



TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)



DEPARTMENT OF MECHANICAL ENGINEERING

Structure & Curriculum

From

Academic Year 2022-2023

Vision of Institute

To emerge as a learning center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

- M1: To strive for rearing standard and stature of the students by practicing high Standards of professional ethics, transparency and accountability.
- M2: To provide facilities and services to meet the challenges of Industry and Society.
- M3: To facilitate socially responsive research, innovation and entrepreneurship.
- M4: To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

To emerge as a premier centre in the field of Mechanical Engineering Education and produce competent Engineers.

Mission of the Department

- To impart quality Technical Education through effective teaching -learning process.
- To provide a better environment to encourage innovation and entrepreneurship.
- To strengthen industry institute interaction to meet the challenges of industry and society.
- To ensure overall development of students and staff members by inculcating knowledge and professional ethics.

Program Education Objectives (PEO)

PEO-1: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in mechanical engineering.

PEO-2 :Analyze the complex problems in the field of mechanical engineering by using modern tools.

PEO-3 :Apply mechanical engineering concepts for the betterment of society and environment.

PEO-4 :Develop professionals having administrative and managerial skills for mechanical engineering and allied industries.

PEO-5 :Demonstrate the attributes of mechanical engineering in lifelong learning to contribute towards societal needs.

Program Outcomes (PO)

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO 1: Apply the knowledge to work professionally and ethically in Thermal, Design, production and Manufacturing areas of Mechanical engineering.

PSO 2: Analyze and design mechanical components and its processes to meet the societal needs.

PSO 3: Apply Engineering and Management principles to work professionally in the industry or as an entrepreneur.

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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SCHEME OF INSTRUCTION & SYLLABUS

Programme: Mechanical Engineering

Scheme of Instructions: Second Year B.E. in Mechanical Engineering

Semester-III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAMS CHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	BSC	BME2301	Applied Mathematics – III	3	1	-	4	4	15	15	10	60	100
2	ESC	BME2302	Materials Engineering	3	-	-	3	3	15	15	10	60	100
3	PCC	BME2303	Manufacturing Engineering -I	3	-	-	3	3	15	15	10	60	100
4	ESC	BME2304	Thermodynamics Engineering	3	1	-	4	4	15	15	10	60	100
5	HMSC	BSH2301	Human Values for Professional Society	3	-	-	3	3	15	15	10	60	100
6	ESC	BME2306	Lab-Material Engineering	-	-	2	1	1	-	-	25	25	50
7	PCC	BME2307	Lab-Manufacturing Engineering -I	-	-	2	1	1	-	-	25	25	50
8	PCC	BME2308	Lab-M/C Drawing and Solid modeling	-	-	2	2	1	-	-	25	25	50
9	MCC	BAU2303	Environmental Science	2	-	-	2	Audit	-	-	-	-	-
			Total	17	2	6	23	20	75	75	125	375	650

L-Lecture

T-Tutorial

P-Practical

CT1-ClassTest1

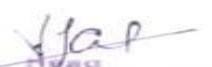
TA/CA-Teacher Assessment/Continuous Assessment

CT2-ClassTest2


ESE-End Semester Examination (For Laboratory End Semester performance)



Course Category	HSMC (Hum., Soc.Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Professional Core Courses)	PEC (Professional Elective Courses)	OEC (Open Elective courses from other discipline)	Project / Seminar /Industrial Training	MCC (Mandatory Courses)
Credits	3	4	8	5	-	-	-	Yes
Cumulative Sum	7	22	24	5	-	-	-	--

PROGRESSIVE TOTAL CREDITS: 38+20=58


 Head
 Department of Mechanical Engineering
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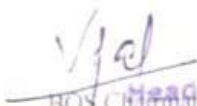

 Dean Academics
 Tulsiramji Gaikwad-Patil
 College Of Engineering
 and Technology, Nagpur




 Vice Principal
 Tulsiramji Gaikwad-Patil
 College Of Engineering &
 Technology, Nagpur

		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade)			
Program: B.Tech In Mechanical Engineering					
Semester-III		BME2301: Applied Mathematics III			
Teaching Scheme			Examination Scheme		
Lectures	3 Hrs/week		CT-1	15 Marks	
Tutorial	1 Hrs/week		CT-2	15 Marks	
Total Credit	4		TA	10 Marks	
Duration of ESE: 3Hrs			ESE	60 Marks	
			Total	100 Marks	
Course Contents					
Unit I	NUMERICAL METHODS: Error in numerical calculations, Errors in series approximation, Rounding of errors, Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method and their convergence, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordon method. Gauss Seidel method, Crout’s method,				
Unit II	Laplace Transforms: Laplace transforms and its properties, Inverse Laplace Transform & its properties, Convolution Theorem, Unit Step Function, Application for Laplace Transform to solve ordinary differential equations including simultaneous Differential Equations.				
Unit III	Fourier Series and Fourier Transform (FT): Periodic Functions and their Fourier Expansions, Even and Odd functions, change of interval, Half Range Expansions, Fourier transform, Fourier Sine & Cosine transforms, Discrete Fourier Transform, Application of Fourier Transform to solve Integral equation.				
Unit IV	Partial Differential equations: Partial differential equation of first order first degree i. e. Lagrange's form. the Linear homogeneous PDE of nth order with constant coefficient, method of separation of variables. Simple Applications to solve Partial Differential Equations (Wave Equations & One-dimensional heat equation only).				
Unit V	Functions of a Complex Variable: Function of a complex variable, Analytic functions, Cauchy-Riemann conditions, Conjugate functions, singularities, Cauchy's integral theorem and integral formula, Taylor's and Laurent's theorem, Residue theorem (without proof), contour integration				
Text Books					
1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication				
2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India				

3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville.
Reference Books	
1	A Text Book of applied Mathematics, Volume II , by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
3	Mathematics for Engineers by Chandrika Prasad John wiley & son

Course Code	Course Outcomes	CL	Class Sessions
BME2301.1	Apply the concept of Laplace Transform for Solving differential equation	3	10
BME2301.2	Analyze numerical techniques to find the roots of equations different types of equations.	4	9
BME2301.3	Apply the knowledge of Fourier series and Transform for understanding periodic signals and solve integral equations.	3	9
BME2301.4	Solve Partial Differential Equation using appropriate method	3	9
BME2301.5	Understand Complex Variable and its application.	2	8


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Program: B.Tech In Mechanical Engineering				
Semester-III	BME2302: Materials Engineering			
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/Week		CT-I	15 Marks
Tutorial	Nill		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Organic & Inorganic Chemistry, Crystallography			Total Marks	100 Marks
Course Contents				
Unit I	Introduction to materials, classification of materials. Properties and applications of materials. Crystalline nature of metals, specially microscopic and macroscopic examinations of metals. Alloys and solid solutions, types and their formations, modified Gibbs's phase rule, Lever rule for phase mixtures and their application in system. Study of equilibrium diagrams and invariant reactions. Iron-Iron carbide equilibrium diagram, critical temperatures. Microstructure of slowly cooled steels. Estimation of carbon from microstructures; structure property relationship.			
Unit II	Classification and application of plain carbon steels. Examples of alloy steel such as Hadfield Manganese Steel, ball Bearing Steels, etc. Tool Steels – Classification, composition, application and commercial heat treatment practice for HSS, Secondary hardening. Stainless Steels - Classification, composition, application and general heat treatment practice for Stainless Steels. Classification and applications of steels. Effect of alloying elements.			
Unit III	Heat treatment and its importance. Annealing, Normalizing, Hardening, Quench Cracks, Hardenability test. TTT diagram and its construction and related Heat Treatment Processes such as Austempering, Martempering, Patenting etc. Retention of Austenite, Effects and elimination of retained austenite, Tempering. Case / Surface hardening treatments such as Carburizing, Nitriding, Cyaniding, Carbonitriding, Flame and Induction hardening.			

Unit IV	Cast Iron – Classification, White cast Iron, Gray Cast Iron, Nodular Cast Iron, Malleable Cast Iron, Chilled and alloy Cast Iron. (Production route, Composition, Microstructure and applications) Effects of various parameters on structure and properties of Cast Iron, Alloy cast Iron such as Ni-resist, Ni-hard. Non-Ferrous Alloys – Study of non-ferrous alloys such as brasses (Cu-Zn diagram), Bronzes (Cu-Sn diagram), Aluminum Alloys (e.g. Al-Si & Al-Cu diagram), Bearing materials.
Unit V	Powder Metallurgy: Powder manufacture and Conditioning, Production of Sintered Structural Components, Self lubricating bearing, Cemented Carbides, Ceramics, Sintered Carbide cutting tools

Text Books

T.1	Material Science & Engineering, An Introduction, 6 th Edition, Donald Askeland, 1984.
T.2	Material Science & Engineering, V. R. Raghavan, 1974.
T.3	Material Science & Engineering, William Callister, 1985.
T.4	Material Science & Engineering, R. K. Rajput, 2009

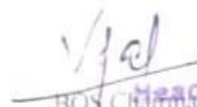
Reference Books

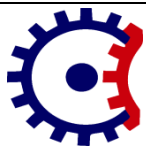
R.1	Modern Physical Metallurgy, R. E. Smallman, Butterworths, 1963
R.2	Phase transformations in metals and alloys- D.A. Potter and K.E. Easterling, CRC Press, 1992. 2. Transformations in Metals, P.G. Shewmon, Mc-Graw Hill, 1969.
R.3	Introduction to Physical Metallurgy 29th revised edition, 2009 Sidney H. Avner McGraw-Hill, 1964

Useful Links

1	https://nptel/2rxbxNem1iI?list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ
2	https://nptel/BJrTZ07bHm4?list=PLfIFNJ1DPG4IENg4VUTWyKxxB911aHuJz

Course Code	Course Outcomes	CL	Class Sessions
BME2302.1	Distinguish microstructure and analyze the effect of Crystalline nature of metals, construct and analyze Iron-Iron carbide equilibrium diagram.	2	9
BME2302.2	Interpret the commercial steels.	3	9
BME2302.3	Analyze and implement suitable heat treatment processes.	2	9
BME2302.4	Analyze the Cast Iron.	2	9
BME2302.5	Perceive the basics of powder Metallurgy for powder metallurgical components.	3	9


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Program: B. Tech In Mechanical Engineering

Semester-III BME2303- Manufacturing Engineering -I

Teaching Scheme

Theory 3 Hr/Week

Tutorial Nil

Total Credits 03

Examination Scheme

CT-I 15 Marks

CT-II 15 Marks

CA 10 Marks

Duration of ESE: 3Hrs

ESE 60 Marks

Pre-Requisites: Workshop Technology

Total Marks 100 Marks

Course Contents

Unit I

Pattern Making & Moulding:- Pattern making: Types, materials used, Pattern making allowances, color codes. Master Pattern, Core making: - Types, core material & its properties. Moulding: Types of sand moulds, moulding sand composition. moulding sand properties, sand preparation technique for casting,

Unit II

Gating System & Casting Processes:- Gating design -Elements of gating systems, pouring equipments, riser design Melting furnaces -Types, Electric furnace, Induction furnace, Cupola construction & operation. Cleaning, inspection & casting defects. Foundry mechanizing, Foundry equipments, Special casting processes such as investment Casting, Centrifugal Casting, Slush Casting and Die Casting. Advances in Gating system.

Unit III

Joining Processes:- Introduction to metal Joining- Types of Welding. Arc Welding & Gas Welding Processes, Thermit Welding, Defects & Inspection of Welding Joints, Electrodes, weldability of Metals, TIG Welding, MIG Welding, Resistance Welding. Soldering & Brazing. Plasma Arc welding, Electron Laser Beam welding.

Unit IV

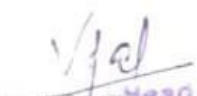
Introduction to Plastics:- Difference of thermosetting and thermoplastic compounds, compression moulding, transfer moulding, injection moulding, film and sheet forming, thermoforming and their applications. Introduction to Joining of Plastics- Mechanical Fastening, Spin Welding, Solvent Bonding, Ultrasonic welding, Induction welding, Dielectric welding, Hot Plate welding, Vibration welding, Hot gas welding. Plastic joining



Unit V

Hot and cold working of metals:
Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, effect of hot working. Cold working processes, Cold rolling, swaging, forging, extrusion forward, backward and impact roll forming, tube drawing, wire drawing, spinning, high energy rate forming, sheet metal working, types of presses, drives, different operations and types of dies.

Text Books	
T.1	A Text Of Book Manufacturing Technolgy by Chand And Co.Publication.
T.2	A Text Of Book Manufacturing Technolgy II by . Chand And Co.Publication
Reference Books	
R.1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy
R.3	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
Useful Links	
1	https://www.digimat.in/nptel/courses/video/112105233/L01.html
2	https://nptel.ac.in/courses/112/103/112103250/
3	https://nptel.ac.in/courses/112/105/112105212/

Course Code	Course Outcomes	CL	Class Sessions
BME2303.1	Apply the sand moldings technique for the castings.	3	9
BME2303.2	Prepare the gating and riser system needed for casting and requirements to achieve defect free casting.	3	9
BME2303.3	Examine appropriate welding process based on the type of industrial application.	3	9
BME2303.4	Summarize appropriate type of plastics and plastics processing method.	2	9
BME2303.5	Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications.	4	9


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Program: B.Tech in Mechanical Engineering				
Semester-III		BME2304: Thermodynamics Engineering		
Teaching Scheme			ExaminationSch	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial	1		CT-II	15Marks
Total Credits	4		CA	10Marks
Duration of ESE:3Hrs			ESE	60Marks
Pre-Requisites: Mathematics-I, Mathematics-II, Applied Physics, Engineering Applied Chemistry			Total Marks	100Marks
Course Contents				
UnitI	Basic concepts and properties: Introduction, thermodynamic system, control volume, macroscopic and microscopic approaches, properties and state of a system, point and path functions, thermodynamic equilibrium, processes and cycles, quasi-static process, properties such as specific volume, pressure, temperature, The Ideal Gas equation of state.The concepts of heat and work interactions. Evaluation of different modes of work. Zeroth law of thermodynamics, temperature scales.			
UnitII	First law of thermodynamics: Energy of systems, classification of energy, law of conservation of energy, first law applied to closed system undergoing a cycle, internal energy: a function of temperature, enthalpy, specific heat at constant volume and constant pressure, change in internal energy and heat transfer during various non-flow processes. First law applied to flow processes: steady state steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, throttling valve, turbines and compressors, pumps, heat exchangers etc. Work done and heat transfer during steady flow processes.			
UnitIII	Second law of thermodynamics: Limitations of first law, heat engines, refrigerators and heat pumps, Kelvin-planck and Clausius statements, their equivalence, reversible and irreversible processes, factors that render processes irreversible, Carnot cycle, two propositions regarding the efficiency of Carnot cycles, the thermodynamic temperature scale, reversed Carnot cycle, COP of heat pump and refrigeration. Thermodynamic processes – constant volume, isothermal, adiabatic, polytropic processes, throttling and free expansion- p-v and T-s diagrams-work done, heat exchanged, change in internal energy.			
UnitIV	Entropy: Inequality of Clausius, entropy: a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, principle of increase entropy. Properties of Pure Substances (Steam): Thermodynamic properties of pure substances in solid, liquid and vapor phases; P-v-T behavior ofsimple compressible substances, phase rule, thermodynamic property tables (Steam Tables) and charts.Calculations of work and heat interactions in non- flow and steady flow processes.Determination of dryness fraction using various calorimeters.			

UnitV	Power cycles: Gas power cycles Otto cycle, Diesel cycle, semi-Diesel, Sterling cycles, their efficiency and mean effective pressure calculations. Vapors power cycles: Properties of steam, specific volume and entropy of steam, dryness fraction of steam, throttling of steam, determination of dryness fraction, steam tables and their use, T-s and H-s diagram, Rankine and modified Rankine cycle, work done and efficiency, specific steam consumption, comparison of Rankine and Carnot cycle
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Text Books

T.1	Cengel Y.A., Boles M.A., A Text Book of Thermodynamics, McGraw-Hill, 6th Edition
T.2	Basic and Applied Thermodynamics, 2nd Edition, Nag P. K., Tata McGraw-Hill.
T.3	Engineering Thermodynamics, 2nd Edition, D.P.Mishra, Cengage Learning

Reference Books

R.1	Fundamentals of Thermodynamics, 5th Edition, Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen, John Wiley and Sons, Inc.
R.2	Thermodynamics, 5th Edition, K. Wark, McGraw-Hill
R.3	Engineering Thermodynamics, Gordon Rogers, Pearson Publications

Useful Links

1	https://nptel.ac.in/courses/112/108/112108148/
2	https://nptel.ac.in/courses/112/105/112105123/
3	https://nptel.ac.in/courses/101/104/101104063/

Course Code	Course Outcomes	CL	Class Sessions
BME2304.1	Apply basic laws of thermodynamics in analysis and design of thermodynamic cycles	3	9
BME2304.2	Apply the First law of thermodynamics for the analysis of thermodynamic systems to evaluate energy interaction in various Processes.	3	9
BME2304.3	Evaluate the performance of cyclic devices, change in the entropy and Availability in various processes applying the laws of thermodynamics.	5	9
BME2304.4	Evaluate various thermodynamic parameters in various processes with Phase change using phase change diagrams	5	9
BME2304.5	Analyze the performance of various Thermodynamic cycles applying Law of thermodynamics for evaluation of energy interaction.	4	9

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Program: B. Tech In Mechanical Engineering

Semester-III BSH2301: Human Values for Professional Society

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/Week		CT-I	15 Marks
Tutorial	Nil		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
			Total Marks	100 Marks

Course Contents

Unit I	Introduction to Value Education Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self-exploration as a means of Value Education.
Unit II	Harmony in the Human Being, Family, Society and Nature Human Being is more than just the Body, Understanding Myself as Coexistence of the Self and the Body, Understanding the activities in the Self and the activities in the Body, Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory.
Unit III	Social Ethics The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct.
Unit IV	Basic Theories Basic Ethical principles, Moral Developments, Deontology, Utilitarianism, Virtue theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.
Unit V	Global Issues in Professional Ethics: Introduction- Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

Text Books

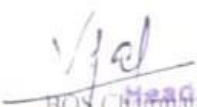
T.1	A.N Tripathy, New Age International Publishers, 2003.
T.2	Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004.
T.3	Bertrand Russell Human Society in Ethics & Politics.
T.4	Professional Ethics: R. Subramanian, Oxford University Press, 2015.

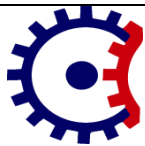

Reference Books

R.1	Corliss Lamont, Philosophy of Humanism.
R.2	Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009

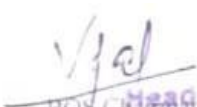
R.3	Gaur. R.R, Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
R.4	I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar
R.5	Mortimer. J. Adler, – Whatman has made of man.
R.6	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage Learning, 2015



Course Code	Course Outcomes	CL	Class Sessions
BSH2301.1	Describe Value Education and its role for Self-exploration.	2	9
BSH2301.2	Illustrate the Harmony in the Human Being and Society.	4	9
BSH2301.3	Examine the Ethical Human Conduct along with Universal Order.	2	9
BSH2301.4	Use of various theories of Basic Ethical principles.	2	9
BSH2301.5	Predict Global Issues in Professional Ethics and Sustainable Development.	3	9


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Program: B.Tech Mechanical Engineering					
SEMESTER-III		BME2306: Lab-Material Engineering			
Teaching Scheme				Examination Scheme	
Practical	2 Hrs/week			CA	25 Marks
Total Credit	2			ESE	25 Marks
				Total	50 Marks
		Duration of ESE: 02 Hrs			
Course Outcomes (CO)					
Students will be able to					
1	Distinguish different type of materials, its physical and chemical properties with crystallographic studies				
2	Analyze the process of metals solidification with phase diagram				
3	Compare the different heat treatment process and plane carbon steel alloys				
4	Categories the different types of cast iron and nonferrous alloys with the applications				
5	Identify the basic of powder Metallurgy with different Hardness testing method and Advance materials				
Sr. No.	List of Experiment				CO
1	Identifying the construction and working of a metallurgical microscope				CO1
2	Interpreting crystal structure of metals				CO1
3	Summarizing iron-iron carbon diagram in equilibrium				CO2
4	Preparation of specimen for metallurgical microscope				CO2
5	To observe and draw microstructure of steel.				CO3
6	To observe and draw microstructure of cast iron				CO4
7	To observe and draw microstructure of non-ferrous metals & alloys				CO4
8	Estimating the effect of annealing and normalizing on properties of steel				CO4
9	Estimating the effect of alloying element on properties of Steel.				CO4
10	To prepare the case study on powder metallurgy part manufacturing process.				CO5
11	Determine the hardness by i) Brinell ii) Rockwell hardness test.				CO5
Text Books					
1	Material Science & Engineering, An Introduction, 6 th Edition, Donald Askeland, 1984.				
2	Material Science & Engineering, V. R. Raghavan,1974.				
3	Material Science & Engineering, William Callister,1985.				
4	Material Science & Engineering, R. K. Rajput, 2009				
Reference Books					
1	Modern Physical Metallurgy, R. E. Smallman, Butterworths, 1963				
2	Phase transformations in metals and alloys- D.A. Potter and K.E. Easterling, CRC Press, 1992. 2. Transformations in Metals, P.G. Shewmon, Mc-Graw Hill, 1969.				
3	Introduction to Physical Metallurgy 29st revised edition, 2009 Sidney H.Avner McGraw-Hill,1964				
4	Modern Physical Metallurgy, R. E. Smallman, Butterworths, 1963				
Useful Links					
1	https://nptel/2rxbxNem1iI?list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ				
2	https://nptel/BJrTZ07bHm4?list=PLfIFNJ1DPG4IENg4VUTWyKxxB911aHuJz				

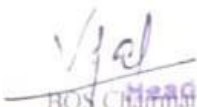
Course Code	Course Outcomes	BT Level	Lab Sessions
BME2306.1	Distinguish different type of materials, its physical and chemical properties with crystallographic studies	2	2
BME2306.2	Analyze the process of metals solidification with phase diagram	3	2
BME2306.3	Compare the different heat treatment process and plane carbon steel alloys	3	2
BME2306.4	Categories the different types of cast iron and nonferrous alloys with the applications	3	2
BME2306.5	Identify the basic of powder Metallurgy with different Hardness testing method and Advance materials	3	2


 BOS Chairman
 Department of Mechanical Engineering
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 Engineering & Technology, NAGPUR.

	Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)			
Program: B.Tech in Mechanical Engineering				
SEMESTER-III		BME2307: Lab -Manufacturing Engineering-I		
Teaching Scheme			Examination Scheme	
Practical	2 Hrs/week		CA	25 Marks
Total Credit	2		ESE	25 Marks
			Total	50 Marks
		Duration of ESE: 02 Hrs		
Course Outcomes (CO)				
Students will be able to				
1	Create the sand moldings technique for the castings.			
2	Prepare the gating and riser system needed for casting and requirements to achieve defect free casting.			
3	Examine appropriate welding process based on the type of industrial application.			
4	Summarize appropriate type of plastics and plastics processing method.			
5	Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications.			
Sr. No.	List of Experiment			CO
1	To analyze Pattern Making process			CO1
2	To perform job of Pattern Making			CO1
3	To perform job of Sand Mould			CO1
4	To analyze Casting Techniques Process			CO2
5	To perform job of Casting Techniques			CO2
6	To analyze the design of Gating System in sand mould techniques			CO2
7	To analyze Joining Techniques Processes			CO3
8	To perform Job of Welding			CO3
9	To Examine Plastic Molding Techniques			CO4
10	To Examine Metal forming process			CO5
Text Books				
T.1	A Text Of Book Manufacturing Technolgy by Chand And Co.Publication.			
T.2	A Text Of Book Manufacturing Technolgy II by . Chand And Co.Publication			
Reference Books				
R.1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har			
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy			
R.3	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har			
Useful Links				
1	https://www.digimat.in/nptel/courses/video/112105233/L01.html			

2	https://nptel.ac.in/courses/112/103/112103250/
3	https://nptel.ac.in/courses/112/105/112105212/

Course Code	Course Outcomes	BT Level	Lab Sessions
BME2307.1	Create the sand moldings technique for the castings.	3	2
BME2307.2	Prepare the gating and riser system needed for casting and requirements to achieve defect free casting.	3	2
BME2307.3	Examine appropriate welding process based on the type of industrial application.	3	2
BME2307.4	Summarize appropriate type of plastics and plastics processing method.	2	2
BME2307.5	Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications.	3	2


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Program: B.Tech in Mechanical Engineering

SEMESTER-III BME2308: Lab-Machine Drawing & Solid Modeling

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Total Credit	1	ESE	25 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs	

Course Outcomes (CO)

Students will be able to

1	Interpret and describe basic elements of standard machine drawing like lines, Name Blocks.
2	Interpret and describe basic elements of standard machine drawing like dimensions, tolerances, symbols.
3	Create 2-D detailing of machine elements from given isometric view.
4	Create sectional views of machine elements from given isometric view.
5	Apply concepts of Geometric Dimensioning and Tolerancing for creating part and assembly drawing.

Sr. No.	List of Experiment	CO
1	Prepare drawing Sheets of Name Blocks and Types of Lines.	CO1
2	Analyze and Draw different Standard Components and their representations.	CO2
3	Analyze and Draw different Standard Features and their representations.	CO2
4	Analyze and Draw different Machining Symbols, Welding Symbols, and Surface Finish Symbols.	CO2
5	Analyze and Draw different Standard dimensioning methods and Applying Tolerances.	CO2
6	Create 2-D orthographic projection of machine elements using Software	CO3
7	Create 2-D Isometric projection of machine elements using Software	CO3
8	Create Dimensioning and detailing of machine elements using Software.	CO3
9	Create Sectional views of machine elements using Software.	CO4
10	Create Limit, Fits and Tolerances Geometrical dimensioning and tolerances (symbols, applications) datum's, reference for assembly drawing using Software.	CO5

Text Books

1	Naryana K.L., Kannaiah R., Venkata Reddy K "Machine Drawing", New Age Int.Pub
2	N.D.Bhatt "Machine Drawing; Ed", Charotar Publishing House, 33 . rd
3	K. Venkata Reddy, B.S. Publication 2 nd Ed

Reference Books

R.1	'Engg. Drawing practice for schools & colleges", Bureau of Indian Standards, 1 Ed.; 2002. st1998
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Useful Links

1	https://eedocs.files.wordpress.com/2014/02/machinedrawing.pdf
2	https://nptel.ac.in/courses/112103019

Course Code	Course Outcomes	BT Level	Lab Sessions
BME2308.1	Interpret and describe basic elements of standard machine drawing like lines, Name Blocks.	3	2
BME2308.2	Interpret and describe basic elements of standard machine drawing like dimensions, tolerances, symbols.	4	2
BME2308.3	Create 2-D detailing of machine elements from given isometric view.	4	2
BME2308.4	Create sectional views of machine elements from given isometric view.	4	2
BME2308.5	Apply concepts of Geometric Dimensioning and Tolerancing for creating part and assembly drawing.	4	2


 Dr. Jyoti Chaudhary
 Department of Mechanical Engineering
 Tulsi Ramji Galkwad-Patil College of
 Engineering & Technology, NAGPUR


 Dr. Jyoti Chaudhary
 Dean Academics
 Tulsi Ramji Galkwad-Patil
 College Of Engineering
 and Technology, Nagpur


 Dr. Jyoti Chaudhary
 Tulsi Ramji Galkwad-Patil
 College Of Engineering &
 Technology, Nagpur