Translation, Speech Recognition,	8

	Perception, Image Formation, Early Image-Processing Operations, Object Recognition by Appearance, Reconstructing The 3d World, Object Recognition from Structural Information, Using Vision Robotics, Hardware, Perception, Movements, Software Architectures, Application Domains	
Pedagogy	Poster Presentation: allows students to represent the concepts visually to understand the topics easily.	
5	**Module 5: Philosophical Foundations and Future of AI** Introduction To Philosophical Foundations Of AI, Weak AI Hypothesis, Strong AI Hypothesis, The Ethics and Risks of Developing AI, The Present and Future of AI, AI Components, AI Architectures, Rationality of AI Agents, Success of AI,	**8**
Pedagogy	Poster Presentation: allows students to represent the concepts visually to understand the topics easily	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	"Introduction to Machine Learning", Ethem Alpaydm, The MIT Press Cambridge, Massachusetts London, England,
2	"An Introduction to Machine Learning", Miroslav Kubat, Second Edition
3	"Introduction to Machine Learning with Python" by Andreas C. Müller and Sarah Guido
4	Ian H. Witten, Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufman Publishers, 3rd Edition, 2011.
5	"BlayWhitby, Artificial Intelligence: A Beginners Guide", Second Edition, One World Publisher, 2008.
Reference Books	
1	"Foundations of Machine Learning", Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, The MIT Press Cambridge, Massachusetts London, England

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamental concepts, theories, and algorithms of artificial intelligence	Understand	L2
CO2	Apply Artificial Intelligence techniques and methods to address modern word problems	Apply	L3
CO3	Analyze and interpret the performance and behaviour of Artificial Intelligent Systems and algorithms	Analyze	L4
CO4	Critically evaluate the ethical implications, limitations, and societal impacts of AI technologies.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4												3		

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2	https://nptel.ac.in/courses/106105077
3	https://onlinecourses.nptel.ac.in/noc23_ge40/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	10	10	50	50
Apply	20	20	-	-
Analyse	20	20	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	04	04	02	02	04	04	20	20
CO2	08	08	04	04	08	08	40	40
CO3	08	08	04	04	08	08	40	40
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100

PROFESSIONAL CORE COURSE LABORATORY (PCCL)

PCCL Course - Professional Core Course Laboratory

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course Laboratory (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course Laboratory (PCCL) – 3 Credit course

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

4th Semester

Course-6

PCCL-1

Assembly Modelling

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th**				
Course Title	**:**	**Assembly Modelling**				
Course Code	**:**	**BME406**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Practical**				
Category	**:**	**PCCL**				
Stream	**:**	**ME**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**1:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**10Hrs (T)+ 20Hrs (P)**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**02**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To equip students with the knowledge to explain the procedures for indicating surface roughness and machining symbols in production drawings.
2	To develop students' skills in applying Geometric Dimensioning and Tolerancing (GD&T) concepts to prepare detailed engineering drawings from component sketches.
3	To enable students to the steps involved in preparing joints and couplings, ensuring proper assembly sequence.
4	To guide students in designing comprehensive assembly drawings with accurate exploded views, title blocks, and exports in various formats, integrating GD&T, BOM tables, and symbols.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**INTRODUCTION:** Drawing Basics-Detailing Drawings. Explode a 3D model for a drawing, Create a drawing sheet and views, Add geometry and dimensions to a drawing, Add GD & T text, BOM, tables and symbols, Place an exploded view, Edit a title block, Export to different file formats.	1
Pedagogy		
2	**PRODUCTION DRAWINGS:** Surface roughness-Indication of machining-symbol showing direction of lay, roughness grades, machining allowances, Machining symbols used in industry (Suggested Practice: Disassembling of any Physical model having not less than five parts, sketch the minimum views required for each component, measure all the required dimensions of each component.)	8
Pedagogy		
3	**DETAILS TO ASSEMBLY:** Introduction to the unit assembly drawing, steps involved in preparing assembly drawing from Details-Sequence in assembly-Preparation of details and Assembly of parts with Sectional views.	12
Pedagogy		
4	**JOINTS & COUPLINGS:** Sequence in assembly-Preparation of details and Assembly of parts of Joints and couplings.	9
Pedagogy		

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Machine drawing, -K.R. Gopala Krishna Subhas Publishers, Bangalore

Reference Books

1	Machine Drawing- N.D.Bhatt, Charotar Publication, Anand
2	Machine Drawing-Sidheshwar-Tata McGraw Hill
3	Production Drawing-L.K.Narayanan,P.Kannaich,- New Age International Publication

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamentals of Assembly Drawings	Understand	L2
CO2	Apply the suitable GD&T symbols to the given engineering drawing	Apply	L3
CO3	Analyze the given drawing, prepare a suitable 3D Model and show the projections	Analyze	L4
CO4	Create the complete assembly drawing of machine components, Joints, and Couplings	Create	L6

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4			3											

Weblinks and Video Lectures (e-Resources)	
1	MIT OpenCourseWare - Technical Drawing
2	Engineering Drawing and Sketching - Engineering.com
3	NPTEL - Engineering Drawing
4	Coursera - Introduction to Engineering Drawing

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand				
Apply			50	50
Analyse				
Evaluate				
Create	50	50		

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
		Module-3			Module-4			
CO1								
CO2							50	50%
CO3							50	50%
CO4		50			50			
CO5								
Total		50			50		100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (20% Theory+80% Practical Questions)
Remember	-
Understand	20 (Viva-voce)
Apply	-
Analyse	20 (Production drawing)
Evaluate	-
Create	35(Assembly)+25 (Couplings and Joints)

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	-	-		
CO1	20						20	20%
CO2								
CO3		20					20	20%
CO4			35	25			60	60%
CO5								
Total								

ABILITY ENHANCMENT COURSE (AEC)

AEC- Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:0:2
Total Hours of Pedagogy	20 hours – Project
Credits:	01
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

	CIE		**SEE**	
	Project Weekly Assessment		**Final Project Evaluation**	
Project	**Project Understanding**	05 Marks	**Write up**	10 Marks
	Technical Competence	10 Marks	**Presentation & Demonstration**	50 Marks
	Innovation	10 Marks	**Project report**	25 Marks
	Problem Solving	15 Marks	**Viva-Voce**	15 Marks
	Project Demonstration	10 Marks	**Total**	**100 Marks**
Total		**50 Marks**	**100 Marks Reduced to 50 Marks**	

1. Introduction

Project Based Learning is a model for classroom activity that shifts away from the classroom practices of short, isolated, teacher-centered lessons and instead emphasizes learning activities that are long-term, interdisciplinary, and student-centered.

A systematic teaching method that engages students in learning essential knowledge and life-enhancing skills through an extended, student-influenced inquiry process structured around complex, authentic questions and carefully designed products and tasks.

Project learning, also known as project-based learning, is a dynamic approach to teaching, in which students explore real-world problems and challenges, simultaneously developing cross-curriculum skills while working in small collaborative groups.

2. Characteristics of Project-Based Learning:

- Students making decisions within a framework
- A problem or challenge to be solved;
- Students designing the process for reaching a solution
- Students gathering and managing information
- Continuous Evaluation
- Students regularly reflecting on the process
- A final product to be evaluated for quality
- An atmosphere that tolerates error and change

3. Purpose

- Introducing project-based learning on the curriculum.
- To help students to gain in-depth knowledge of the subject via project.
- During this process, students will be able to learn and understand the various stages of project development.

4. Objectives

- Introducing mini project based on the curriculum.
- Develop in depth knowledge of the topic and technology.

- Use critical thinking skills and make real world connections
- Demonstrate and understand through products.
- Industry and concept-oriented learning.

5. Why Incorporate PBL?

- Promotes collaboration and interaction
- Learners communicate meaningfully and for authentic purposes
- Allows students with a variety of learning styles to demonstrate their acquired knowledge
- Students learn language, content, and skills simultaneously
- Increases learner autonomy
- Provides opportunities for students to pursue their own interests and questions and make decisions about how they will find answers and solve problems.
- Improves education for all students Facilitates student integration of the content of different subjects
- Teaches children to use their own minds well and applies what they learn in school to life-long endeavors.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

6. Benefits of PBL

- Offers multiple ways for students to participate and to demonstrate their knowledge.
- Accommodates different kinds of intelligences.
- Shifts students away from doing only what they typically do in a classroom Environment.
- Encourages the mastery of technological tools, thus preparing them for the workforce.
- Serves as a medium for students who don't usually participate.
- Prompts students to collaborate while at the same time support self-directed learning.
- Offers a learning experience that draws on the thinking and shared efforts of several individuals.

- Helps students develop a variety of social skills relating to group work and negotiation.
- Promotes the internalization of concepts, values, and modes of thought, especially those related to cooperation and conflict resolution.
- Establishes a supportive and non-competitive climate for students.
- Provides a means for transferring the responsibility for learning from teachers to students.
- Calls upon students to explain or defend their position to others in their project groups, so that learning is more apt to be personalized and valued.

7. Process

- Project batches will be formed after the commencement of 3rd semester.
- The Students Batch Comprising of 4 members in a batch should be formed by the Project Based Learning co-ordinator.
- Each Semester consists of 16 Weeks of Project based Learning.
- The Level of the Projects to be identified.

  Level 1- 2nd Year – 3rd Semester & 4th Semester

  Level 2- 3rd year – 5th Semester & 6th Semester

  Level 3 – Final Year Project
- The Faculty handling the respective Theory Subject will be the PBL Coordinator and all the three Batches to be handled by the PBL Coordinator with additional faculty.
- The List of Project Batches to be identified by the faculty assigned in consultation with HOD.
- The batch can select any topic from the list circulated by the PBL Coordinator
- The details of students Interaction with the guide shall be maintained by the guide in the prescribed format.
- The Students Project should be continuously evaluated and PBL Coordinator should submit weekly report to the HOD.
- The Rubrics for the PBL should be followed.
- The Students batches shall give the presentation on understanding of the topic and plan for implementation.
- The Evaluation of the Projects is done in Two Phases

7.1 Two phases for Assessment

Phase 1:

1. Phase 1 is for 4 weeks

2. During this phase, the students shall discuss about the Objectives, Literature Survey and plan for project execution.

Phase 2:

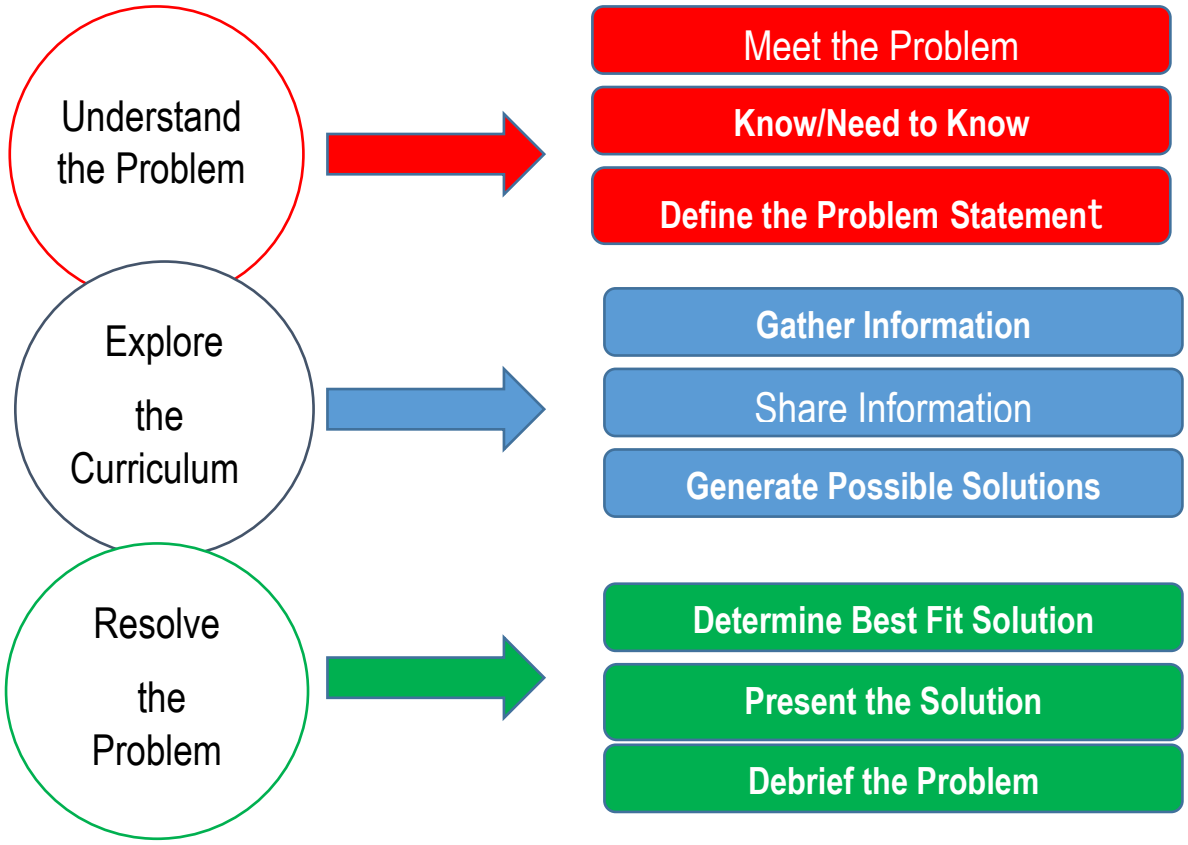
1. Phase 2 is for 11 Weeks

2. During this phase, the students shall carry out the project under regular supervision of the guide/subject expert, Implementation and give final presentation/demonstration with project documents.

The marks distribution for PBL Work:

4. Phase 1 – 25 Marks
5. Phase 2 – 25 Marks

8. PBL Teaching and Learning Template



9. Practice

- Every week 3 hour is exclusively dedicated to Project Based Learning.
- Assess their progress until they resolve the problem and summarise their learning.
- Provide opportunities for in-depth investigations of worthy topics.
- Allow learners to become more autonomous as they construct personally-meaningful artefacts that are representations of their learning.
- Motivate students by engaging them in their own learning. PBL affords students opportunities for development.
- Building communication, technical and management skills.

10. Obstacles/Gaps

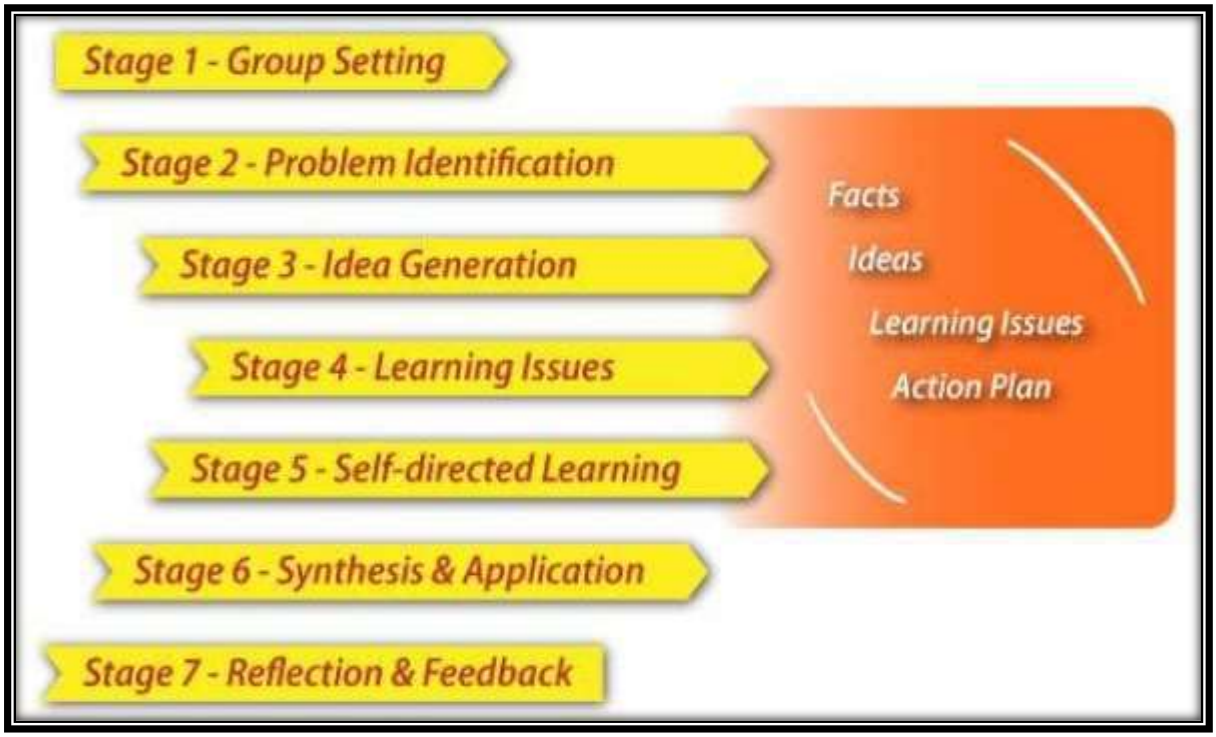
- Lack of student's interest
- Lack of assessment

- Lack of Basic knowledge
- Lack of consistence attendance and monitoring.
- Lack of abundant time allotment and time management

11. How to Overcome?

- Periodic process – stage wise assessment has to be done.
- Basic Knowledge- A complete guidelines and videos will be provided by the faculty who is handling the respective subject and allotted guide.
- Regular evaluation and periodic monitoring is done by 2 stages.
- For Successful execution and demonstration of end-to-end system, exclusive 3hr/week project time is allotted.

12. Block diagram of PBL



13. Impact Analysis

- It encourages students to draw on their own creativity on problem solving and they learn the bridge gap between theory and practice.
- Final products resulting from project-based learning can be shared with the department at large, thus fostering ownership and technically strong with the subject scenario.

14. Guidelines

The guidelines are for successful completion of the project and to facilitate effective and uniform conduction of projects by the students. It is expected that these guidelines will help in overall improvement in the quality of the project.

14.1 Main phases of the project

Sl.No	Topics	Duration
Phase-1		
1.	Understanding of the project and preparing a project plan	**3 Weeks**
2.	Literature review	**1 Week**
6.	Planning	**1 Week**
Phase-2		
4.	Analysis and Design	**3 Weeks**
5.	Implementation	**6 Weeks**
6.	Testing	**1 Week**
7.	Writing the project report	**1 Week**
	Total	**16 Weeks**

14.2 Final Presentation Structure

10. Title of the project & Batch Information
11. Agenda / Topics
12. Problem Statement / Project Definition
13. Background / Literature Review
14. Methodology
15. Analysis and Design
16. Implementation
17. Testing
18. Conclusion and Scope for Future Works

14.3 Project Based Learning Report Structure

17. Cover Page
18. Certificate
19. Declaration
20. Acknowledgement
21. Table of Contents
22. List of Tables
23. List of Figures
24. Introduction
25. Background / Literature Review
26. Methodology / Solution
27. Analysis and Design
28. Implementation
29. Results
30. Conclusion and Future Works
31. Bibliography / References
32. Appendices

15. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom – 0.75".
- The total number of reports to be prepared are
    - One copy to the department.
    - One copy to the concerned guide
    - One copy to the candidate.
- Before taking the final printout, the approval of the concerned guide is mandatory and suggested corrections, if any, must be incorporated in the Final Report.
- For making copies dry tone Xerox is suggested.
- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

16. Outcome of the project

- Students will gain the knowledge and understand
- To think creatively, work collaboratively.
- Solve complex problems using digital technology.
- Students learn and desire to engage continuous gain about knowledge such as design, analysis, development, implementation and testing.
- Strong written communication skills and the ability to write technical documents that include specification, design, and implementation of a mini project.

4th Semester

Course-7

AEC-1

Machine Learning Using Python

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4th**				
Course Title	:	**Machine Learning Using Python**				
Course Code	:	**BME407**				
Course Type (Theory/ Practical/ Integrated)	:	**Project Based Learning**				
Category	:	**PBL**				
Stream	:	**ME**		**CIE**	:	**50 Marks**
Teaching hours/ week (L: T:P:S)	:	**0:0:0:2**		**SEE**	:	**50 Marks**
Total Hours	:	**20 Hrs (P)**		**SEE Duration**	:	**3 Hours**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	The main objective of this course is to enabling the student with basic knowledge on the techniques to build an intellectual machine for making decisions behalf of humans.
2	This course covers the techniques on how to make learning by a model, how it can be evaluated, what are all different algorithms to construct a learning model.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to Machine Learning** Introduction to Machine Learning, Definition and applications, Types of machine learning, Basic Terminology and Concepts, Features, labels, training, testing, validation, Overfitting and underfitting, Machine Learning Workflow, Problem definition, Data collection and preprocessing, Model selection, training, evaluation, and deployment	4
Pedagogy	Project Based Learning	
2	**Data Preprocessing and Visualization** Data Collection and Cleaning, handling missing values, Data normalization and scaling, Feature Engineering, Feature selection and extraction, encoding categorical data, Data Visualization, understanding data distributions and relationships, Using libraries like Matplotlib and Seaborn for visualization	4
Pedagogy	Project Based Learning	
3	**Supervised Learning Algorithms** Linear and Logistic Regression, Concepts and implementation, Evaluation metrics (MSE, accuracy, precision, recall, F1 score) Decision Trees and Random Forests, Concepts and implementation, Handling overfitting and parameter tuning, Support Vector Machines (SVM), Concepts and implementation, Kernel trick and SVM tuning	4
Pedagogy	Project Based Learning	
4	**Unsupervised Learning Algorithms** Clustering Algorithms, K-means clustering, Hierarchical clustering Dimensionality Reduction, Principal Component Analysis (PCA), t-Distributed Stochastic Neighbor Embedding (t-SNE)	4
Pedagogy	Project Based Learning	
5	**Model Evaluation** Model Evaluation Techniques, Cross-validation, Confusion matrix and ROC curve, Hyperparameter Tuning, Grid search and random search, Using validation data for tuning	4

	Project Based Learning

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	"Introduction to Machine Learning with Python" by Andreas C. Müller and Sarah Guido
2	Ian H. Witten, Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufman Publishers, 3rd Edition, 2011.
3	"BlayWhitby, Artificial Intelligence: A Beginners Guide", Second Edition, One World Publisher, 2008.
Reference Books	
1	"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
2	"Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems", Aurélien Géron, Published by O'Reilly Media,2017
3	"Artificial Intelligence," Elaine Rich, Kevin Knight, and Shivashankar B. Nair, TMH Education Pvt. Ltd., 2008.
4	"Introduction to Artificial Intelligence and Expert Systems," Dan W. Patterson, Pearson.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the foundational principles and methodologies of machine learning	Understand	L2
CO2	Apply the appropriate Machine Learning algorithms and techniques to practical problems and datasets for required predictions	Apply	L3
CO3	Evaluate the performance, effectiveness, limitations, and behaviour of machine learning models and interpret their results using Python	Evaluate	L5
CO4	Present and communicate about the Project process effectively	Understand	L2

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3					3									
CO4										3				

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc23_cs18/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs24/preview
3	https://onlinecourses.nptel.ac.in/noc23_ee87/preview
4	https://onlinecourses.nptel.ac.in/noc23_cs87/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	Review-1	Review-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	20	20	-	-
Apply	30	-	-	-
Analyse	-	-	-	-
Evaluate	-	30	-	-
Create	-	-	-	-

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Review-1			Review-2				
CO1		20					20	20%
CO2		30					30	30%
CO3					30		30	30%
CO4					20		20	20%
CO5							-	-
Total		50			50		100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	-
Understand	40
Apply	20
Analyse	-
Evaluate	40
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	-	-	-	-	-	20	20%
CO2	-	-	-	-	-	-	20	20%
CO3	-	-	-	-	-	-	40	40%
CO4	-	-	-	-	-	-	20	20%
CO5	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	100	100%

UNIVERSAL HUMAN VALUES (UHV)

SCR- Social Connect & Responsibility

Teaching Hours/Week (L: T: P: S)	0:0:0:2
Total Hours of Pedagogy	40 hour Practical Session +15 hour Planning
Credits:	01
Programs / Experiments	12
CIE Marks	100
SEE Marks	------
Total Marks	100
Exam Hours	3
Examination nature (SEE)	No SEE only CIE For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept.

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**					
Course Title	**:**					
Course Code	**:**					
Course Type (Theory/ Practical/ Integrated)	**:**					
Category	**:**					
Stream	**:**			**CIE**	**:**	
Teaching hours/ week (L:T:P:S)	**:**			**SEE**	**:**	
Total Hours	**:**			**SEE Duration**	**:**	
Credits	**:**					

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Provide a formal platform for students to communicate and connect to the surrounding.
2	create a responsible connection with the society.
3	Understand the community in general in which they work.
4	Identify the needs and problems of the community and involve them in problem –solving.
5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

Teaching-Learning Process

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
- State the need for activities and its present relevance in the society and Provide real-life examples.
- Support and guide the students for self-planned activities.
- You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
- Encourage the students for group work to improve their creative and analytical skills

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

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COURSE CURRICULUM

Contents :

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.

The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Module No.	Topics	Hours
1	**Part I:** **Plantation and adoption of a tree:** Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.	
Pedagogy		
2	**Part II :** **Heritage walk and crafts corner:** Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives,Visit, case study, report, outcomes.	
Pedagogy		
3	**Part III :** **Organic farming and waste management:** Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus –Objectives,Visit, case study, report, outcomes.	
Pedagogy		
4	**Part IV:** **Water conservation:** Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.	
Pedagogy		

5	**Part V :** **Food walk:** City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study,report, outcomes.	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	
2	
Reference Books	
1	
2	

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Communicate and connect to the surrounding.		
CO2	Create a responsible connection with the society.		
CO3	Involve in the community in general in which they work.		
CO4	Notice the needs and problems of the community and involve them in problem –solving.		
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge		

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersionwith NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

Duration :

A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per guidelines of scheme & syllabus.

Continuous Internal Evaluation (CIE):

- After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period.
- The report should be signed by the mentor.
- The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50.
- Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing
- Considering all above points allotting the marks as mentioned below

Excellent	: 80 to 100
Good	: 60 to 79
Satisfactory	: 40 to 59
Unsatisfactory and fail: <39	

Pedagogy – Guidelines:

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl.No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc.…	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…..	Site selection /proper consultation/Contin uous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc.…	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers / campus etc…..	Site selection / proper consultation/Contin uous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
5.	Food walk: Practices in societ	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Governme nt Schemes officers/ campus etc…	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty

1 Credit Course – Practical + Planning

Assessment Details (both CIE and SEE)

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Plan of Action (Execution of Activities)	
Sl.No	**Practice Session Description**
1.	Lecture session in field to start activities
2.	Students Presentation on Ideas
3.	Commencement of activity and its progress
4.	Execution of Activity
5.	Execution of Activity
6.	Execution of Activity
7.	Execution of Activity
8.	Case study-based Assessment, Individual performance
9.	Sector/ Team wise study and its consolidation
10.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	**CIE – 100%**	• Implementation strategies of the project (NSS work). • The last report should be signed by NSS Officer, the HOD and principal. • At last report should be evaluated by the NSS officer of the institute.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study-based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5 = 25	25 Marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks	
Total marks for the course in each semester	100 Marks	
For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.		

Course - Skills Mapping Table

Sl.No	Name of the Course	Course Type	Course Category	Skills attained by the students
1	Metal Casting and Welding	Theory + Practical	IPCC	Apply Metal casting and Welding skills in Manufacturing
2	Fluid Mechanics and Machines	Theory + Practical	IPCC	Analyze the fluid behavior and Machines
3	Theory of Machines	Theory	PCC	Analyze the kinematic and Dynamic behavior of Machines
4	Hydraulics and Pneumatics Systems	Theory	PCC	Analyze the Fluid power systems
6	Fundamentals of Artificial intelligence	Theory	ETC	Apply the design concepts of AI systems
7	Assembly Modeling	Practical	PCCL	Design the 3D Modelling
8	Machine Learning Using Python	Project Based Learning	AEC	Evaluate the data using Python and ML techniques
9	Universal human values course	Theory	UHV	Contribute to the Societal Development Activities

Student - Skills Mapping Table

Sl.No	Name of the Student	USN	3rd Semester				4th Semester			
			Skill-1	Skill-2	Skill-3	Skill-4	Skill-1	Skill-2	Skill-3	Skill-4
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No