NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus
For

Bachelor of Technology
Mechanical Engineering

Second Year

(Effective from the Session: 2025-26)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)
Bachelor of Technology
Mechanical Engineering

Evaluation Scheme
SEMESTER-III

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods		Evaluation Schemes					End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSCC0301	Employability Skill Development - I	Mandatory	2	0	0	60	40	100				100	2
2	BASL0301N	Technical Communication	Mandatory	2	0	0	30	20	50		50		100	2
3	BME0301N	Engineering Mechanics & Strength of Materials	Mandatory	3	1	0	30	20	50		100		150	4
4	BME0305	Material Science	Mandatory	3	0	0	30	20	50		100		150	3
5	BME0306	Thermodynamics and Heat Transfer	Mandatory	3	0	0	30	20	50		100		150	3
6	BME0304	Manufacturing Science & Technology	Mandatory	3	0	0	30	20	50		100		150	3
7	BME0356	Thermodynamics and Heat Transfer Lab	Mandatory	0	0	2				25		25	50	1
8	BME0352	Computer Aided Modelling Lab	Mandatory	0	0	2				25		25	50	1
9	BME0351	Strength of Materials & Material Characterization Lab	Mandatory	0	0	2				25		25	50	1
10	BME0355	Computer Aided Manufacturing	Mandatory	0	0	6				50		100	150	3
11	BME0359X	Social Internship	Mandatory	0	0	2				50			50	1
12	BNC0302/ BNC0301	Environmental Science / Artificial Intelligence and Cyber Ethics	Compulsory Audit	2	0	0	30	20	50				50	NA
		*Massive Open Online Courses (For B.Tech. Hons. Degree)												
		TOTAL											**1150**	**24**

*** List of MOOCs Based Recommended Courses for Second year (Semester-III) B. Tech Students**

Sr. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0054	Advanced Writing	Infosys Wingspan (Infosys Springboard)	24 h 6 m	1.5
2	BMC0032	Cyber Security Foundation	Infosys Wingspan (Infosys Springboard)	11h 5m	0.5

PLEASE NOTE: -

- **A 3-4 weeks Internship shall be conducted during summer break after semester-II and will be assessed during semester-III**
- **Compulsory Audit (CA) Courses (Non-Credit - BNC0301/BNC0302)**
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - The total and obtained marks are not added in the grand total.

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
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Bachelor of Technology
Mechanical Engineering

Evaluation Scheme
SEMESTER-IV

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BASCC0401	Employability Skill Development - II	Mandatory	2	0	0	60	40	100				100	2
2	BAS0405	Probability, Statistics and Complex Analysis	Mandatory	3	1	0	30	20	50		100		150	4
3	BME0403	Measurement and Metrology	Mandatory	3	0	0	30	20	50		100		150	3
4	BME0402	Computer Integrated Manufacturing	Mandatory	3	0	0	30	20	50		100		150	3
5	BME0404	Fluid Mechanics & Machines	Mandatory	3	0	0	30	20	50		100		150	3
6		Department Elective - I	Department Elective	3	0	0	30	20	50		100		150	3
7	BME0453	Measurement and Metrology Lab	Mandatory	0	0	2				25		25	50	1
8	BME0454	Fluid Mechanics & Machines Lab	Mandatory	0	0	2				25		25	50	1
9	BME0455	Machine Design and Application of FEA	Mandatory	0	0	6				50		100	150	3
10	BCSCC0452	Problem Solving Approaches	Mandatory	0	0	2				50			50	1
11	BME0459	Mini Project	Mandatory	0	0	2				50			50	1
12	BNC0402/ BNC0401	Environmental Science / Artificial Intelligence and Cyber Ethics	Compulsory Audit	2	0	0	30	20	50				50	NA
		*Massive Open Online Courses												
		Total											**1200**	**25**

*** List of MOOCs Based Recommended Courses for Second year (Semester-IV) B. Tech Students**

S. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0050	CATIA V5 - Computer Aided Design (CAD)	Infosys Wingspan (Infosys Springboard)	42h 30m	3.5
2	BMC0034	Finite Elements Analysis	Infosys Wingspan (Infosys Springboard)	9h 52 m	0.5
3	BMC0033	Introduction to AI	Infosys Wingspan (Infosys Springboard)	6h 18m	0.5

PLEASE NOTE: -

- **A 3-4 weeks Internship shall be conducted during summer break after semester-IV and will be assessed during Semester-V**
- **Compulsory Audit (CA) Courses (Non-Credit - BNC0401/BNC0402)**
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - The Total and obtained marks are not added in the Grand Total.

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

List of Departmental Electives

Sl. No.	Subject Codes	Subject Name	Types of Subjects	Bucket Name	Branch	Semester
1	BME0412	Factory Automation	Department Elective - I	Industry 4.0(Robotics and Automation)	ME	IV
2	BME0411	Automotive Engineering	Department Elective - I	Automotive Engineering	ME	IV
3	BME0413	Operations Management	Department Elective - I	Supply Chain Management	ME	IV

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
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A student will be eligible to get Under Graduate degree with Honor's only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Course Code: BCSCC0301	Course Name: Employability Skill Development -I	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		2	0	0	2

Pre-requisite: Programming Language C

Course Objectives: This course introduces computer system fundamentals, basic mathematics for computing, and software development principles. It emphasizes algorithm design and C++ programming skills. Through hands-on practice and project-based learning, students develop problem-solving abilities and teamwork while creating real-world applications, mini-games, and simulations, enhancing both technical and collaborative competencies

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply sets, relations, functions to computational problem-solving	K3
CO2	Understand and implement the steps in the software development life cycle using logical reasoning and flowcharts.	K3
CO3	Design and develop small-scale software projects or games using structured programming and project-based approaches.	K6
CO4	Collaborate in teams to plan, develop, and present a complete software project, demonstrating problem-solving and communication skills.	K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2				2						
CO2	3	3	3	2				2						
CO3	3	3	3	2				2						
CO4	3	3	3	3				2						

Course Contents / Syllabus

Module 1	Foundations of Computer Systems and Mathematical Concepts	8 hours

Computer System Fundamentals: Introduction to Assembler, Compiler, Interpreter, Role of Loader and Linker in program execution. **Mathematical Foundations for Computing:** Sets, Relations, and Functions: definitions and applications, Principle of Mathematical Induction and its use in proofs.

Module 2	Software Development Fundamentals	8 hours

Introduction to Software Development Life Cycle, Step-by-step solution to simple problems, Developing logic/flowchart/pseudocode, simple games, puzzles, Step-wise refinement and Procedural Abstraction

Module 3	Project-Based Learning	8 hours

Introduction to the basics of C++, Implementation of control structures through practical tasks such as creating a number guessing game using loops and conditions, Functions and scope demonstrated by developing a menu-driven applications using user-defined functions, implement simple logic-based games including puzzles, tic-tac-toe, Hangman etc., the concept of pointers and dynamic memory allocation is introduced by creating a dynamic leader board to store player scores. File handling in C++ to save high scores or game states to external files.

Module 4	Project/Game Development	8 hours

Project Planning & Development (Teams, roles, idea pitching, develop C++ game or simulation), Mini Project, Project Demonstration and Review

	Total Lecture Hours	40 hours

Textbook:

S.No	Book Title with publication agency & year	Author

Reference Books:

S.No	Book Title with publication agency & year	Author
1	A Project-Based Introduction to Programming	Access Point Publishing
2	Programming: Principles and Practice Using C++	Bjarne Stroustrup
3	Effective Modern C++	Scott Meyers

TA* - Teacher Assessment marks on the basis of defined Teaching Methodologies like Quiz, Assignment, Video Assignment, Seminar, Group discussion, PBL or any other defined by respective faculty members and may vary to subject-wise and faculty-wise

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
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School of Mechanical Engineering

Course Code: BASL0301N	Course Name: Technical Communication	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		**2**	**0**	**0**	**2**

Pre-requisite: Intermediate level (CEFR) and above

Course Objectives: Demonstrate effective verbal and non-verbal communication skills in diverse professional settings, including meetings, presentations, and interpersonal interactions.
2. Develop and apply clear, concise, and audience-appropriate written communication, such as emails, letters, memos, resume', using correct grammar, tone, and format.
3. Adapt communication style based on cultural, organizational, and situational contexts to foster inclusive and respectful professional relationships.
4. Employ digital communication tools and platforms (e.g., video conferencing, business messaging apps) responsibly and effectively in remote or hybrid work environments.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Comprehend the principles and functions of technical communication	K3
CO2	Write for specific audience and purpose to fulfil the provided brief	K3
CO3	Recognize and produce different kinds of technical documents.	K3
CO4	Apply effective speaking skills to efficiently carry out official discourses.	K3
CO5	Demonstrate their understanding of communication through digital media.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**3**	**1**			
CO2	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**1**			
CO3	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**1**			
CO4	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**1**			
CO5	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**1**			

Course Contents / Syllabus

Module 1	Introduction to Technical Communication	**8 hours**
Technical Communication: Definition, Process, Types, Levels, and Flow; Barriers to Technical Communication: emphasis on gender neutral language and cultural sensitivity; Significance of audience in technical communication		
Module 2	Technical Writing 1	**8 hours**
Technical writing skill: characteristics, examples; Business letters/emails: Content organization, Tone and intent; Agenda & Minutes of Meetings		
Module 3	Technical Writing 2	**8 hours**
Job application, Resume'; Report, proposal; Technical paper: Abstract; Ethical Writing: Copy Editing, Referencing and Plagiarism		
Module 4	Public Speaking	**8 hours**
Components of effective speaking: Simplicity, order, balance in arranging ideas. Importance of KOPPACT; Appearing for a job interview: FAQs; Telephonic & Online Interviews		
Module 5	Virtual/Remote Communication	**8 hours**
Remote work: online platforms; Video conferencing; Virtual etiquette: email ids, usernames; Writing Blogs & creating Vlogs		
	Total Lecture Hours	**40 hours**

Textbook:

S.No	Book Title with publication agency & year	Author
1	1. Technical Communication – Principles and Practices, 4th Edition by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2022, New Delhi.	Meenakshi Raman & Sangeeta Sharma

Reference Books:

S.No	Book Title with publication agency & year	Author
1	Technical Communication, 15th Edition, Pearson, 2021.	John M. Lannon & Laura J. Gurak
2	Spoken English- A Manual of Speech and Phonetics (5th Edition) Orient Blackswan,	by R K Bansal & J B Harrison

	2024, New Delhi.	
3	Business Correspondence and Report Writing (6th Edition), Tata McGraw Hill & Co. Ltd., 2020, New Delhi.	by Prof. R C Sharma, Krishna Mohan, and Virendra Singh Nirban
4	Intercultural Communication in Virtual Exchange Press, 2024.	Francesca Helm, Cambridge Univ
NPTEL/ Youtube/ Faculty Video Link:		
1	Unit 1 https://onlinecourses.nptel.ac.in/noc24_ge37/preview	
2	Unit 2 https://archive.nptel.ac.in/courses/109/106/109106094/	
3	Unit 3 https://www.youtube.com/watch?v=kOJlwMJxEG0&t=8s	
4	Unit 4 https://www.youtube.com/watch?v=Sg7Q_dC_fWU&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb	
5	Unit 5 https://www.youtube.com/watch?v=ymLFJDpjgCk&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb&index=6	

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Mechanical Engineering

Course Code: BME0301N	Course Name: Engineering Mechanics & Strength of Materials	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		3	1	0	4

Pre-requisite: Engineering Mathematics I & II and Physics.

Course Objectives: This course aims to provide a foundational understanding of the mechanics of deformable bodies. It introduces the analysis of force systems and equilibrium in two dimensions, followed by the study of stress-strain relationships under various loading conditions. The course focuses on the analysis of beams for shear force, bending moment, slope, and deflection, and extends to torsion in circular shafts and buckling of columns. It also covers the behavior of thin and thick-walled cylinders under internal and external pressures, enabling students to apply mechanical principles to practical engineering problems.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the concept of force systems and apply the force equilibrium condition to solve various two-dimensional problems.	K4
CO2	Understand the concept of stress and strains and apply concept of principle stress and strains stress and strain under different loading conditions.	K4
CO3	Analyze the beams and determine stresses, slope, and deflection of the transversely loaded members	K3
CO4	To understand the basic concept and analysis of shaft subjected to torsion and apply the concepts of stresses and strain in solving problems buckling of columns.	K4
CO5	Understand the concept of thin and thick cylinders and apply the concepts of stresses and strain in solving problems related to thin and thick cylinders.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS03
CO1	3	3	2	1						1	1	3	2	
CO2	3	3	2	1						1		3	2	
CO3	3	3	2	1						1	1	3	2	
CO4	3	3	2	1						1	1	3	2	
CO5	3	3	2	1						1		3	2	

Course Contents / Syllabus

Module 1	Force system & Truss Analysis	8 hours

Overview of force system: Review of two-dimensional force systems, free body diagram, laws of friction, equilibrium analysis of simple systems involving friction.

Trusses: Introduction, simple truss and solution of simple truss, methods of joints and methods of sections.

Module 2	Simple, Compound and Principal Stresses	8 hours

Simple stress and strains: Introduction to simple stress, strain, shear stress, hooks law, elastic constants, numerical problems on hooks law, thermal stresses, strain energy.

Principle stress and strain stress on inclines sections, state of plane stress, principal stress and strain, maximum shear stress, Mohr's circle for plane stress.

Module 3	Beams	8 hours

Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.

Bending of beams: Theory of Pure Bending, normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams. Deflection of beams: Differential equation of the elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams.

Module 4	Torsion and Column analysis	8 hours

Torsion: combined bending and torsion of solid and hollow shafts, torsion of thin-walled tubes.
Stability of columns: Buckling and stability, slenderness ratio, combined bending, and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin-ended columns, effect of end conditions on column buckling, Ranking Gordon formulae.

Module 5	**Cylinders & Spheres**	**8 hours**

Thin cylinders & spheres: Introduction, difference between thin-walled and thick-walled pressure vessels, thin-walled spheres and cylinders, hoop and axial stresses and strain, and volumetric strain.
Thick cylinders: Radial, axial, and circumferential stresses in thick cylinders subjected to internal or external pressures.

	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	Strength of materials	R. K. Rajput
2	Strength of Materials	R. K. Bansal
3	Engineering Mechanics	Nelson

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Introduction to Solid Mechanics	Shames
2	Mechanics of Material	Gere
3	Mechanics of Materials	Beer, Johnston

NPTEL/ Youtube/ Faculty Video Link:

Module 1	NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics
Module 2	NPTEL :: Mechanical Engineering - Strength of Materials
Module 3	NPTEL :: Mechanical Engineering - Strength of Materials
Module 4	NPTEL :: Mechanical Engineering - Strength of Materials
Module 5	NPTEL :: Mechanical Engineering - Strength of Materials

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

Course Code: BME0305	Course Name: Material Science	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		3	0	0	3

Pre-requisite: NA

Course Objectives: The student cover various aspects of advance engineering materials. Firstly, an investigation into the Phase diagram will be conducted, studying the relationships between phases of materials under different conditions. Next, an exploration of strengthening processes, including heat treatment techniques, will be undertaken to enhance material properties. Additionally, there will be a focus on the study of new materials and their diverse applications. Another area of interest will be the analysis of composite materials and their unique characteristics. Finally, the research will encompass the study of Material characterization and Metallography, providing insights into the structure and properties of materials.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Analyze the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy.	K4
CO2	Understand and apply heat treatment techniques, TTT diagrams, and diffusion principles for material properties.	K4
CO3	Interpret features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.	K3
CO4	Understand the fundamentals of composite and its applications.	K4
CO5	Interpret Materials characterization and Metallographic techniques such as X-Ray diffraction, scanning electron microscopy.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS03
CO1	3	2	-	-							1	3		1
CO2	3	3	2	2	2						2	3	2	1
CO3	2	1	2		2	1	2				2	2	3	3
CO4	2	1	3		2	1	2				2	2	2	2
CO5	3	2		3	3						2	3	3	2

Course Contents / Syllabus

Module 1 — **Properties of Materials & Phase Diagram** — **8 hours**

Mechanical Properties: Stress-strain response of metallic, ceramic and polymer materials, yield strength, tensile strength and modulus of elasticity, toughness, plastic deformation, hardenability, fatigue, creep and fracture.
Phase Diagram: Solid solutions, Solubility limit, Gibb's phase rule, binary phase diagrams, intermetallic compounds, iron-carbon phase diagram, cold and hot working of metals, recrystallization, and grain growth. Microstructure, properties, and applications of ferrous and nonferrous alloys.

Module 2 — **Heat Treatment and Diffusion** — **8 hours**

Heat treatment: Various types of heat treatments such as Annealing, Normalizing, Quenching, Tempering (Aus- tempering, Martempering), and various case hardening processes. Time Temperature Transformation (TTT) diagram.
Diffusion: Introduction to Diffusion, Types of diffusion, Fick's laws, Factors Affecting Diffusion, Diffusion in Sintering, Doping of semiconductors, Diffusion-based surface treatments.

Module 3 — **Smart and Advanced Materials** — **8 hours**

Smart materials: classification, piezo electric materials, Rheological materials, chromic materials, thermo- responsive materials magneto strictive materials, Electrostrictive materials, Nanomaterials, Biomaterials and applications, super-alloys, shape memory alloys, exhibiting ferroelectric, opto-electric, semi-conductive,
photoconductive, and superconductive properties, and applications.

Module 4	**Composite Materials**	**8 hours**
Composite: Introduction to Composite, classification of composites, Application of composite, Types of matrix and reinforcements, Fabrication methods of composite materials.		
Module 5	**Material characterization and Metallography**	**8 hours**
Materials characterization and Metallographic techniques: X-Ray diffraction, scanning electron microscopy, transmission electron microscopy, atomic force microscopy, scanning tunnelling microscopy, atomic absorption spectroscopy, and differential scanning calorimetry. Introduction to NDT and various NDT Techniques.		
	Total Lecture Hours	**40 hours**

Textbook:

S.No	Book Title with publication agency & year	Author
1	Materials Science and Engineering	William D., Jr. Callister and David G. Rethwisch
2	A Textbook of Material Science	R. K. Rajput
3	Introduction to Material Science for Engineers	F. Shackelford

Reference Books:

S.No	Book Title with publication agency & year	Author
1	Experiments in Materials Science and Engineering	Tariq A. Khraishi and Marwan S. Al-Haik
2	Materials Science and Engineering: A First Course	V. Raghavan
3	Fundamentals of Metal Cutting and Machine Tools	B. L. Juneja Sekhon

NPTEL/ Youtube/ Faculty Video Link:

Module 1	NPTEL :: Metallurgy and Material Science - NOC:Introduction to Materials Science and Engineering
Module 2	NPTEL :: Metallurgy and Material Science - NOC:Heat Treatment and Surface Hardening - I NPTEL :: Metallurgy and Material Science - Phase Transformations and Heat Treatment
Module 3	NPTEL :: Metallurgy and Material Science - NOC:Advanced Materials and Processes NPTEL :: Mechanical Engineering - NOC:Smart Materials and Intelligent System Design
Module 4	NPTEL :: Mechanical Engineering - NOC:Introduction To Composites NPTEL :: Mechanical Engineering - NOC:Manufacturing of Composites
Module 5	NPTEL :: Metallurgy and Material Science - NOC:Material Characterization

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Mechanical Engineering

Course Code: BME0306	**Course Name: Thermodynamics and Heat Transfer**	**L**	**T**	**P**	**C**
Course Offered in: B.Tech. Second Year Sem-III ME		**3**	**0**	**0**	**3**

Pre-requisite: Basic Knowledge of Physics and Mathematics

Course Objectives: To provide students with a comprehensive understanding of the principles and laws of thermodynamics and their applications in engineering and learn the concept of heat transfer in different fields of engineering. Learn about the application of Fin in Automobile and other electrical equipment. Learn about free and forced convection. Learn about radiation and how to minimize the effect of radiation. Learn about the application of heat exchanger in industry.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Demonstrate thermodynamic systems, processes and properties and analyze Zeroth, 1st, and 2nd laws of thermodynamics.	K3
CO2	Analyze and apply laws of thermodynamics with principles of entropy, availability and properties of pure substances.	K4
CO3	Demonstrate the modes of heat transfer and analyze steady and unsteady heat transfer with its industrial applications.	K3
CO4	Analyze the theoretical and numerical approach of free, forced convection and radiation heat transfer with its application to industry.	K4
CO5	Design and analyze heat exchangers and different industrial applications of thermodynamics.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	1	1	1	1	1	1	1	2	1	
CO2	3	3	2	2	1	1	1	1	2	1	1	2	1	
CO3	3	3	2	2	1	1	1	1	1	1	1	2	1	
CO4	3	3	2	2	1	1	1	1	2	1	1	2	1	
CO5	3	3	2	2	1	1	1	1	1	1	1	2	1	

Course Contents / Syllabus

Module 1	**Basic Concepts and laws of thermodynamics**	**8 hours**

Basic Concepts: Concept of System and Surrounding, State, Property, Process.
Zeroth law of thermodynamics: Concept of equality of Temperature First law of thermodynamics: Concept of Heat and Work.
First law of thermodynamics: First law analysis for open and closed system, Limitations of first law of thermodynamics, PMM -I. SFEE and its applications.

Second law of thermodynamics: Concept of Heat engines, Heat pump and Refrigerator, Kelvin Planck, and Clausius statement of second law of thermodynamics, Carnot cycle, Carnot theorem.

Module 2	**Principles of entropy, availability, and properties of pure substances**	**8 hours**

Entropy: Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes. Properties of steam and Rankine cycle: Property of Pure Substance(steam), Saturation states, Sub - cooled liquid state, Superheated vapour state, Phase transformation process of water, Steam -Tables & Mollier chart.

Module 3	**Steady and unsteady State Conduction**	**8 hours**

Modes of Heat Transfer: Conduction, convection and radiation.
Conduction: General differential heat conduction equation in the rectangular, cylindrical coordinate systems Steady State One-dimensional Heat conduction: Simple and Composite Systems in rectangular, cylindrical

coordinate. Thermal resistance, Critical radius of insulation Transient Conduction: Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only. Fins of uniform cross-sectional area;

Module 4	**Convection and Radiation heat transfer**	**8 hours**

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer;
Natural Convection: Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection Basic radiation concepts; Radiation properties of surfaces; Black body radiation. Radiation exchange between diffuse nonblack bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection;
Absorption and emission in gaseous medium; Solar radiation, Condensation and Boiling.

Module 5	**Applications of thermodynamics and heat transfer**	**8 hours**

Heat Exchangers: Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method.
Boilers: Classifications and working of boilers, boilers mountings and accessories.
Condenser: Classification of condenser, air leakage. Steam and Gas Nozzles, Steam Turbines: Classification of steam turbine.

	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	Engineering Thermodynamics	P.K. Nag
2	Thermodynamics: An Engineering Approach by Michael	Michael A. Boles and Yunus A Çengel
3	Heat and Mass Transfer	Yunus A Çengel
4	A Textbook on Heat Transfer	S.P.Sukhatme
5	Heat and Mass Transfer	R K Rajput

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Fundamentals of Engineering Thermodynamics	Moran M. J. & Shapiro H. N.
2	Fundamentals of Heat and Mass Transfer	Incroperra & DeWitt
3	Heat Transfer by J.P. Holman	J.P. Holman

NPTEL/ Youtube/ Faculty Video Link:

Module 1	https://nptel.ac.in/courses/101104063
Module 2	https://nptel.ac.in/courses/112106419
Module 3	https://nptel.ac.in/courses/112101002
Module 4	https://nptel.ac.in/courses/112101097
Module 5	https://nptel.ac.in/courses/112107256

TA* - Teacher Assessment marks on the basis of defined Teaching Methodologies like Quiz, Assignment, Video Assignment, Seminar, Group discussion, PBL or any other defined by respective faculty members and may vary to subject-wise and faculty-wise

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Mechanical Engineering

Course Code: BME0304	Course Name: Manufacturing Science and Technology	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		3	0	0	3

Pre-requisite: Digital Manufacturing

Course Objectives: Classify manufacturing processes; understand the significance and steps involved in metal casting processes, Design, analyze gating systems for casting and explain different special casting processes, Understand and apply principles concerned with metal forming processes , identify, evaluate different sheet metal forming operations, sheet metal dies, arc welding processes and welding defects, Working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, The concept of abrasive machining process such as grinding and allied machines and broaching , The basic concepts of Computer Numerical Control (CNC) of machine tools and
CNC Programming, The basic concepts of Non-Traditional Manufacturing Methods.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the concept of manufacturing processes, solve the problems based on casting.	K3
CO2	Analyze & solve the problems based on Metal forming processes & understand the concept of powder metallurgy.	K4
CO3	Understand the concept of metal joining processes.	K2
CO4	Analyze the conventional machining processes.	K3
CO5	To analyze the non-traditional machining process & the Abrasive finishing processes.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	1	1	1	1	1	2	3	2	
CO2	3	3	2	2	3	1	1	2	1	2	2	3	2	
CO3	2	2	1	1	3	1	1	1	1	1	3	3	2	
CO4	3	3	2	2	3	1	1	1	1	1	2	3	2	
CO5	3	3	2	3	3	1	1	2	2	2	3	3	2	

Course Contents / Syllabus

Module 1	**Casting & Special Casting Processes**	**8 hours**

Gating and Riser Design for Casting: Elements of Gating System, Types of Gates and gating systems. Pouring time calculations, Top Gating, Bottom Gating and Relation (condition) to Avoid Aspiration Effect.

Design of Risers: Types of Risers, Directional Solidification, Chvorinov's Rule and Caine's method.

Special Casting Processes: CO2 Moulding, Shell Moulding, Investment Casting, Die Casting, Hot and Cold Chamber Processes; Centrifugal casting; Continuous Casting Defects – Types, Causes and Remedies.

Module 2	**Metal Forming Processes & Sheet Metal Forming**	**8 hours**

Forging: Analysis of forging process. Rolling: Types of Rolling mills and Defects in Rolling. Flat Rolling and Terminology. Analysis of rolling process Extrusion: Direct and Indirect Extrusion, Impact Extrusion, Hydrostatic Extrusion, analysis of extrusion process, Defects in Extruded Products. Drawing: Wire drawing, Rod and Tube Drawing. Sheet Metal Forming: Classification of press tool operations; Punch and Die Clearances, Ironing, Coining and Embossing, Lancing, Twisting, Spinning, Stretch forming. Sheet Metal Drawing: Drawing, Cupping and Deep drawing Draw Die Design. Defects in drawing. Sheet Metal Dies: Progressive, Compound and Combination Dies. Bending and Bending
Allowance, Rubber Forming.

Module 3	**Metal Joining Processes**	**8 hours**

Electric Arc Welding: Introduction, Characteristic curves of constant-current and constant voltage, arc welding transformer; Electrodes – consumable and non-consumable electrodes, Functions of coatings on the electrodes, Arc blow. Arc Welding Processes – Shielded metal arc welding (SMAW), Inert Gas Arc Welding – Tungsten
Inert Gas (TIG) welding and Metal Inert Gas (MIG) arc welding, Submerged arc welding (SAW), Resistance welding: Principle and types of resistance welding. Metallurgy of Arc welding: Principal zones in the joint and

typical grain structure, Welding defects. Terminology. Welding Symbols, WPS (Welding Procedure Specifications), PQR (Procedure Qualification Record).

Module 4	**Mechanics of Metal Cutting**	**8 hours**

Tool Engineering: Cutting Tool geometry and definition of principles tool angles of single point cutting tools, Mechanics of Metal Cutting: Features of machining processes, mechanism of chip formation, chip reduction coefficient, force analysis, Merchants circle of cutting forces, expression for shear plane angle and coefficient of friction in terms of cutting forces and tool angles, Merchants theory-original and modified, effect of various parameters on cutting forces, Different types of dynamometers and their operations, Tool life definition, mechanism of tool wear and measurement, preliminary and ultimate feature, factors influencing tool life such as speed, feed, depth of cut, tool material, cutting fluids etc.,
Machinability, factors affecting surface finish.

Module 5	**Unconventional Machining**	**8 hours**

Introduction and Classification of Un-Conventional Machining, Analysis of Un-Conventional Machining: ECM, EDM, USM, LBM and Water and Abrasive Jet Machining.

	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	A Textbook of Manufacturing Technology	R. K. Rajput
2	A Textbook of Production Technology	P.C. Sharma
3	Manufacturing Technology	D. K. Singh
4	Manufacturing Technology - I	Anup Goel

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Manufacturing Technology: Materials, Processes, and Equipment	Helmi A. Youssef, Hassan A. El-Hofy, Mahmoud H. Ahmed
2	Advanced Manufacturing Technologies	Stephen F. Krar, Arthur Gill
3	Manufacturing Technology II	Dr. R. Kesavan, B. Vijaya Ramnath
4	Manufacturing Science	Ghosh, A. K. Mallik

NPTEL/ Youtube/ Faculty Video Link:

Module 1	Mechanical Engineering -NOC: Fundamentals of manufacturing processes
Module 2	Manufacturing Process Technology I & II - Course (nptel.ac.in)
Module 3	Mechanical Engineering - NOC: Fundamental of Welding Science and Technology
Module 4	Mechanical Engineering - NOC: Mechanics of Machining
Module 5	Mechanical Engineering - Advanced Machining Processes
Module 6	Mechanical Engineering - NOC: Non-Traditional Abrasive Machining Processes- Ultrasonic, Abrasive Jet and Abrasive Water Jet Machining

TA* - Teacher Assessment marks on the basis of defined Teaching Methodologies like Quiz, Assignment, Video Assignment, Seminar, Group discussion, PBL or any other defined by respective faculty members and may vary to subject-wise and faculty-wise

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Mechanical Engineering

LAB Course Code: BME0356	**LAB Course Name: Thermodynamics and Heat Transfer Lab**	**L**	**T**	**P**	**C**
Course Offered in: B.Tech. Second Year Sem-III ME		**0**	**0**	**2**	**1**

Pre-requisite: Engineering Mathematics

Course Objectives: To provide practical experience in measuring and analysing thermal properties, heat transfer processes, and fluid flow. Students will conduct experiments, interpret data, and apply theoretical concepts to enhance their understanding of thermodynamic systems and heat transfer mechanisms in real-world applications.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Demonstrate and calculate the heat transfer rate through conduction.	K3
CO2	Demonstrate and calculate the heat transfer rate through convection.	K3
CO3	Demonstrate and calculate the heat transfer rate through radiation, and heat exchanger units.	K3
CO4	Demonstrate and calculate the performance of petrol and diesel engine.	K3
CO5	Demonstrate the complete working of boiler and compounding of turbines.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PS03**
CO1	3	3	1	1	1	1	1	1	2	1	3	3	2	
CO2	3	3	1	1	1	1	1	2	1	1	3	3	3	
CO3	3	3	1	1	1	1	1	1	1	1	2	3	2	
CO4	3	3	1	1	1	1	1	2	2	1	2	2	2	
CO5	3	3	1	1	1	1	1	1	1	1	2	2	2	

List Of Practical's (Indicative & Not Limited To)

1. Conduction – Heat transfer analysis of Composite plane wall
2. Conduction – Heat transfer analysis of Composite cylinder wall
3. Conduction – Heat transfer analysis of Transient heat conduction
4. Conduction – Determination of Thermal conductivity of insulating slab
5. Conduction – Determination of Thermal conductivity of insulating powder
6. Convection –Performance analysis of Pool boiling.
7. Convection - Experiment on heat transfer through Pin fin
8. Convection - Heat Pipe experiment.
9. Radiation- Determination of Stefan-Boltzmann constant
10. Radiation- Determination of Emissivity of a plate
11. Heat exchanger – Performance analysis of Parallel and Counter flow heat exchanger.
12. Heat exchanger - Performance analysis of Plate type heat exchanger.
13. Study of two stroke Petrol Engine and Diesel Engine
14. Study of four stroke Petrol Engine and Diesel Engine
15. To study boilers and their accessories and mountings.
16. To study various types of compounding of turbine.

Total Hours: 30 hrs.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

LAB Course Code: BME0352	LAB Course Name: Computer Aided Modelling Lab	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		**0**	**0**	**2**	**1**

Pre-requisite: CAD and Digital Manufacturing.

Course Objectives: The objective is to equip students with practical skills in using CAD software to create, analyze, and modify 3D models. Students will learn to design complex geometries, perform simulations, and generate technical drawings, preparing them for real-world engineering and design challenges.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply basic concepts and methods from design engineering to explore creative solutions of real-world problems	K2
CO2	Create parts, assemblies, flexible & sheet metal modelling, diagram complex systems and detailed engineering concept drawings.	K2
CO3	Apply industry standards in the sketching, 3D modelling, validation and visualization of the products & assemblies.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS03
CO1	2	1	3	2	2	1	2	1	2	2	1	1	1	1
CO2	2	2	3	2	3	2	1	1	2	2	2	1	1	1
CO3	2	2	3	2	3	2	1	1	2	2	2	1	1	1

List Of Practical's (Indicative & Not Limited To)

1. To draw polygons using a modeling software
2. To draw isometric projections of a given solid using modeling software.
3. Modeling of simple machine components (bracket, flange, nut, and bolt).
4. Modeling of carburetor parts I: body and plate
5. Modeling of carburetor parts II: shaft, arm, and cover
6. Modeling of I.C. engine components I: connecting rod and cylinder block
7. Modeling of I.C. engine components II: piston and crankshaft
8. To assemble pre modelled carburetor parts that are body, plate, shaft, arm, and cover in a CAD software
9. To assemble pre modelled internal combustion engine components that are connecting rod, cylinder block, piston, and crankshaft in a CAD software
10. To place a punch and die form on a Sheetmetal using CAD software.
11. To model a structural component using welding in CAD software
12. To model and force simulation of a structural component.
13. Flow simulation of a fan using CAD software.
14. To create a drawing with different views of a 3D modeled component

Total Hours: 30 hrs.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

LAB Course Code: BME0351	LAB Course Name: Strength of Materials & Material Characterization Lab	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		0	0	2	1

Pre-requisite:

Course Objectives:

The course aims to provide students with practical experience that complements the theoretical aspects of the course by providing with hands-on experience. It allows them to validate theoretical concepts, apply their knowledge to real-world scenarios, develop proficiency in instrumentation and measurements, analyses experimental data, and enhance their technical reporting and communication skills. Ultimately, the practical/lab component prepares students for practical engineering applications and equips them with the necessary skills for success in the field of strength of materials.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand and observe the microstructural study of different materials.	K2
CO2	Observe the effect of heat treatment effect on mechanical properties of metallic specimens.	K2
CO3	Determine the tensile, compressive, shear, flexural, torsional and fatigue strength of metallic.	K3
CO4	Determine the different types of hardness of metallic specimens.	K3
CO5	Observe the effect of impact and corrosion behavior on metallic specimen.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	1	-	-	-	-	2	2	2	
CO2	3	3	2	2	2	2	-	-	-	-	2	2	2	
CO3	3	3	3	3	3	2	-	2	2	2	2	2	2	
CO4	3	3	2	2	3	2	-	2	2	2	2	2	2	
CO5	3	3	2	2	3	3	2	2	2	2	3	2	2	

List Of Practical's (Indicative & Not Limited To)

1. To determine the microstructures of a prepared specimen using optical microscope.
2. Comparative study of microstructures of different specimens of different materials (mild steel, Gray C.I., brass, copper etc.)
3. To Study of heat treatment processes such as annealing, normalizing, quenching, and comparison of properties before and after heat treatment.
4. To determine the tensile strength of metallic specimen on universal testing machine.
5. To determine the tensile strength of polymer specimen on universal testing machine.
6. To determine the compressive strength of metallic specimen on universal testing machine.
7. To determine the shear strength of metallic specimen on universal testing machine.
8. To determine the flexural strength (3-point bending) of metallic specimen on universal testing machine.
9. To determine of torsional strength of a metallic specimen using the torsion testing machine.
10. To determine of fatigue strength of a metallic specimen.
11. To determine the Brinell hardness of materials using hardness testing machine.
12. To determine the Rockwell hardness of materials using hardness testing machine.
13. To Determine the Charpy impact strength of a metallic specimen using impact testing machine.
14. To Determine the Izod impact strength of a metallic specimen using impact testing machine.
15. To study the corrosion and its effects on metallic specimen.

Total Hours: 30 hrs.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

LAB Course Code: BME0355	LAB Course Name: Computer Aided Manufacturing	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		0	0	6	3

Pre-requisite:

The course aims to elucidate conventional and modern manufacturing processes and to make components by using different manufacturing processes

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Demonstrate different Casting and forming operation and make components.	K2
CO2	Demonstrate traditional and computer-controlled machining process to make a component as per the drawing	K2
CO3	Demonstrate welding process and make a component as per the drawing.	K2
CO4	Demonstrate different types of surface finishing processes.	K2
CO5	Demonstrate modern manufacturing processes and make a component as per drawing.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

	CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS03
	CO1	3	2	2	2	3	1	1	2	2	1	2	3	1	3
	CO2	3	2	2	2	3	1	1	2	2	2	3	3	1	2
	CO3	3	2	2	2	3	1	2	2	2	1	2	3	1	3
	CO4	3	2	2	2	3	1	1	2	2	1	2	3	1	2
	CO5	3	3	3	2	3	2	1	2	2	2	3	3	1	3

List Of Practical's (Indicative & Not Limited To)

Hands-on practice on casting process

1.1 Pattern Making by wood working lathe

1.2 Gatting System: - Mould making, Position of riser, runner,

1.3 Casting: - Melting of metal in furnace, pouring of molten metal

1.4. Identification of different casting defects

Hands-on practice on metal forming processes

2.1 Flattening: Use a mallet or a hammer to flatten a sheet metal surface that has become warped or distorted.

2.2 Make a nail using forging process.

2.3 Make a ring using forging process.

2.4 Curling: Use a curling tool or pliers to curl the edge of a sheet metal strip or panel.

2.5 Embossing: Use embossing dies or stamps to create raised designs or patterns on a sheet metal surface.

2.6 Stamping: Use metal stamps and a hammer to stamp letters, numbers, or designs onto a sheet metal surface.

2.7. Piercing: Use a hole punch or drill to create holes of various sizes and shapes in a sheet metal panel

2.8. Examine the influence of heat treatment on the mechanical properties of cold-formed components

Hands-on practice on sheet metal forming

3.1 Analyze the impact of varying blank holding forces on the formability of deep-drawn sheet metal components.

3.2 Study the effect of different lubrication methods on the quality of stretch-formed sheet metal parts.

3.3 Investigate the influence of process parameters on the dimensional accuracy in incremental sheet forming.

3.4 Examine the effect of different tool geometries on the wrinkling behavior in sheet metal hydroforming.

3.5 Edge Forming: Use pliers or a forming tool to create various edge shapes, such as flared, curled, or chamfered edges

3.6 Planishing: Use a planishing hammer or a hammer and dolly to smooth out imperfections or surface irregularities on a sheet metal panel.

3.7 To make a component using Injection Mounding
Hands-on practice on metal cutting processes (Lathe Machine Tools)
4.1 To Perform Plane Turning, Taper Turning, Threading, Grooving, Knurling Chamfering and make a component.
Hands-on practice on metal cutting processes (Drilling Machine Tools)
5.1 Make a hole at different locations using radial drill machine.
Hands-on practice on metal cutting processes (Milling Machine Tools)
6.1 Cut gear teeth on horizontal milling machine through plane indexing method.
6.2 Cut a keyway on vertical milling machine.
Hands-on practice on metal cutting processes (CNC Machine)
7.1 To write a part program for Perform Plane facing, Turning, Taper Turning and Threading operations and make a component
7.2 V-Carving: Use a CNC Router with a V-bit to create decorative V-shaped grooves or carvings on a material.
7.3 Engraving: Use a CNC router to engrave text or designs onto a surface, such as wood or acrylic
7.4 Pocketing: Use a CNC machine to create pockets or recesses in a material, suitable for fitting objects like screws or nuts
7.5 Drilling: Use a CNC machine to drill precise holes in a material at specific locations and depths.
Hands-on practice on metal joining processes and Grinding processes
8.1 To make a Butt, Lap, T Joint by using gas and ARC welding Process
8.2 To make a component by using spot welding
8.3 To make a component by using TIG and MIG welding
8.4 Polishing: Use abrasive compounds or polishing wheels to achieve a smooth and reflective surface finish on a workpiece
8.5 To make a single point cutting tool on tool grinder.
8.6 Study of the effect of grinding wheel conditioning techniques (e.g., dressing, truing) on grinding performance and wheel life
8.7 Material Removal Rate Analysis: Determine the material removal rate achieved by different abrasive machining processes under various parameters.
Hands-on practice on un-conventional machining processes
9.1 LASER Machining: - make a hole in non-conducting materials
9.2 ECM Taper Cutting: Explore the capabilities of ECM for cutting tapered features or workpieces with angled profiles
10. Hands-on practice on 3D printing (Rapid Prototyping)
10.1 Keychain or Key Holder: Design and print a personalized keychain or key holder to showcase the capabilities of 3D printing
10.2 Phone Stand: Print a phone stand to hold your smartphone in a convenient viewing position
10.3 Plant Pot: Print a small plant pot to hold a succulent or small indoor plant.
10.4 Pencil Holder: Design and print a pencil holder to keep your desk tidy.
Total Hours: 30 hrs.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

Course Code: BNC0302	Course Name: Environmental Science	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-III ME		**2**	**0**	**0**	**2**

Pre-requisite: Basic knowledge of biology, chemistry, ecology, geology, mathematics, and understanding of human impacts on natural systems.

Course Objectives: After completion of the course, the student will be able to
understand ecosystems, promote sustainability, address environmental issues, conserve biodiversity, and ensure responsible use of natural resources for future generations.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem, food chains and food webs. Ecological pyramids, biodiversity.	K2
CO2	Understand the different types of natural recourses like food, forest, Minerals and energy and their conservation.	K2
CO3	Understand the different types of pollution, pollutants, their sources, effects and their control methods.	K2
CO4	Understand the basic concepts of sustainable development, Environmental Impact Assessment (EIA) and different acts related to environment	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	3	3	2						
CO2	3	3	2	2	1	3	3	2						
CO3	3	3	2	2	1	3	3	3						
CO4	3	3	2	2	1	3	3	2						

Course Contents / Syllabus

Module 1 **Basic Principle of Ecology and Biodiversity** **4 hours**

Definition, Scope and basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem. Food chains and food. Webs. Ecological pyramids, Energy flow in ecological systems, Characteristics of different ecosystems. Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Biodiversity and their importance, Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book. Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies Mega diversity zones and Hot spots, concepts, distribution and importance.

Module 2 **Natural Resources and Ecological succession** **4 hours**

Natural resources and associated problems. Forest resources: Use and over- exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over- grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, and salinity. Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles. Non-Renewable Energy Resources: Fossil fuels and their reserves, Nuclear energy, types, uses and effects, Renewable Energy Resources: hydropower, Solar energy, geothermal, tidal and wind energy, Biomass energy, biogas and its advantages. Ecological succession-Types, stages, examples of ecological succession

Module 3 **Pollution and Waste Management** **4 hours**

Air pollution: sources of air pollution, Primary and secondary air pollutants. Origin and effects of SOX, NOX, Cox,CFC, Hydrocarbon, control of air pollution. Water pollution: sources and types of water pollution, Effects of water pollution, Eutrophication, Soil pollution: Causes of soil pollution, Effects of soil pollution, Major sources of and effects of noise pollution on health, Radioactive and thermal pollution sources and their effects on surrounding environment. Solid waste disposal and its effects on surrounding environment, Introduction to E-Waste, Types and classification of E- Waste, Impacts of E- Waste on environment and human health,E-Waste management and recycling., Climate change, global warming, acid rain, ozone layer depletion.

Module 4 **Environmental Assessment and Legislation** **4 hours**

Women education, Role of NGOs regarding environmental protection, Bio indicators and their role, Natural disasters and disasters management, Aims and objectives of Environmental Impact Assessment (EIA). Salient features of following Acts: Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972.Water (Prevention and control of pollution) Act, 1974. Forest (Conserving) Act,

1980.
Definition and concept of sustainability, impacted areas of sustainable development, Global initiative and issues on sustainable development UNSDsGs, System Thinking and Sustainability.

Total Lecture Hours	**20 hours**

Textbook:

S.No	Book Title with publication agency & year	Author
1	Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York	Brady, N.C
2	Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing House, New Delhi.	Sodhi G.S
3	Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.	Dash, M.C

Reference Books:

S.No	Book Title with publication agency & year	Author
1	Rao M.N. and H.V.N. Rao, 1989 : Air Pollution, Tata McGraw Hill Publishing Co. Ltd., New Delhi	Rao M.N. and H.V.N. Rao
2	A Text Book of environmental Science By Shashi Chawla	Shashi Chawla

NPTEL/ Youtube/ Faculty Video Link:

1	https://www.youtube.com/watch?v=T21OO0sBBfc,https://www.youtube.com/watch?v=qt8AMjKKPDo
2	https://www.youtube.com/watch?v=mOwyPENHhbc,https://www.youtube.com/watch?v=yqev1G2iy2 https://www.youtube.com/watch?v=_74S3z3IO_I, https://www.youtube.com/watch?v=jXVw6M6m2
3	https://www.youtube.com/watch?v=7qkaz8ChelI,https://www.youtube.com/watch?v=NuQE5fKmfME https://www.youtube.com/watch?v=9CpAjOVLHII, ttps://www.youtube.com/watch?v=yEci6iDkXYw
4	https://www.youtube.com/watch?v=ad9KhgGw5iA, https://www.youtube.com/watch?v=nW5g83NSH9 M, https://www.youtube.com/watch?v=xqSZL4Ka8xo

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Mechanical Engineering

Course Code: BASCC0401	Course Name: Employability Skill Development - II	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		**2**	**0**	**0**	**2**

Pre-requisite: Basic understanding of elementary mathematics

Course Objectives: The objective of this course is to develop students' quantitative aptitude and logical reasoning skills through number theory, analytical puzzles, and business mathematics, enabling them to solve real-world and competitive exam problems with speed, accuracy, and logical thinking.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply fundamental number theory concepts such as divisibility, HCF & LCM, remainder theorem, and cyclicity to solve quantitative problems efficiently.	K3
CO2	Solve problems involving logical reasoning and analytical thinking, including direction sense, blood relations, series patterns, and time-based puzzles like clocks and calendars.	K3
CO3	Solve real-life business math problems involving percentages, profit and loss, discounts, interest average calculations and using appropriate mathematical methods	K3
CO4	Solve real-life business math problems involving averages, mixtures, and ratios using appropriate mathematical methods	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1										
CO2	1	1	1	1										
CO3	1	1	1	1										
CO4	1	1	1	1										

Course Contents / Syllabus

Module 1	Speed Math and Number System	8 hours

Classification of number, Divisibility Rule, Factorization, HCF & LCM, It's Application, Unit digit(Cyclicity), Last two digit, Remainder theorem, Factorial and Number of zeroes, Highest power

Module 2	Analytical and Logical Reasoning	8 hours

Direction and Sense, Blood Relation, Number Series and Letter Series, Coding Decoding,

Module 3	Business Math I	8 hours

Percentage, Profit and Loss, Discount, Simple Interest and Compound Interest, Average

Module 4	Business Math II	8 hours

Ratio & Proportion, Partnership, Mixture & Allegation, Clock , Calendar

	Total Lecture Hours	32 hours

Textbook:

S.No	Book Title with publication agency & year	Author

Reference Books:

S.No	Book Title with publication agency & year	Author
1	Quicker math	M. Tyra (BSC publication co. Pvt. Ltd)
2	Quantitative Aptitude	RS Aggarwal
3	Verbal & Non-Verbal Reasoning	RS Aggarwal
4	Quantitative Aptitude - Quantum CAT	Sarvesh K Verma

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

Course Code: BAS0405	Course Name: Probability ,Statistics, and Complex Analysis	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		3	1	0	4

Pre-requisite: B.Tech 1st year

Course Objectives: The objective of this course is to familiarize the students with concepts of statistical techniques and complex variables. It aims to show case the students with standard concepts and tools from B. Tech to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply the basic concepts of probability theory in real life problems.	K3
CO2	Apply the concept of skewness and Kurtosis in the relevant application area.	K3
CO3	Apply the concept of Random Variable and Probability Distributions in real world problems.	K3
CO4	Apply the working methods of complex functions for finding analytic functions.	K3
CO5	Apply the concepts of complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	1	-	1	2	2	2			
CO2	3	2	2	3	1	1	-	1	2	2	2			
CO3	3	2	1	2	-	-	-	-	1	1	1			
CO4	3	2	2	3	-	-	-	-	2	1	1			
CO5	3	2	2	3	1	1	-	1	2	2	2			

Course Contents / Syllabus

Module 1	Statistical Techniques-I	8 hours

Introduction: Measures of central tendency: Mean, Median, Mode, Standard deviation, Quartile deviation, Moment, Skewness, Kurtosis.

Module 2	Theory of Probability	8 hours

Definition of Probability, Elementary problems of probability, Addition and Multiplication theorems of probability, Conditional Probability

Module 3	Random Variables and distribution	8 hours

Random Variable: Definition of a Random Variable, Discrete Random Variable, Continuous Random Variable, Expected Value of a Random Variable, Mean, Variance, Moment Generating Function, Binomial, Poisson, Normal.

Module 4	Complex Variable – Differentiation	8 hours

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions.

Module 5	Complex Variable –Integration	8 hours

Complex integrals, Contour integrals, Cauchy-Goursat theorem (Statement), Cauchy integral formula (Statement), Taylor's series, Laurent's series, Liouvilles's theorem (Statement), Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem.

	Total Lecture Hours	40 hours

Textbook:

S.No	Book Title with publication agency & year	Author
1	Textbook of Engineering Mathematics- IV	Bali, N.P.
2	Advanced engineering mathematics	Jain, R.K.
3	Higher engineering mathematics	Grewal, B.S.
4	Statistical methods	Gupta, S.P.
5	Advanced engineering mathematics	ZILL, DENNIS G.

Reference Books:

S.No	Book Title with publication agency & year	Author
1	Introduction to Probability Models	Ross, Sheldon M
2	Probability, Random Variables and Stochastic Processes	Papoulis, Athanasios
3	Advanced engineering mathematics	Kreyszig, E.

NPTEL/ Youtube/ Faculty Video Link:	
1	https://youtu.be/r1sLCDA-kNY?si=CbJiRYQhAT01IghM
2	https://youtu.be/1MiT06JFNo4?si=zVH-5AdAeu7Qcs9x https://youtu.be/6lQn1hdG43o?si=2WJXQHXJE-ByAghk **https://archive.nptel.ac.in/courses/110/107/110107114/**
3	https://archive.nptel.ac.in/courses/111/104/111104032/
4	**https://archive.nptel.ac.in/courses/111/107/111107056/**
5	**https://archive.nptel.ac.in/courses/111/103/111103070/**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

Course Code: BME0403	Course Name: Measurement & Metrology	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		3	0	0	3

Pre-requisite:

Course Objectives: Understand principles of dimensional metrology, standardization, and tolerancing. Gain proficiency in gauge design, limit gauging, and inspection techniques. Learn advanced measuring technologies such as CMMs, interferometers, and laser vision. Familiarize with GD&T principles and feature inspection methods. Develop skills in using metrology software and interfacing with advanced measuring systems.

	Course Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level (KL)
CO1	Ability to apply dimensional metrology principles for quality control and compliance with standards.	K3
CO2	Competence in designing gauges, conducting limit gauging, and ensuring selective assembly.	K4
CO3	Proficiency in operating CMMs, interferometers, and laser vision systems for accurate measurements.	K3
CO4	Capability to interpret GD&T specifications and perform feature inspections accurately.	K4
CO5	Understanding of metrology software and its application in precision measurements for manufacturing processes.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

	CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
	CO1	3	2	1	1	3	1	1	1	1	1	2	3	2	
	CO2	2	2	2	1	2	1	1	2	1	1	2	3	2	
	CO3	3	2	1	2	3	1	1	1	1	1	3	3	3	
	CO4	2	3	2	2	3	1	1	1	1	1	2	3	3	
	CO5	2	2	2	2	3	1	1	1	1	2	3	3	3	

Course Contents / Syllabus

Module 1	**Introduction to Metrology**	**8 hours**

Introduction to Dimensional Metrology, Standardization, Interchangeability, Selective assembly, Indian standard specifications, Application of tolerances, Limit gauging- Taylor's principles of limit gauging,
Inspection by measurement, and Interferometers.

Module 2	**Inspection**	**8 hours**

GD&T, Applications of Dimensional Inspection, Inspection of Surface Quality, Feature inspection- Straightness, Flatness, Parallelism, Squareness, Circularity, and Roundness.

Module 3	**Measuring Machines**	**8 hours**

CMMs, Applications, Types, instructions, Materials used for different elements, Probing, Hard Probing and Soft probing, Construction and Working Principle of Touch Trigger Probe, Alignment, Types of errors, Flow
Measurement, Temperature Measurement, Measurements of Force and Torque.

Module 4	**Advanced Metrology**	**8 hours**

Advanced measuring machines, CNC systems, Laser vision, In-process gauging, 3D metrology, Metrology software, Nanotechnology instrumentation, Stage position metrology, Testing and certification services, Optical system, Lens, Coating, Precision lens assembly techniques, Complex opto-mechanical assemblies, Contact bonding and other joining
technologies and Radioactive technologies.

Module 5	**Computer Aided Inspection**	**8 hours**
Computer Aided Metrology- Principles and interfacing, Software metrology. Laser metrology- Applications of lasers in precision measurements - Laser interferometer, Speckle measurements, Laser scanners. Coordinate Measuring Machine – Non-contact CMM Electro optical sensors for dimensional metrology- non-contact sensors for surface finish measurements, Image processing and its application in metrology.		
	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	Experimental Methods for Engineers	Holman, MCGRAW HILL INDIA
2	Mechanical Measurements	Beckwith, Pearson
3	Principles of Measurement Systems	Bentley, Pearson
4	Metrology of Measurements	Bewoor and Kulkarni, MCGRAW HILL INDIA
5	Measurement Systems, Application Design	Doeblein, MCGRAW HILL INDIA
6	Hume K.J., "Engineering Metrology"	MacDonald and Co

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Engineering Metrology," Khanna Publishers	Jain, R.K
2	Mechanical Measurement," Khanna Publishers	Jain, R.K
3	Engineering Metrology, Dhanpat Rai Publications	Gupta S.C

NPTEL/ Youtube/ Faculty Video Link:

Module 1	Mechanical Engineering - NOC: Engineering Metrology
Module 2	Computer Aided Design and Manufacturing (Mechanical Engineering)
Module 3	Metrology, IIT Madras

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

Course Code: BME0402	Course Name: Computer Integrated Manufacturing	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		3	0	0	3

Pre-requisite: Manufacturing science and Technology

Course Objectives: This course introduces Computer Integrated Manufacturing (CIM) and Smart Manufacturing, covering essential processes, data flow, and subsystem integration. Students will learn about computer graphics, including CAD systems and geometric transformations. The course also covers CNC machines, group technology, and their manufacturing applications. Advanced topics include process planning, flexible manufacturing systems, and modern technologies such as AI, Machine Learning, Deep Learning, and IoT, focusing on their roles in enhancing manufacturing processes and efficiency.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the concept of computer integrated manufacturing.	K2
CO2	Understand Different types of geometric transformations used during CAD geometry Generation and display and their evaluation.	K3
CO3	To demonstrate CNC machines and write down the part program.	K3
CO4	Understand the concept of Computer aided process planning, group technology and flexible manufacturing.	K3
CO5	To apply the concept of modern computer-based technologies.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	2	2	2	
CO2	3	2	2	-	3	-	-	-	-	-	2	3	2	
CO3	3	2	3	2	3	-	-	1	1	1	2	3	3	
CO4	3	2	3	2	3	2	-	-	-	-	2	3	3	
CO5	3	2	2	2	3	2	1	-	-	1	3	3	3	

Course Contents / Syllabus

Module 1	Introduction to CIM	8 hours

Introduction to CIM, Data flow in CIM, CIM wheel, Processes involved, CIM integration, sub system of CIM, Introduction to Smart manufacturing.

Module 2	Computer Graphics	8 hours

Introduction to design, Computer graphics display, Coordinate systems in CAD, Transformation of geometry, Colour Models, Numerical problems based on transformation of geometry.

Module 3	CNC Machines & Group Technology	8 hours

CNC machining centers: Drilling centers, milling centers, turning centers.

CNC Tooling: CNC tooling mechanism, ATC. Adaptive control.

Group Technology: Benefits of group Technology, Part Family, Coding Systems, Limitations of Group Technology.

Module 4	Advanced Metrology	8 hours

Advanced measuring machines, CNC systems, Laser vision, In-process gauging, 3D metrology, Metrology software, Nanotechnology instrumentation, Stage position metrology, Testing and certification services, Optical system, Lens, Coating, Precision lens assembly techniques, Complex opto-mechanical assemblies, Contact bonding and other joining technologies and Radioactive technologies.

Module 5	Computer Aided Inspection	8 hours

Computer Aided Metrology- Principles and interfacing, Software metrology. Laser metrology- Applications of lasers in precision measurements - Laser interferometer, Speckle measurements, Laser scanners. Coordinate Measuring Machine – Non-contact CMM Electro optical sensors for dimensional metrology- non-contact sensors for surface finish measurements, Image processing and its application in metrology.

Total Lecture Hours	**40 hours**

Textbook:

S.No	Book Title with publication agency & year	Author
1	Handbook of Flexible Manufacturing System	Editor: Nand K. Jha (Academic Press, San Diego, California
2	Automation, Production System & Computer Integrated Manufacturing	Groover (PHI)
3	Flexible Manufacturing System	Wernecks (Spring- Verlag).
4	CAD/CAM	- P. N. Rao (Tata McGraw Hill)
5	Automation, Production systems and Computer Integrated Manufacturing System, Prentice Hall, 2007.	Mikell P. Groover

Reference Books:

S.No	Book Title with publication agency & year	Author
1	Handbook of Flexible Manufacturing System	Editor: Nand K. Jha (Academic Press, San Diego, California).
2	Automation, Production System & Computer Integrated Manufacturing-	Groover (PHI).
3	Performance Modelling of Automated Manufacturing Systems	Vishwanathan & Narahari (PHI)

NPTEL/ Youtube/ Faculty Video Link:

Module 1	https://archive.nptel.ac.in/courses/112/104/112104289/
Module 2	https://archive.nptel.ac.in/courses/112/105/112105211/
Module 3	https://nptel.ac.in/courses/112102103
Module 4	https://archive.nptel.ac.in/courses/110/106/110106044/

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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School of Mechanical Engineering

Course Code: BME0404	Course Name: Fluid Mechanics & Machines	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		3	0	0	3

Pre-requisite: Engineering Mathematics, Engineering Mechanics

Course Objectives: The objective of the Fluid Mechanics & Machines course is to provide students with a comprehensive understanding of fluid properties, fluid statics, and fluid dynamics principles. Students will learn to analyze and solve problems related to fluid flow in pipes, and around submerged bodies. The course will cover the principles and applications of fluid machinery, including pumps, turbines, and compressors. Through theoretical concepts and practical laboratory experiments, students will develop the skills to design, and analyze, fluid systems and machinery, preparing them for advanced studies and careers in mechanical engineering field.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand fluid properties, laws, and applications in measurements, buoyancy, Bernoulli's equation, and hydrostatic force analysis.	K2
CO2	Analyze continuum and free molecular flows, including various flow types, equations, dimensionless numbers, and aerodynamic concepts.	K4
CO3	Apply the fluid flow through pipes, turbulence characteristics, boundary layer dynamics, and application of momentum equations.	K3
CO4	Understand and apply momentum equations, hydrodynamic thrust, turbine classifications, velocity triangles, power/efficiency calculations, and turbine selection principles.	K3
CO5	Understand classifications, efficiencies, performance, and characteristics of centrifugal and reciprocating pumps, compressors, and related systems.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	1	–	–	–	–	1	3	2	
CO2	3	3	2	2	3	1	–	–	–	–	2	3	3	
CO3	3	3	2	3	3	1	–	–	–	–	2	3	3	
CO4	3	3	3	3	3	1	–	–	–	–	2	3	3	
CO5	3	2	2	2	3	1	–	–	–	–	2	3	3	

Course Contents / Syllabus

Module 1 — **Fluid Properties** — **8 hours**

Definition of fluid, Newton's law of viscosity, Units and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Capillarity effect, Pressure Scale,
manometers, buoyancy, Bernoulli's equation, and its applications - Pitot tube, orifice meter, venturi meter and bend meter, Magnus effect, notches and weirs, Hydrostatic force analysis.

Module 2 — **Fluid Flow Analysis** — **8 hours**

Continuum & free molecular flows; Steady and unsteady, uniform, and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub- critical, critical, and supercritical flows, one, two- and three-dimensional flows, streamlines, path lines, streak lines and
flow net, continuity equation and applications (3D), circulation and vorticity, stream function and velocity potential function. Drag and lift, aero foil, Buckingham Pi theorem, important dimensionless numbers, and their significance.

Module 3 — **Pipe Flow and Boundary Layer Analysis** — **8 hours**

Equation of motion for laminar flow through pipes, turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe
networks. Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub layer, separation and its control.

Module 4	**Prime Movers and Thrust Analysis**	**8 hours**
Momentum equation and its applications, Introduction to hydrodynamic thrust of jet on a fixed, moving surface, hinged surface and series of vanes, Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel. Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.		
Module 5	**Fluid Pumps and Devices**	**8 hours**
Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics. Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics, Hydraulic lifts, torque convertor, Air jet pump, Vacuum pumps, Pressure regulators, Introduction to Compressors		
	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	F. M. White, Fluid Mechanics, 6th Ed., Tata McGraw-Hill, 2008.	F. M. White
2	Fluid Mechanics and Its Applications by V.K. Gupta et.al	V.K. Gupta
3	Batchelor, G. K. (1999). Introduction to fluid dynamics. New Delhi, India: Cambridge University Press	Batchelor, G. K.
4	Acheson, D. J. (1990). Elementary fluid dynamics. New York, USA: Oxford University Press.	Acheson, D. J.
5	R.W. Fox, A.T. McDonald and P.J. Pritchard, Introduction to Fluid Mechanics, 6th Ed., John Wiley, 2004.	R.W. Fox, A.T. McDonald and P.J. Pritchard

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Fluid mechanics and machines by R.K Bansal.	R.K Bansal
2	Fluid mechanics by R. K. Rajput, S. Chand and Company Limited.	R. K. Rajput
3	Fluid Mechanics by Yunus Cengel.	Yunus Cengel.
4	Introduction to fluid mechanics and Fluid machines by S.K. Som, Gautam Biswas, S Chakraborty	S.K. Som, Gautam Biswas, S Chakraborty

NPTEL/ Youtube/ Faculty Video Link:

Module 1	NPTEL: Mechanical Engineering - NOC: Introduction to Fluid Mechanics
Module 2	NPTEL: Mechanical Engineering - NOC: Fluid Machines

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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LAB Course Code: BME0453	LAB Course Name: Measurement and Metrology Lab	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		0	0	2	1

Pre-requisite: Understanding of fundamental Basic knowledge of physics, engineering mechanics, mathematics, drawing, manufacturing processes, basic metrology theory, instrumentation basics and computer skills.

Course Objectives:

1. To provide students with the necessary skills for calibration and testing of different gauges and instruments.
2. To provide students with the necessary skills to collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments.
3. To expose students to modern measurement techniques and metrology tools such as optical projectors, autocollimators, and strain gauges, enabling them to evaluate mechanical properties and geometrical features of machine components.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	To provide students with the necessary skills for calibration and testing of different gauges and instruments.	K2
CO2	To provide students with the necessary skills to collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments.	K3
CO3	To demonstrate proficiency in using modern metrology tools to evaluate dimensional accuracy, surface finish, and mechanical properties of engineering components.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS03
CO1	3	2	2	2	3	1	1	1	2	1	2	3	1	2
CO2	3	3	2	3	3	1	1	2	2	2	3	3	2	2
CO3	2	2	-	3	3	-	-	-	-	-	-	2	3	-

List Of Practical's (Indicative & Not Limited To)

1. To study about measurements and metrology
2. Performance on linear measurements using Vernier Caliper, Vernier height gauge, and Micrometer.
3. To study about Temperature Measurement.
4. To study about Stress, Strain and Force Measurements.
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.
6. Measurements using Optical Projector / Toolmaker Microscope.
7. Performance on linear measurements using Vernier Calliper, Vernier height gauge, and Micrometer.
8. Measurement of alignment using Autocollimator / Roller set.
9. To Study about Torque and Speed and accelaration Measurement.
10. Performance on Gear and Screw Thread Measurement (two wire method, screw pitch gauge)
11. To Study about Surface Measurements.
12. Measurement of gear tooth profile using gear tooth Vernier /Gear tooth micrometer
13. Calibration of Micrometer using slip gauges.
14. Measurement using Optical Flats.

Total Hours: 30 hrs.

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School of Mechanical Engineering

LAB Course Code: BME0454	LAB Course Name: Fluid Mechanics & Machines Lab	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		**0**	**0**	**2**	**1**

Pre-requisite: Basic Knowledge of Physics and Mathematics.

Course Objectives:

The course aims to provide students with practical experience that complements the theoretical aspects of the course by providing with hands-on experience. It allows them to validate theoretical concepts, apply their knowledge to real-world scenarios, develop proficiency in instrumentation and measurements, analyse experimental data, and enhance their technical reporting and communication skills. Ultimately, the practical/lab component prepares students for practical engineering applications and equips them with the necessary skills for success in the field of strength of materials.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Demonstrate performance characteristics of flow and flow measuring devices.	K2
CO2	Demonstrate various turbines and determine their efficiency.	K2
CO3	Demonstrate various pumps and determine their efficiency.	K2
CO4	Demonstrate various compressor and determine their efficiency.	K2
CO5	Demonstrate hydraulic ram and determine its efficiency.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	3	3	1	–	–	–	–	1	3	3	
CO2	3	2	2	3	3	1	–	–	–	–	1	3	3	
CO3	3	2	2	3	3	1	–	–	–	–	1	3	3	
CO4	3	2	2	3	3	1	–	–	–	–	1	3	3	
CO5	3	2	2	3	3	1	–	–	–	–	1	3	3	

List Of Practical's (Indicative & Not Limited To)

1. To verify the Bernoulli's Theorem.
2. To determine the coefficient of discharge of venturi meter.
3. To determine coefficient of discharge of an orifice meter
4. To determine the coefficient of discharge of Notch (V and Rectangular types)
5. To determine the minor losses due to sudden enlargement, sudden contraction, and bends.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To find critical Reynolds number for a pipe flow.
8. To determine the coefficient of impact for vanes.
9. Experiments on performance of Pelton wheel
10. To study of various Reaction turbines.
11. Experiments on performance of Francis turbine
12. Experiments on performance of Centrifugal Pump
13. Experiments on performance of reciprocating pump
14. To study of Gear pump.
15. To demonstrate centrifugal compressor and find the efficiency.
16. To demonstrate hydraulic ram and find the efficiency.

Total Hours: 30 hrs.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

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School of Mechanical Engineering

LAB Course Code: BME0455	**LAB Course Name: Machine Design and Application of FEA**	**L**	**T**	**P**	**C**
Course Offered in: B.Tech. Second Year Sem-IV ME		**0**	**0**	**6**	**3**

Pre-requisite: Mechanics, Strength of Materials

Course Objectives:

This course aims to introduce students to the fundamentals of Finite Element Analysis (FEA) and its practical applications in mechanical design. It equips students with the knowledge and skills to design and analyze machine components such as shafts, gears, bearings, and joints under static, dynamic, and fluctuating loads using both analytical methods and FEM software tools. The course also emphasizes understanding material behavior, fatigue, failure theories, and design optimization to ensure the strength, reliability, and efficiency of mechanical systems.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the fundamentals and workflow of Finite Element Analysis (FEA).	K2
CO2	Analyze mechanical components under static and dynamic loading conditions.	K4
CO3	Apply failure theories and fatigue concepts in mechanical design.	K4
CO4	Design and evaluate gear and bearings using analytical and FEM methods.	K4
CO5	Design and evaluate joints using analytical and FEM methods.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	3	1	1	1	1	1	1	3	2	
CO2	3	3	3	2	2	1	1	1	1	1	1	3	3	
CO3	3	3	3	2	2	1	1	1	1	2	1	3	2	
CO4	3	3	3	3	3	1	1	1	1	2	2	3	3	
CO5	3	3	3	3	3	1	1	1	1	2	2	3	3	

List Of Practical's (Indicative & Not Limited To)

1. Introduction to FEA Packages.
2. Direct stress in uniform and non-uniform cross section rod.
3. Shaft under combined loading
4. Analysis of plate, shaft using FEA package under fluctuating load, Visualization of stress, criterion of failure.
5. Cyclic stresses, Fatigue and endurance limit, Stress concentration, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.
6. Design and analysis of plate having notch or circular hole FEA package under fluctuating load, Visualization of stress, criterion of failure.
7. Stress visualization in Spur Gears using FEA Package
8. Stress visualization in Helical Gears using FEA Package
9. Stress visualization in spur gears and gear shaft using FEA Package
10. Stress visualization in worm gears using FEA Package
11. Thermal modeling of worm gear
12. Stress visualization in worm gear system using FEA Package.
13. Drafting of Bearing on Solid modeling software.
14. Analysis of stress concentration in Ball Bearing using FEA Package.
15. Analysis of stress concentration in Roller Bearing using FEA Package.

16. Analysis of Stress concentration in Needle Bearing using FEA Package.
17. Stress analysis in different types of Gear using FEA Package.
18. Stress analysis in Threaded bolt and rivet joints using FEA Package.
19. Stress analysis in different types of Welded Joints using FEA Package.
20. Stress analysis in spring under different loading conditions using FEA Package.
Total Hours: 30 hrs.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Course Code: BNC0401	Course Name: Artificial Intellgence and Cyber Ethics	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		2	0	0	2

Pre-requisite: Basic understanding of AI, Cybercrime, Computer System and Ethics

Course Objectives: The course aims to foster critical thinking about ethical issues, promote responsible use of technology, and ensure students can identify, analyze, and address ethical dilemmas in Artificial Intelligence and cyber domains.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Learn key principles of AI ethics, summarizing ethical considerations and applications in AI development and deployment.	K2
CO2	Apply policies and framework for Fairness in AI and Machine Learning.	K3
CO3	Apply privacy and security concepts, risk management and regulatory compliance in the field of AI and Cyber Security.	K3
CO4	Understand the nature of cybercrimes, the principles of intellectual property rights (IPR), and the legal measures necessary to address and prevent these issues.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1		1				1	2				2	1	1	1
CO2	2	3	2		2	1	2		2	1	2	2	1	1
CO3	2	3	2	1	2	3	3		2	2	2	2	2	1
CO4	2	2			1	3	3		2	2	2	2	1	1

Course Contents / Syllabus

Module 1	**An Overview to AI Ethics**	**6 hours**

Definition of AI Ethical principles in AI, Sources of AI data, Legal implications of AI Security Breaches, Privacy and AI Regulations, Key Principles of Responsible AI, Transparency and Accountability, Dual-Use Dilemma, Human-Centric Design, Introduction to Cyber Laws and Ethics, Historical Development of Cyber laws, Legal frameworks.

Module 2	**Fairness and Favoritism in Machine Learning**	**8 hours**

Introduction to Fairness and Bias in AI, Types of Fairness and Bias, Impact of Bias and Fairness in AI, Techniques for Measuring Fairness and Bias, Techniques for Mitigating Bias, Current Policies and Frameworks for Fairness in AI, Bias in Data Collection, Fairness in Data Processing, Generative AI, Types of Bias in Generative AI.

Module 3	**AI Ethics and Cybersecurity Principles**	**8 hours**

Importance of Privacy and Security in AI, AI specific Security Tools and Software, Privacy-Preserving Machine Learning (PPML) and Privacy-Preserving Data Mining (PPDM), Risk Management: Risk Assessment and Incident Response, Regulatory Compliance: GDPR, HIPAA, Case Studies: Implementation of AI Ethics guidelines and best practices in engineering projects.

Module 4	**Cybercrimes, IPR and Legal Measures**	**8 hours**

Types of Cybercrimes and their Impact, Legal measures for Cybercrime Prevention and Prosecution, IPR: Copyrights, Trademarks, Patents, and Trade Secrets, Ethical Implications of Intellectual Property, Cyber Security and Privacy Issues, Cyber Crime Investigations and Digital Evidence Handling, Overview of Indian Cyber Laws (IT Act 2000 and Amendments), Comparative Overview: Indian vs Global Cyber Laws, Case Study: The ATM Heist – Cosmos Bank Cyber Attack (India, 2018).

	Total Lecture Hours	**30 hours**

Textbook:

1	Artificial Intelligence: A Guide for Thinking Humans	by Melanie Mitchell, Penguin Books, 2019.
2	Cyber Ethics: Morality and Law in Cyberspace	by Richard Spinello, Jones & Bartlett Learning, 7th Edition (2023).

Reference Books:

1	Artificial Intelligence and Ethics	by S. B. Kishor, Debajit Biswas, BPB Publications, 2023.
2	Cyber Security and Cyber Laws	by Alfred Basta, Nadine Basta, Sattwik Panda, Cengage India, 2022.

NPTEL/ YouTube/ Faculty Video Link:

1.	https://www.youtube.com/watch?v=VqFqWIqOB1g

2.	https://www.youtube.com/watch?v=hVJqHgqF59A
3.	https://www.youtube.com/watch?v=O5RX_T4Tg24
4.	https://www.youtube.com/watch?v=RJZ0pxcZsSQ

TA* - Teacher Assessment marks on the basis of defined Teaching Methodologies like Quiz, Assignment, Video Assignment, Seminar, Group discussion, PBL or any other defined by respective faculty members and may vary to subject-wise and faculty-wise

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

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List of Program Electives

Course Code: BME0412	**Course Name: Factory Automation**	**L**	**T**	**P**	**C**
Course Offered in: B.Tech. Second Year Sem-IV ME		**3**	**0**	**0**	**3**

Pre-requisite:

Course Objectives: Upon completing this course, students will be able to implement, and manage automated systems in manufacturing environments, including material handling, production, quality control, and process control. They will gain a comprehensive understanding of automation technologies, including computer-based control systems, and be able to apply this knowledge to improve efficiency, productivity, and quality in industrial settings.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	explain the principles and strategies of automation in production systems, including basic elements, advanced functions, and levels of automation.	K2
CO2	design and apply material handling systems.	K4
CO3	analyze and implement automated manufacturing systems.	K3
CO4	apply industrial control systems.	K3
CO5	design and implement computer-based industrial control systems.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	2	-	-	-	-	2	3	2	
CO2	3	3	3	3	3	2	-	-	-	-	2	3	2	
CO3	3	3	3	3	3	2	-	-	-	-	2	3	2	
CO4	3	3	3	3	3	2	-	-	-	-	2	3	2	
CO5	3	3	3	3	3	2	-	-	-	-	2	3	2	

Course Contents / Syllabus

Module 1	**Introduction to Factory Automation**	**8 hours**

Introduction to Automation in Production Systems, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automation, Flow Lines and Transfer Mechanisms, Fundamentals of Transfer Lines

Module 2	**Material Handling and Identification Technologies**	**8 hours**

Overview of Material Handling Systems, Applications of Material Handling Systems, Material Transport Systems, Storage Systems, Overview of Automatic Identification Methods.

Module 3	**Automated Manufacturing Systems**	**8 hours**

Components, Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing, FMS, FMS and its Planning and Implementation. Quality Control Systems: Traditional and Modern Quality Control Methods, SPC Tools, Inspection Principles and Practices, Inspection Technologies.

Module 4	**Control Technologies in Automation:**	**8 hours**

Industrial Control Systems, Process Industries versus Discrete Manufacturing Industries, Continuous Versus Discrete Control, Computer Process and its Forms.

Module 5	**Computer Based Industrial Control:**	**8 hours**

Introduction & Automatic Process Control, Building Blocks of Automation Systems: LAN, Analog & Digital I/O Modules, SCADA Systems & RTU. Distributed Control System: Functional Requirements, Configurations.

	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**

1	Automation, Production Systems, and Computer-Integrated Manufacturing	Mikell P. Groover
2	Manufacturing Automation: Metal Cutting Mechanics, Machine Tool Vibrations, and CNC Design	Yusuf Altintas
3	Industrial Automation: Handbook of the Practical Man	Frank Lamb
4	Automated Manufacturing Systems with PLCs	Hugh Jack

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Computer Control of Machines and Processes	John G. Bollinger and Neil A. Duffie
2	Industrial Control Electronics: Applications and Design	J. Michael Jacob
3	Automation and Control Systems	Frank Petruzella

NPTEL/ Youtube/ Faculty Video Link:

Module 1	https://www.youtube.com/@realpars
Module 2	https://www.youtube.com/@Automationanywhere

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Course Code: BME0411	Course Name: Automotive Engineering	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		3	0	0	3

Pre-requisite: Basic knowledge of physics, mathematics, and mechanical engineering is essential for automotive engineering. Understanding concepts in thermodynamics, fluid mechanics, and electrical circuits helps in grasping engine and vehicle systems. Familiarity with engineering drawing and CAD tools also supports learning of design and structural aspects of automobiles effectively.

Course Objectives: This course aims to introduce fundamental concepts of automobile engineering, including vehicle layout, power dynamics, and resistances. It will explore the principles and performance of internal combustion engines, as well as the emerging field of electric and hybrid vehicles. Students will gain an understanding of essential vehicle systems like transmission, breaking, and electrical components. Finally, the course will expose students to modern automotive technologies, including ADAS, connectivity, and future trends in the industry.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Describe the fundamental principles of automobile engineering, including the general layout of a vehicle and the concepts of power, torque, and various resistances to motion.	K2
CO2	Explain the working principles, components, and performance characteristics of both Spark Ignition and Compression Ignition internal combustion engines, including their cycles, timing diagrams, emissions, and firing order.	K2
CO3	Explain EV, hybrid types, propulsion types, energy, and comparing their environmental and economic impacts against conventional vehicles.	K2
CO4	Explain the operation of different automotive transmission systems and braking systems	K2
CO5	Discuss ADAS, telematics, infotainment, sensors, ECUs, CAN bus, autonomous/connected concepts, advanced materials, IoT, and cybersecurity trends.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2	2	2	2	1	1	2	2	
CO2	3	2	2	2	2	2	3	2	2	1	1	2	3	
CO3	3	2	2	1	2	2	2	2	1	1	1	2	2	
CO4	3	2	3	2	2	1	2	2	2	1	1	2	2	
CO5	3	2	1	1	2	2	2	2	1	1	1	2	3	

Course Contents / Syllabus

Module 1	**Introduction to Automotive Engineering**	**8 hours**

Introduction to Automobile Engineering: Definition, history, and importance of automobiles in modern transportation. **Classification of Automobiles:** Based on purpose, fuel type, drive type, and body style (e.g., passenger cars, commercial vehicles, electric vehicles).
Vehicle Configurations: Front-engine, rear-engine, mid-engine layouts; drive types – FWD, RWD, AWD/4WD.
Introduction to Vehicle Dimensions and Terminology: Wheelbase, track width, ground clearance, approach/departure angles, etc.
General Layout of an Automobile: Overview of main systems powertrain, chassis, suspension, braking, steering, electrical, and body components.

Module 2	**I.C. Engines Vehicles**	**8 hours**

Introduction to I.C. Engines: Basic principles and working of internal combustion engines; classification – spark ignition (SI) and compression ignition (CI) engines.

Engine Types and Configurations: 2-stroke vs 4-stroke engines, inline vs V-type engines, air-cooled vs water-cooled engines.

Main Components of I.C. Engines: Engine block, piston, crankshaft, connecting rod, camshaft, valves, cylinder head, flywheel.

Engine Systems Overview: Fuel supply system (carburetor, fuel injection, common rail direct injection). Ignition system (battery ignition, magneto, spark plugs). Cooling system (radiator, thermostat, coolant, water pump). Lubrication system (wet sump, dry sump, oil pump, oil filters).

Basic Engine Terminology: Bore, stroke, compression ratio, displacement, power, torque, efficiency.

Module 3	**Electric and Hybrid Vehicles**	**8 hours**

Introduction to Electric Vehicles (EVs): Evolution, need for electrification, advantages and challenges of electric mobility.

Classification of Electric Vehicles: Battery Electric Vehicles (BEVs), Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and Fuel Cell Vehicles (FCVs).

Basic Components of an Electric Vehicle: Electric motor, battery pack, power electronics, inverter, converter, and electric drivetrain.**Types of Electric Motors Used**: DC motors, Brushless DC (BLDC), Induction motors, Permanent Magnet Synchronous Motors (PMSM).

Battery Technologies: Lead-acid, Nickel-Metal Hydride (NiMH), Lithium-ion batteries – structure, working, advantages, limitations.Hybrid Powertrain Architectures: Series, parallel, and series-parallel hybrids working principles and power flow.

Regenerative Braking and Energy Recovery: Concept and operation in EVs and hybrids.

Comparison with I.C. Engine Vehicles: Efficiency, emissions, range, maintenance, and overall performance.

Module 4	**Transmission and Braking System**	**8 hours**

Clutch Systems – Types of clutches: single plate, multi-plate, centrifugal, and diaphragm; basic operation and applications.

Gearboxes – Manual (sliding mesh, constant mesh, synchromesh) and automatic transmissions (CVT, AMT, DCT); gear shifting mechanisms. Final Drive and Differential – Function and construction; power transmission to wheels in various drivetrain layouts.

Drive Configurations – Overview of FWD, RWD, AWD, and 4WD systems with their advantages and use cases.

Module 5	**Modern Automotive Technologies**	**8 hours**

Automotive Electronics: Role of Electronic Control Units (ECUs), Integrated Circuit Modules (ICMs), sensors, and actuators in controlling vehicle performance, safety, and emissions.

On-Board Diagnostics (OBD): OBD-II and OBD-III systems, real-time monitoring, diagnostic trouble codes (DTCs), and advanced fault detection systems.

Advanced Driver Assistance Systems (ADAS) – Features like Lane Departure Warning (LDW), Forward Collision Warning (FCW), Automatic Emergency Braking (AEB), Pedestrian Detection, Adaptive Cruise Control (ACC), Traffic Sign Recognition (TSR), and 360-degree cameras.

	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	Automobile Engineering	Newton and Steeds
2	Automobile Engineering	Ramakrishna, PHI, India.
3	Automobile Engineering	Kripal Singh

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Automotive Engineering-	Hietner.
2	Automobile Engineering -	Narang
3	Automobile Engineering –	TTTI, Pearson India

NPTEL/ Youtube/ Faculty Video Link:

Module 1	1:- http://digimat.in/nptel/courses/video/107106088/L01.html
Module 2	2:https://www.google.com/search?q=https://www.youtube.com/playlist%3Flist%3DPLwdnKv6Jags1bzjeJRhFTfVn1L7JmZJma

Module 3	3:- https://onlinecourses.nptel.ac.in/noc24_de03/preview

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Course Code: BME0413	Course Name: Operations Management	L	T	P	C
Course Offered in: B.Tech. Second Year Sem-IV ME		3	0	0	3

Pre-requisite: Basic Knowledge of Maths

Course Objectives: students with fundamental concepts and principles of operations management, enabling them to understand its strategic role in achieving organizational goals. Students will learn tools and techniques for designing, planning, and controlling operations, fostering problem-solving skills for both manufacturing and service sectors.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the fundamental concepts and strategic importance of Operations Management.	K2
CO2	Design products, processes, and facility layouts effectively for various production systems.	K3
CO3	Apply forecasting and aggregate planning techniques for efficient resource management and demand fulfillment.	K3
CO4	Manage inventory effectively and implement Material Requirements Planning (MRP) for dependent demand systems.	K3
CO5	Apply principles of Total Quality Management (TQM) and understand the fundamentals of Supply Chain Management (SCM).	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	2	1	-	-	1	2	2	1	
CO2	3	3	3	1	2	2	2	-	-	1	1	3	2	
CO3	3	3	2	2	3	1	1	-	-	3	2	3	2	
CO4	3	3	2	1	3	1	1	-	-	3	1	3	2	
CO5	2	2	1	1	2	3	3	1	2	2	2	2	2	

Course Contents / Syllabus

Module 1	**Introduction to Operations Management & Operations Strategy**	**8 hours**

Introduction to Operations Management: Definition, scope, importance, and historical evolution of operations management. Role of operations in an organization. Types and Characteristics of Manufacturing and Service Systems: Product strategies, productive system types, production to stock or order, Definition and characteristics of service, classification of service systems

Operations Strategy in global Economy: Linkage with corporate strategy. Competitive priorities (Cost, Quality, Delivery, Flexibility). Order qualifiers and order winners. Strategic choices in operations. Global Shift, Factor cost deflation, Decline of china, new manufacturing locations.

Operations Management and Productivity: The heritage of operations management, Scietific Management, Productivity Definition, measurement, and improvement strategies. Factors affecting productivity.

Module 2	**Product Design and Forecasting**	**8 hours**

Product Design: objectives, phases, concurrent Engineering, Design for customers, design for manufacturability and assembly.

Forecasting: Introduction to Forecasting: Introduction to Time-series forecasts, Extrapolative methods, Extrapolative methods, Forecasting Error, Causal Methods of forecasting, Qualitative Methods of Forecasting.

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Module 3	**Inventory Management & Aggregate Planning**	**8 hours**

Inventory Management: Introduction to Inventory Management, Various costs involved in inventory management, EOQ Models of Inventory Management, Various variations of EOQ, Inventory Models with Uncertain Demand, Miscellaneous Systems and Issues, Inventory Control and Supply Chain Management Material Requirements Planning (MRP): Introduction and benefits of MRP, Inputs and outputs of MRP. Basic understanding of MRP II and ERP.

Aggregate Planning: Aggregate Sales and Operations Planning, Aggregate planning Techniques , Material requirement Planning-Improvements in the MRP system, Lot Sizing in MRP Systems

Module 4	**Quality management, Acceptance sampling and Maintenance management**	**8 hours**

Evolution of Quality Management , Modern Quality Management, Total Quality Management, Statistical Concepts in Quality Control, Introduction to Acceptance Sampling , QC Tool, Introduction to Six Sigma, Quality Function Deployment , Quality issues in Services Nature of Quality,

Introduction to Maintenance Management, Types of maintenance, Total Productive Maintenance, Introduction to Project Management

Module 5	**Process analysis and supply chain strategy**	**8 hours**

Introduction to Process analysis, Job Design and work Measurement, Manufacturing Process selection and Design, Service Process Selection and Design, Business process Reengineering.

Supply Chain Strategy, Measuring Supply Chain performance, Case discussion of Supply Chain Management, Contemporary Issues in Operations management, Framework for Operations Strategy Formulation

Supply Chain Management (SCM): Introduction to SCM, objectives, and importance. Supply chain drivers. Recent trends in SCM (Resilience, Digitalization, Sustainability).

	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	**Operations Management: Processes and Supply Chains**	**Lee J. Krajewski, Manoj K. Malhotra, Larry P. Ritzman**
2	**Operations Management**	**ay Heizer, Barry Render, Chuck Munson**
3		

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	**Production and Operations Management**	**S.N. Chary**
2	**Operations Management: Theory and Practice**	**B. Mahadevan**
3		

NPTEL/ Youtube/ Faculty Video Link:

Module 1	http://www.youtube.com/watch?v=nmDg3chbNVs
Module 2	http://www.youtube.com/watch?v=KaIPe5pUVbc
Module 3	http://www.youtube.com/watch?v=MbNmIZNy3qI
Module 4	What is the Material Requirement planning (MRP)? | MRP Process
Module 5	Operations & Supply Chain Management: Quality Management

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