Vidya Pratishthan's
Kamalnayan Bajaj Institute of Engineering and Technology, Baramati.

Faculty of Science and Technology

Board of Studies
Mechanical Engineering

Syllabus

Exit Courses
Mechanical Engineering

(w.e.f. AY: 2023-24)

Exit Course Syllabus: First Year (F.Y. B. Tech.) Mechanical Engineering															
w.e.f. AY:2023-2024															
Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks						Credits				
		TH	PR	TUT	Activity	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
EME23101	Skill Based Courses (Online/Offline)		4		10			20		30			2		
EME23102	Work Based Voc. Course (Online/Offline)		4		10			20		30			2		
EME23103	Internship / Apprenticeship		25		50			50		30			4		
Total					70			90		90			8		

Skill Based Courses (Online/Offline)		Work Based Voc. Course (Online/Offline)	
EME23101 - A	Drafting with AutoCAD (Offline)	EME23102 - A	Machine Shop (Offline)
EME23101 - B	Solid Modeling and Drafting (Offline)	EME23102 - B	Additive Manufacturing Lab (Offline)
EME23101 – C	Design, Technology, and Innovation (Online)	EME23102 - C	Fundamentals of Additive Manufacturing Technologies (Online)
EME23101 – D	Computer Graphics (Online)	EME23102 - D	Rapid Manufacturing (Online)
EME23101 - E	Learn AutoCAD 2023- 21 Mechanical 2D and 3D Complete Course (Online)		

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Acad. Coordinator

02/12/2023
Head
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EME23101 Skill Based Courses Online / Offline - F. Y. B. Tech Exit		
Teaching Scheme:	**Credits:02**	**Examination Scheme:**
PR: 04 Hrs/Week		**Course Activity: 10 Marks**
		Term Work: 20 Marks
		Oral Exam: 30 Marks

Complete any one course from the following courses.
Offline Skill Based Courses

1. Drafting with AutoCAD (EME23101 – A)

COURSE OBJECTIVES:

1. To support learners to effectively utilize AutoCAD software in design, drafting, and production tasks.
2. To enhance learners' drawing and drafting skills in AutoCAD by troubleshooting common issues.
3. To enable learners to create 2D and 3D models using AutoCAD software.
4. To empower learners to apply best practices for file management and collaboration using AutoCAD software.

COURSE OUTCOMES:

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

1. Become familiar with the AutoCAD user interface.
2. Understand the fundamental concepts and features of AutoCAD.
3. Use the precision drafting tools in AutoCAD to develop accurate technical drawings.

SYLLABUS

UNIT - I

DRAW COMMANDS: In this topic, students will learn about the objects used for drawing purposes, such as lines, polylines, constructed lines, polygons, rectangles, circles, arcs, ellipses, etc. These toolbars are used to create 2-dimensional drawings.

Some other parts of the syllabus are:

- Understanding the concept of drawing a toolbar
- Learning about line command, polyline command, and circle command
- Understanding the concept of other commands
- Arc command
- Text and rectangle command.

UNIT - II

MODIFY COMMANDS: The commands are used for passing information to the initial point of the task; the information is only communicated between running programs. There are many restrictions attached to modifying commands.

Some other parts of the syllabus are:

- Use of erase commands
- Selection of multiple objects
- Move and copy command

- The distance method
- The two points method
- Trim and extend

UNIT - III

2D FUNDAMENTALS: The students will learn about the various fundamentals of 2D in AutoCAD. The 2D fundamentals are an exploration of a variety of contemporary processes and techniques used in drawing in the wide array of drawing media.

Some other parts of the syllabus are:

- Understanding the AutoCAD workspace and user interface
- Organizing drawing objects in layers
- Using basic drawing, editing, and viewing tools
- Preparing a layout to be plotted

UNIT – IV

ISOMETRIC DRAWINGS: Students will learn about the isometric drawings, which are 2 dimensional rather than 3. Autocad provides us with tools for creating isometric drawings.

Some other parts of the syllabus are:

- How to turn on isograft mode in AutoCAD
- How to draw isometric in AutoCAD
- How to apply isometric drafting for piping

TEXT BOOKS:

1. T1. Venugopal K, Engineering Drawing and Graphics + AutoCAD New Age, 2001.

REFERENCE BOOKS:

1. R1. Jolhe Dhananjay A, Engineering Drawing with An Introduction To Autocad, Tata Mcgraw Hill, 2008.
2. R2. Jeyapoovan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd, 2014.

PRACTICAL (Assignments)

The student shall complete the following Practical in laboratory using suitable AUTOCAD / FUSION 360 software. Learner will demonstrate skills to communicate drawings as per industry standards.

1. 2-D sketching with geometrical and dimensional constraints

2. Drafting for simple mechanical components (Output file as Production drawing) (a) Sheet-Metal (b) Machining (c) Fabrication (d) Casting (e) Forgings (f) Plastic Molding

3. Assembly drafting (Output file as Assembly drawing and detailing) of the parts modeled in Practical assignment-2 using proper assembly constraint conditions and generation of exploded view for assemblies like Couplings, Clutches, Gear Assemblies, Engine/Pump/Turbine Components, Valves, Machine Tools, Automobile Components, Gearbox, Pressure Vessels, etc.

2. Solid Modeling and Drafting (EME23101 – B)

COURSE OBJECTIVES: -

1. To understand basic structure of CAD systems and their use to create geometric models of simple engineering parts
2. To introduce the curves and surfaces and their implement in geometric modeling

3. To apply basic concepts of 3D modeling, viewing and evaluate mass properties of components and assemblies

COURSE OUTCOMES
On completion of the course, learner will be able to
CO1. UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management
CO2. UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry.
CO3. CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system.

UNIT I
FUNDAMENTALS OF 3D MODELING
Introduction, Product Life Cycle, CAD tools in the design process of Product Cycle, Scope of CAD, Software Modules - Operating System (OS) module, Geometric module, application module, programming module, communication module, Computer Aided Design - Features, requirements and applications 3D Modeling approach - Primitive, Features and Sketching, Types of Geometric models - 2½ extrusions, axisymmetric, composite, 3D objects, difference between wireframe, surface & solid modeling, Modeling strategies Model viewing: VRML web-based viewing

UNIT II
CURVES & SURFACES
Curves: Methods of defining Point, Line and Circle, Curve representation - Cartesian and Parametric space, Analytical and Synthetic curves, Parametric equation of line, circle, ellipse, Continuity (C0 , C1 & C2), Synthetic Curves - Hermit Cubic Spline, Bezier, B-Spline Curve, Non-Uniform Rational BSpline curves (NURBS) Surfaces: Surface representation, Types of Surfaces, Bezier, B-Spline, NURBS Surface, Coons patch surface, Surface Modeling Reverse Engineering: Introduction, Point Cloud Data (PCD), PCD file formats, Quality issues in PCD, Requirements for conversion of surface models into solid models, Applications of PCD

UNIT III
SOLID MODELING
Introduction, Geometry and Topology, Solid entities, Solid representation, Fundamentals of Solid modeling, Half spaces, Boundary representation (B-Rep), Constructive Solid Geometry (CSG), Sweep representation, Analytical solid modeling, Parametric solid modeling, feature based modeling, etc., Euler Equation (Validity of 3D solids), Mass Property Calculations Introduction to Assembly Modeling, Assemblies (Top-down and Bottom-up approach), Design for Manufacturing [DFM], Design for Easy Assembly & Disassembly [DFA], Design for Safety

Text Books
1. Zeid, I and Sivasubramania, R., (2009), "CAD/CAM : Theory and Practice", 2nd edition, McGraw Hill Education, ISBN-13: 978-0070151345
2. Rao, P. N., (2017), "CAD/CAM: Principles and Applications", 3rd edition, McGraw Hill Education, ISBN-13: 978-0070681934
3. Chang, Kuang-Hua, (2015), "e-Design: Computer-Aided Engineering Design", Academic Press, ISBN-13: 978-0123820389

Reference Books
1. Lee, Kunwoo, (1999), "Principles of CAD/CAM/CAE Systems", Pearson/Addison-Wesley,

ISBN-13: 978-0201380361
2. Bordegoni, Monica and Rizzi, Caterina, (2011), "Innovation in Product Design: From CAD to Virtual Prototyping", Springer, ISBN-13: 978-1447161875
3. Vukašinovic, Nikola and Duhovnik, Jože, (2019), "Advanced CAD Modeling: Explicit, Parametric, Free-Form CAD and Re-engineering", Springer, ISBN-13: 978-3030023980
4. Um, Dugan, (2018), "Solid Modeling and Applications: Rapid Prototyping, CAD and CAE Theory", 2nd edition, Springer, ISBN-13: 978-3319745930
5. Rogers, D. and Adams, J. A., (2017), "Mathematical Elements for Computer Graphics", 2nd edition, McGraw Hill Education, ISBN-13: 978-0070486775
6. Hearn, D. D. and Baker, M. P., (2013), "Computer Graphics with OpenGL", 4th edition, Pearson Education India, ISBN-13: 978-9332518711
7. Gokhale, N. S., Deshpande, S. S., Bedekar, S. V. and Thite, A. N., (2008), "Practical Finite Element Analysis", Finite to Infinite, Pune, India, ISBN-13: 978-8190619509
8. Lee Ambrosius, (2015), "AutoCAD® Platform Customization: User Interface, AutoLISP® , VBA, and Beyond", John Wiley & Sons, Inc., IN, ISBN-13: 978-1118798904
9. Bucalo, Joe and Bucalo, Neil, (2007), "Customizing SolidWorks for Greater Productivity", Sheet Metal Guy, LLC, ISBN-13: 978-0979566608
10. Ziethen, Dieter R. (2012), "CATIA V5: Macro Programming with Visual Basic Script", McGraw-Hill Companies, Inc./Carl Hanser Verlag München, ISBN-13: 978-0071800020, ISBN: 978-007180003-7
11. Programming Manuals of Softwares

PRACTICAL (Assignments)

The student shall complete the following Practical in laboratory using suitable CAD modeling software. Learner will demonstrate skills to communicate drawings as per industry standards.

1. 2-D sketching with geometrical and dimensional constraints

2. Solid & Surface modeling for simple mechanical components (Output file as Production drawing and Model Based Definition (MBD) (a) Sheet-Metal (b) Machining (c) Fabrication (d) Casting (e) Forgings (f) Plastic Molding

3. Assembly modeling (Output file as Assembly drawing and detailing) of the parts modeled in Practical assignment-2 using proper assembly constraint conditions and generation of exploded view for assemblies like Couplings, Clutches, Gear Assemblies, Engine/Pump/Turbine Components, Valves, Machine Tools, Automobile Components, Gearbox, Pressure Vessels, etc.

Online Skill Based Courses

Sr. No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	EME23101 - C	Design, Technology, and Innovation	Prof. B.K. Chakravarthy	IIT Bombay	8 weeks	2
2	EME23101 - D	Computer Graphics	Prof. Samit Bhattacharya	IIT Guwahati	8 Weeks	2
3	EME23101 - E	Learn AutoCAD 2023- 21 Mechanical 2D and 3D Complete Course	Ujjwal	Udemy	38 Hrs	2

Online Skill Based Courses Links:

1. EME23101 – C: - https://onlinecourses.nptel.ac.in/noc21_de16/preview
2. EME23101 – D: - https://onlinecourses.nptel.ac.in/noc20_cs90/preview
3. EME23101– E: - https://www.udemy.com/course/learn-autocad-2023-mechanical-2d-and-3d-complete-course/

EME23102 Work Based Voc. Course (Online/Offline) - F. Y. B. Tech Exit		
Teaching Scheme:	**Credits:02**	**Examination Scheme:**
PR: 04 Hrs/Week		**Course Activity: 10 Marks**
		Term Work: 20 Marks
		Oral Exam: 30 Marks

Complete any one course from the following courses.
Offline Work Based Voc. Courses

1. Machine Shop (EME23102 – A)

Course Objective:

1. To set the manufacturing set–up appropriately and study the corresponding set up parameters.
2. To select appropriate process parameter for obtaining desired characteristic on work piece.
3. To understand the operational problems and suggest remedial solution for adopted manufacturing process.

Course Outcome:

1. Ability to develop knowledge about the working and programming techniques for various machines and tools.

I. Jobs (Both the following jobs should be completed individually)

a. Any one marketable assembly consisting of at least three components with tolerance involving use of lathe, drilling, milling, grinding and any additional machine tool or processes as per requirement.

b. Development and execution of one simple turning job on CNC (Trainer) machine.

II. Journal consisting of following assignments.

a. Two views of at least one jig and one fixture designed, for a component on a half imperial sheet.

b. Process planning sheets for job 1.a and 1.b.

Textbook:

1. Elements of Workshop Technology Machine Tools by Choudhury S K Hajra; Bose S K, Media Pramoters, 2002.

Reference Book:

1. Introduction To Basic Manufacturing Processes and Workshop Technology by Singh Rajender, New Age International, 2010.

2. Additive Manufacturing Lab (EME23102 – B)

Course Objectives:

1. To make the students aware of rapidly evolving and widely used technology.
2. It is aimed to make the students aware of the technology for conceptual modeling, prototyping, and rapid manufacturing. It is also aimed to introduce reverse engineering (RE).

3. It is aimed to impart detailed knowledge of wide applications of AM in industry and society and key applications of AM such as rapid tooling, medical AM and rapid manufacturing

Course Outcomes:

The course imparts hands on training in core additive manufacturing technologies Fused deposition modeling (FDM) which is commonly used for modeling, prototyping, and production applications. Persons trained in digital fabrication (3D Printing, 3D Scanning will have the following new skills which are directly relevant to industry.

Students have to perform the any 3 following activities in lab:

1. Design the Coupling in SOLIDWORKS software and print it using PLA material.

2. Design the Key ring of your own name in SOLIDWORKS software and print it using multilateral.

3. Emboss / engrave your name on a 3D object and print it with different materials.

4. Reverse engineering- Scan your own face by 3D Scanner and then 3D print it using point cloud data.

Textbooks:

1. 3D Printing Failures: 2019 Edition: How to Diagnose and Repair All 3D Printing Issues by Sean Aranda and David Feeney
2. The 3D Printing Handbook: Technologies, design and applications by Ben Redwood and Filemon Schöffer
3. 3D Printing For Dummies" by Richard Horne and Kalani Kirk Hausman

Reference Books:

1. Functional Design for 3D Printing by Clifford T. Smyth
2. Getting Started with 3D Printing: A Hands-On Guide to the Hardware, Software, and Services Behind the New Manufacturing Revolution by Liza Wallach Kloski and Nick Kloski

Online Work Based Voc. Courses

Sr. No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	EME23102 - C	Fundamentals of Additive Manufacturing Technologies	Prof. Sajan Kapil	IIT Guwahati	12 Weeks	3
2	EME23102 - D	Rapid Manufacturing	Prof. J. Ramkumar, Prof. Amandeep Singh	IIT Kanpur	12 Weeks	3

Online Work Based Voc. Courses Links: -

1. EME23102 – C: - https://onlinecourses.nptel.ac.in/noc21_me115/preview
2. EME23102 – D: - https://onlinecourses.nptel.ac.in/noc21_me104/preview

EME23103 Internship / Apprenticeship - F. Y. B. Tech Exit		
Teaching Scheme:	**Credits:04**	**Examination Scheme:**
PR: 25 Hrs/Week		**Course Activity: 50 Marks**
		Term Work: 50 Marks
		Oral Exam: 30 Marks

Course Objective:

- Expose Students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Expose students to the engineer's responsibilities and professional ethics from social, economic and administrative view.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Course Outcomes: On completion of the internship, learner will be able to –

- **CO1:** To develop professional competence through internship.
- **CO2:** To apply academic knowledge in a personal and professional environment.
- **CO3:** To build the professional network and expose students to future employees.
- **CO4:** Apply professional and societal ethics in their day-to-day life.

Guidelines to the students:

Any absenteeism by students during their internship should be informed immediately to the mentor/reporting manager and the HOD. No special considerations will be accepted. Student cannot take leave fest activities. The monthly attendance should be duly submitted to the HOD by the student.

Internship Diary / Internship Workbook:

Student must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The student should record in the daily training diary account of the observations, impressions, information gathered and suggestions given, if any. The training diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.

Internship Diary/workbook and Internship Report should be submitted by the student along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary / workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries.
- Adequacy & quality of information recorded
- Data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report:

The report shall be presented covering following recommended fields but limited to:

- Title/Cover Page
- Internship completion certificate.
- Internship Place Details- Company background-organization and activities/Scope and object of the study / personal observation.
- Index/Table of Contents
- Introduction
- Title/Problem statement/objectives
- Motivation/Scope and rationale of the study
- Methodological details
- Results / Analysis /inferences and conclusion
- Suggestions / Recommendations for improvement to industry, if any
- Attendance Record
- List of reference (Library books, magazines and other sources)

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Exit Course Syllabus: Second Year (S.Y. B. Tech.) Mechanical Engineering w.e.f. AY:2023-2024															
Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
		TH	PR	TUT	Activity	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
EME23201	Skill Based Courses (Online/Offline)		4		10			20		30			2		
EME23202	Mini Project		4		10			20		30			2		
EME23203	Internship		25		50			50		30			4		
Total					70			90		90			8		

Skill Based Courses (Online/Offline)	
EME23201 – A	Computer Aided Manufacturing (Offline)
EME23201 - B	Automation in Manufacturing (Online)
EME23201 - C	Manufacturing Systems Technology I & II (Online)
EME23201 - D	Mechanics of Machining (Online)

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EME23201 Skill Based Courses Online / Offline – S.Y. B. Tech Exit		
Teaching Scheme:	**Credits:02**	**Examination Scheme:**
PR: 04 Hrs/Week		**Course Activity: 10 Marks**
		Term Work: 20 Marks
		Oral Exam: 30 Marks

Complete any one course from the following courses.

Offline Skill Based Course

1. Computer Aided Manufacturing (EME23201 – A)

COURSE OBJECTIVES:

This course covers fundamentals and concepts of CNC machining centers, NC part programming, Programming through CAD/CAM (Master CAM), and Maintenance and Troubleshooting the CNC machine tools. This course offers more hands-on experience through which the participants will be developing CNC programs and machining complicated shapes by using the CNC machine tools.

COURSE OUTCOMES:

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

- Understand fundamentals of NC/CNC
- Learn and Write NC Part Programming
- Learn NC Programming through CAD/CAM
- Hands –on experience on MasterCAM
- Learn Tooling for NC/CNC
- Understand machines like Chucking and Turning Centres, Machining Centres
- Learn Maintenance and Trouble Shooting of CNC Machine Tools

SYLLABUS

Students have to perform any 6 Practical's from following list (Assignments)

1. Introduction to CNC Machine and Part programming
2. Simulation of different part-programs
3. Writing and execution of part programs for CNC Lathe Machine
4. Writing and execution of part programs for CNC Milling Machine
5. Assembly and dis-assembly of a CNC Trainer kit
6. Study of Flexible manufacturing systems (FMS)
7. Robot programming for material handling system
8. Circuit design for pneumatic systems used in Automation – Part 1
9. Circuit design for pneumatic systems used in Automation – Part 2

Text Books:

1. Cnc And Vmc Programming by Avinash S Ladage, 4th ed. Padmavati Prakashan, 2008.
2. Cnc Machines by Adithan M; Pabla B S, New Age International, 2009.

Reference Book:

1. Cnc Programming Principles And Application by Mattson Mike, Cengage Learning, 2009.

Online Skill Based Courses

Sr. No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	EME23201 - B	Automation in Manufacturing	Prof. Shrikrishna N. Joshi	IIT Guwahati	12 weeks	3
2	EME23201 - C	Manufacturing Systems Technology I & II	Prof. Shantanu Bhattacharya	IIT Kanpur	12 Weeks	3
3	EME23201 - D	Mechanics Of Machining	Prof. Uday S. Dixit	IIT Guwahati	8 Weeks	2

Online Skill Based Courses Links: -

1. EME23201 – B: - https://onlinecourses.nptel.ac.in/noc20_me58/preview
2. EME23201 – C: - https://onlinecourses.nptel.ac.in/noc20_me49/preview
3. EME23201 – D: - https://onlinecourses.nptel.ac.in/noc23_me16/preview

EME23202 Mini Project – S.Y. B. Tech Exit		
Teaching Scheme:	**Credits:02**	**Examination Scheme:**
PR: 04 Hrs/Week		**Course Activity: 10 Marks**
		Term Work: 20 Marks
		Oral Exam: 30 Marks

Course Objectives:

• To understand the —Product Development Process" including budgeting through Mini Project.

• To plan for various activities of the project and distribute the work amongst team members.

• To develop student 's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.

• To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcome:

On completion of the course, student will be able to

CO1: Understand, plan and execute a Mini Project with team.

CO2: Implement Designing (Modelling), Manufacturing, testing, and troubleshooting etc.

CO3: Prepare a technical report based on the Mini project.

CO 4: Deliver technical seminar based on the Mini Project work carried out.

- Execution of Mini Project

• Project designs ideas can be necessarily adapted from recent issues of automation, robotics, manufacturing, thermal area magazines application notes from well-known device manufacturers may also be referred.
• Use of Hardware devices/components is mandatory.
• Modelling of system on any CAD tool is mandatory.
• Assembly of components and enclosure design is mandatory.

B: Selection: Domains for projects may be from the following, but not limited to:

- Robotics (RPA)
- 3-D Printing
- Hydraulics & Pneumatics
- AI-ML in Mechanical Systems
- Design (Mechanisms)

- Thermal
- Manufacturing

Report writing: A project report with following contents shall be prepared:

1. Title
2. Specifications
3. Block Diagram
4. Circuit Diagram (If required)
5. Selection of components, calculations
6. Simulation Results
7. Modelling
8. Testing Procedures (If required)
9. Enclosure Design (If required)
10. Test Results & Conclusion
11. References

EME23203 Internship – S.Y. B. Tech Exit		
Teaching Scheme:	**Credits:04**	**Examination Scheme:**
PR: 25 Hrs/Week		**Course Activity: 50 Marks**
		Term Work: 50 Marks
		Oral Exam: 30 Marks

Course Objective:

- Expose Students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Expose students to the engineer's responsibilities and professional ethics from social, economic and administrative view.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Course Outcomes: On completion of the internship, learner will be able to –

- **CO1:** To develop professional competence through internship.
- **CO2:** To apply academic knowledge in a personal and professional environment.
- **CO3:** To build the professional network and expose students to future employees.
- **CO4:** Apply professional and societal ethics in their day-to-day life.
- **CO5:** To become a responsible professional having social, economic and administrative considerations.
- **CO6:** To make own career goals and personal aspirations.

Guidelines to the students:

Any absenteeism by students during their internship should be informed immediately to the mentor/reporting manager and the HOD. No special considerations will be accepted. Student cannot take leave fest activities. The monthly attendance should be duly submitted to the HOD by the student.

Internship Diary / Internship Workbook:

Student must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The student should record in the daily training diary account of the observations, impressions, information gathered and suggestions given, if any. The training

diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.

Internship Diary/workbook and Internship Report should be submitted by the student along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary / workbook may be evaluated on the basis of the following criteria:

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Internship Report:

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Exit Course Syllabus: Third Year (T.Y. B. Tech.) Mechanical Engineering															
w.e.f. AY:2023-2024															
Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
		TH	PR	TUT	Activity	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
EME23301	Skill Based Courses (Online/Offline)		4		10			20		30			2		
EME23302	Mini Project		4		10			20		30			2		
EME23303	Internship		25		50			50		30			4		
Total					70			90		90			8		

Skill Based Courses (Online/Offline)	
EME23301 – A	Computer Aided Engineering (Offline)
EME23301 - B	Finite Element Method and Computational Structural Dynamics (Online)
EME23301 - C	Basics of Finite Element Analysis-I (Online)
EME23301 - D	Finite Element Method (Online)

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Baramati

EME23301 Skill Based Courses Online / Offline – T.Y. B. Tech Exit		
Teaching Scheme:	**Credits:02**	**Examination Scheme:**
PR: 04 Hrs/Week		**Course Activity: 10 Marks**
		Term Work: 20 Marks
		Oral Exam: 30 Marks

Complete any one course from the following courses.

Offline Skill Based Courses

1. Computer Aided Engineering (EME23301 – A)

COURSE OBJECTIVES:

1. UNDERSTAND the basic concepts of Computer Aided Engineering (CAE) and CHARACTERISTICS of various elements required for analysis.
2. NURTURE students about the discretization process and criteria for quality mesh.
3. UNDERSTAND the approaches of Finite Element Method (FEM) and to find displacement and stresses over the body.
4. DEVELOP the knowledge and skills needed to effectively evaluate the results using Finite Element Analysis (FEA).

COURSE OUTCOMES:

On completion of the course, learner will be able to
CO1: DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.
CO2: APPLY the various meshing techniques for better evaluation of approximate results.
CO3: APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.
CO4: ANALYZE and APPLY various numerical methods for different types of analysis.

SYLLABUS

The student shall complete any 6 activities of the following activities as a Practical using any commercial FEA software or open-source software's (Assignments)
1. 1D Bar Element – Structural Linear Analysis
2. Truss Analysis using 1D Element
3. Plate/Shell Element – Structural Linear and Non-Linear Analysis
4. Beam Element – Non-Linear Buckling Analysis
5. Thermal Analysis – Static/Transient Analysis
6. Coupled Analysis- (Structural + Thermal)
7. Analysis of Machine Component using 3D Elements
8. Non-Linear Analysis of Assembly using Contact Elements
9. Modal Analysis – Spring -Mass system, simply supported/Cantilever beam, etc.

Text Books:

1. Gokhale N. S., Deshpande S. S., Bedekar S. V. and Thite A. N., Practical Finite Element Analysis, Finite to Infinite, Pune, 1st Edition, 2008.

2. S. S. Bhavikatti, Finite Element Analysis, New Age International Publishers, Third Edition, 2015.
3. Chandrupatla T. R. and Belegunda A. D., Introduction to Finite Elements in Engineering, Prentice Hall India, 2002.

Reference Book:

1. K. J. Bathe, Finite Element Procedure, Prentice-Hall of India (P) Ltd., New Delhi, 1996.
2. Cook R. D., Finite Element Modeling for Stress Analysis, John Wiley and Sons Inc, 1995.
3. G.R. Liu S. S. Quek, The Finite Element Method- A Practical Course, Butterworth Heinemann, 2013.

Online Skill Based Courses

Sr. No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	EME23301 - B	Finite Element Method and Computational Structural Dynamics	Prof. Manish Shrikhande	IIT Roorkee	12 Weeks	3
2	EME23301 - C	Basics of Finite Element Analysis-I	Prof. Nachiketa Tiwari	IIT Kanpur	8 Weeks	2
3	EME23301 - D	Finite Element Method	Prof. Biswanath Banerjee, Prof. Amit Shaw	IIT Kharagpur	12 Weeks	3

Online Skill Based Courses Links:-

1. EME23301 – B: - https://onlinecourses.nptel.ac.in/noc21_ce62/preview
2. EME23301 – C: - https://onlinecourses.nptel.ac.in/noc21_me109/preview
3. EME23301 – D: - https://nptel.ac.in/courses/112105308

EME23302 Mini Project – T.Y. B. Tech Exit		
Teaching Scheme:	**Credits:02**	**Examination Scheme:**
PR: 04 Hrs/Week		**Course Activity: 10 Marks**
		Term Work: 20 Marks
		Oral Exam: 30 Marks

Course Objectives:

• To understand the —Product Development Process" including budgeting through Mini Project.

• To plan for various activities of the project and distribute the work amongst team members.

• To develop student 's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.

• To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcome:

On completion of the course, student will be able to

CO1: Understand, plan and execute a Mini Project with team.

CO2: Implement Designing (Modelling), Manufacturing, testing, and troubleshooting etc.

CO3: Prepare a technical report based on the Mini project.

CO 4: Deliver technical seminar based on the Mini Project work carried out.

- Execution of Mini Project

• Project designs ideas can be necessarily adapted from recent issues of automation, robotics, manufacturing, thermal area magazines application notes from well-known device manufacturers may also be referred.

• Use of Hardware devices/components is mandatory.

• Modelling of system on any CAD tool is mandatory.

• Assembly of components and enclosure design is mandatory.

B: Selection: Domains for projects may be from the following, but not limited to:

- Robotics (RPA)
- 3-D Printing
- Hydraulics & Pneumatics
- AI-ML in Mechanical Systems
- Design (Mechanisms)

- Thermal
- Manufacturing

Report writing: A project report with following contents shall be prepared:

1. Title
2. Specifications
3. Block Diagram
4. Circuit Diagram (If required)
5. Selection of components, calculations
6. Simulation Results
7. Modelling
8. Testing Procedures (If required)
9. Enclosure Design (If required)
10. Test Results & Conclusion
11. References

EME23303 Internship – T.Y. B. Tech Exit		
Teaching Scheme:	**Credits:04**	**Examination Scheme:**
PR: 25 Hrs/Week		**Course Activity: 50 Marks**
		Term Work: 50 Marks
		Oral Exam: 30 Marks

Course Objective:

- Expose Students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Expose students to the engineer's responsibilities and professional ethics from social, economic and administrative view.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Course Outcomes: On completion of the internship, learner will be able to –

- **CO1:** To develop professional competence through internship.
- **CO2:** To apply academic knowledge in a personal and professional environment.
- **CO3:** To build the professional network and expose students to future employees.
- **CO4:** Apply professional and societal ethics in their day-to-day life.
- **CO5:** To become a responsible professional having social, economic and administrative considerations.
- **CO6:** To make own career goals and personal aspirations.

Guidelines to the students:

Any absenteeism by students during their internship should be informed immediately to the mentor/reporting manager and the HOD. No special considerations will be accepted. Student cannot take leave fest activities. The monthly attendance should be duly submitted to the HOD by the student.

Internship Diary / Internship Workbook:

Student must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The student should record in the daily training diary account of the observations, impressions, information gathered and suggestions given, if any. The training

diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.

Internship Diary/workbook and Internship Report should be submitted by the student along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary / workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries.
- Adequacy & quality of information recorded
- Data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report:

The report shall be presented covering following recommended fields but limited to:

- Title/Cover Page
- Internship completion certificate.
- Internship Place Details- Company background-organization and activities/Scope and object of the study / personal observation.
- Index/Table of Contents
- Introduction
- Title/Problem statement/objectives
- Motivation/Scope and rationale of the study
- Methodological details
- Results / Analysis /inferences and conclusion
- Suggestions / Recommendations for improvement to industry, if any
- Attendance Record
- List of reference (Library books, magazines and other sources)

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