MGDH/LLL
25/09/24

FOR I yr 2024 Admitted

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)
NAAC Accredited with A++ Grade
Department of Mechanical Engineering

D no. 486
1-11-24

Board of Studies Proceeding

Online Meeting Dated: 12/09/2024

Department of Mechanical Engineering

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Minutes of Board of Studies Meeting held on 12th September 2024

The meeting of Board of Studies (BoS) of the Mechanical Engineering was held on 12th September, 2024 at 11 AM onwards in online mode. Following members were present

1. Dr . C. S. Malvi	(Chairperson, BoS and Head, Dept. of Mech. Engg. MITS-DU)
2. Dr. B. B. Panigrahi	(Professor, IIT, Hyderabad, External Expert)
3. Dr. Mukul Shukla	(Professor, IIT, Hyderabad, External Expert)
4. Dr. Pratesh Jayaswal	(Professor, Mechanical Engg. MITS, Member)
5. Dr. M. K. Gaur	(Professor, Mechanical Engg. MITS, Member)
6. Dr. M. K. Sagar	(Professor, Mechanical Engg. MITS, Member)
7. Prof. R. P. Kori	(Astt. Prof., Mechanical Engg. MITS, Member)
8. Prof. V. Chaturvedi	(Astt. Prof., Mechanical Engg. MITS, Member)
9. Dr. Jyoti Vimal	(Astt. Prof., Mechanical Engg. MITS, Member)

BoS Agenda Items	
Item ME1	**To propose the scheme structure for the Batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) (The total credits from I-VIII semester should not be less than 160 for this batch).** The proposed Scheme structure of B.Tech. Mechanical Engineering for the batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science- Deemed University (MITS-DU) along with tentative list of DE & OC course to be offered was presented and discussed in the meeting. The proposed scheme structure along with the list of DE & OC is attached in Annexure-I
Item ME2	**To review & finalize the syllabi for all courses of B. Tech I Semester (for batch admitted in 2024-25) under the flexible curriculum along with their COs.** The syllabi for all the courses of B.Tech. Mechanical Engineering I Semester (for batch admitted 2024-25) were reviewed and finalized. The finalized syllabi for the courses is attached in Annexure-II.
Item ME3	**To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. I semester along with their COs.** The experimental list and list of micro project for B.Tech. Mechanical Engineering I Semester (for batch admitted 2024-25) were reviewed and finalized. The finalized experimental list and list of micro project for the courses is attached in Annexure-III.
Item ME4	**To discuss and recommend the scheme structure for the Batch admitted in 2024-25 academic session & syllabi of I semester PG Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) (M.E./M.Tech./MCA/MBA/MUP) along with their**

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	Course Outcomes (COs) Department of Mechanical Engineering offering one PG course (Production Engineering) The scheme and syllabus of M.Tech. Production Engineering (2024 -25 admitted batch) was reviewed and discussed and attached in Annexure -IV
Item ME5	**To review and finalize the syllabus/module of Classified Novel Engaging Course to be offered in I semester of PG programme.** The following course will be offered as classified Novel Engaging Course in I sem. PG Program 1. Reference Management and Engineering Research The syllabus/Module for this course was finalized and the same is attached in Annexure- V.
Item ME6	**To review and finalize the scheme structure for the Batch admitted in 2024-25 academic session syllabi of I Research Methodology and Ethics Ph.D. Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU).** The scheme structure for the Ph.D. program under MITS –DU for the batch admitted in 2024-25 was discussed and finalized. The same is attached in Annexure –VI.
Item ME7	**Any other matter.** **No**

In addition to above, the following are the suggestion given by the external expert.

1. In the Scheme of VIII sem, "Research Internship" word should be replaced by "Project".

2. The time for the major evaluation in the theory block is not balanced. If the minor evaluation, which is 1 hour long and worth 20 marks, then the major evaluation, which is worth 30 marks, should be 1.5 hours long. Alternatively, if the major evaluation is 2 hours long, it should be worth 40 marks.

3. If first 2 units are covered in Minor Evaluation 1 and then 2 units in Minor Evaluation 2, then the individual weightage for these units will be 10 marks. However, if all 5 units are covered in the Major Evaluation for 30 marks, the weightage of Unit V will become significantly lower.

4. As a NAAC A++ Deemed University, it is better for your faculty to teach the students rather than relying too much on NPTEL/SWAYAM.

5. Mode of examination is un-justified. Major Evaluation should not be in MCQ type.

6. Total percentage distribution of DC, DE, OC, and Computer based Subjects should be displayed on the front page.

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Dr. Jyoti Vimal
(BoS Member)

Mr. V. Chaturvedi
(BoS Member)

Mr. R. P. Kori
(BoS Member)

Dr. M. K. Sagar
(BoS Member)

Dr. M. K. Gaur
(BoS Member)

Dr. Pravesh Jayaswal
(BoS Member)
12/9/2024

Dr. Mukul Shukla
(External Expert)
online Present

Dr. B. B. Panigrahi
(External Expert)
online present

Dr. C. S. Malvi
(BoS Chairman)

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Annexure-I

Item ME1	To propose the scheme structure for the Batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) (The total credits from I-VIII semester should not be less than 160 for this batch).

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Department of Mechanical Engineering

Semester-Wise General Scheme Structure & Important Guidelines for Flexible Curriculum

(Batch admitted in Academic Session 2024-25 onwards)

Abbreviations Used

L	Lecture
T	Tutorial
P	Practical
HSMC	Humanities and Social Sciences including Management Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
DC	Departmental Core
DE	Departmental Elective
SPC	Specialization Courses
OC	Open Category
DLC	Departmental Laboratory Courses
MOOC	Massive Open Online Course
MWS	Mandatory Workshop
SP	Semester Proficiency
SIP	Skill Internship Program
SLP	Self-learning Presentation
PDC	Professional Development Component
PBL	Project Based Learning
PC	Professional Certification
MAC	Mandatory Audit Course
NEC	Novel Engaging Course

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Department of Mechanical Engineering

Scheme of Evaluation

B. Tech. I Semester *(Mechanical Engineering)*

For batch admitted in academic session 2024-25

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted: Theory Block: Continuous Evaluation: Mseee Evaluation I	Mseee Evaluation II	Quiz/ Assignment	Major Evaluation	Practical Block: Continuous Evaluation: Lab Work & Internal	Major Evaluation	Total Marks	Contact Hours per week: L	T	P	Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
1.	1251101	BC	Engineering Materials	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	1251102	ESC	Computer Programming	30	20	30	30	-	-	100	2	-	-	2	Face to Face	SEQ	2 Hrs
3.	1251103	BC	Manufacturing Science	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	1251104	BC	Basic Mechanical Engineering	20	20	30	30	-	-	100	2	1	-	3	Face to Face	SEQ	2 Hrs
5.	1251105	ESC	Basic Electrical & Electronics Engineering	30	20	30	30	-	-	100	2	-	-	2	Face to Face	SEQ	2 Hrs
6.	1251106	BSC	Computer Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	Viva	-
7.	1251107	BSC	Electrical & Electronics Engineering Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	Viva	-
8.	1251108	SP	Semester Proficiency*	-	-	-	-	70	-	70	-	-	2	1	Face to Face	Viva	-
9.	1251109	ESC	Micro Project# (Manufacturing Group Workshop)	-	-	-	-	70	30	100	-	-	2	1	Experimental	Viva	-
10.	1251110	ESC	Engineering Chemistry Lab**	-	-	-	-	70	30	100	-	-	2	1	Experimental	Viva	-
11.	[illegible]	MDC	Value Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	-	1	1	Interactive	Viva	-
			Total	200	100	150	150	350	120	1000	11	02	10	19	-	-	-
12.	1251011	MAN	Universal Human Values & Professional Ethics (UHVPE)	20	20	50	50	-	-	100	3	-	-	GRADE	Practical	50 Hrs	3 Hrs
13.	[illegible]	MNC	[illegible]											GRADE	Interactive	50 Hrs	-

Induction programme of [illegible] under MC-1, Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Interaction to Famous People, Visit to local Area, Familiarization to Dept./Branch & Institution

Skill Knowledge Program (Self Study) Minimum 45 hours duration. To be credited in II Semester.

MCQ: Multiple Choice Question AQ: Assignment + Oral PP: Pen Paper SOE: Submission + Oral OB: Open Book

ESC	HC	BSC	MAC	SP	PHY	MAC	MNC
1	1	2		1	1	-	1

Theory		Practical	MIC	Lab			Theory				Lab		
Face to Face	Online	Face to Face	Interactive	Blended	Experiential	Experiential	PP	MP	MCQ	OB	AQ	MP	
12	-	1	1	-	1	1	6	-	7	-	8	3	19
[illegible]	-	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	-	[illegible]	-	[illegible]	[illegible]	[illegible]

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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Department of Mechanical Engineering

Annexure-II

Item ME2	To review & finalize the syllabi for all courses of B. Tech I Semester (for batch admitted in 2024-25) under the flexible curriculum along with their COs.

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12241101: Engineering Materials

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Core-DC	Engineering Materials	12241101	3	-	-	Major Evaluation: 30 marks Duration: 2 Hr

Course Objectives: To make the students to understand:

1. The basic fundamentals of materials science and engineering.
2. The different classes of materials, their properties, structures and imperfections present in them.
3. The functional properties of materials and the roles of microstructure, heat treatment defects and environment play in typical engineering applications.

Course Pre-Requisites: NIL

Syllabus

Unit-I Structure of materials

Fundamentals of crystal structures and crystal system, crystallographic planes and directions, linear and planar density, single crystal, polycrystalline material and non-crystalline materials, Homogeneous and heterogeneous solidifications, Crystal imperfections: point, line, surface and volume defects.

Unit-II Material testing and mechanical properties

Mechanical properties in static tensile, compression and bending tests, Hardness: Rockwell, Brinell, Vicker's, Impact toughness and fracture toughness.

Role of dislocations in plastic deformation, slip and twinning processes. Mechanism of ductile and brittle fracture. Fatigue: Cyclic stresses, S-N curve, crack initiation and propagation, factors affecting fatigue life; Creep: Generalized creep behavior, stress and temperature effects.

Unit-III Engineering Materials

Ferrous (Steels and Cast irons with role of different alloying elements) and non-ferrous metals and alloys (Aluminum, Magnesium, Titanium, Copper, Nickel alloys), Nano-materials, Ceramic material, Composite material with their properties and applications, Smart materials, Bio-materials.

Unit-IV Phase diagrams and phase transformation of metal alloys

Concept of phases, Gibb's phase rule, Lever-rule, binary isomorphous and eutectic phase diagrams, Eutectoid, Peritectic and Peritectoid systems, allotropy in iron, Fe-Fe_3C phase diagram; Isothermal transformation of austenite, continuous cooling transformation of austenite, Objectives of heat treatments, Annealing, Normalizing, Hardening (bulk and surface)

Unit-V Environmental consideration and some case studies

Corrosion: Introduction, types & its prevention; generalized material selection process, material selection for torsionally-stressed cylindrical shaft, Automotive valve spring, orthopedic implants, Integrated circuit and etc.

Course Outcomes: After successful completion of this course students will be able to:

CO1. State the fundamental relationship between structure and properties of materials.
CO2. Discuss mechanical properties of materials
CO3. Compare the different processes to alter the material properties.

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CO4. Determine the effect of different phases, impurities on the behavior of materials.
CO5. Analyze crystal structure and composition of different materials.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	3	1	1	1	-	1	-	3	-	1
CO2	3	1	2	2	3	1	1	-	-	1	-	3	1	1
CO3	3	3	3	2	3	2	-	1	-	-	2	3	1	2
CO4	3	3	3	2	3	1	2	1	-	1	2	3	-	-
CO5	3	3	3	3	3	2	1	1	1	1	2	3	1	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Text & Reference Books

1. Material Science and Engineering: An Introduction, William D. Callister, John Willey & Sons Inc., 7th edition
2. Elements of Material Science and Engineering by Lawrence, H. Vanvlackdison; Wesley.Mention the Year or the Edition and Publisher and Place of Publication
3. Material Science and Engineering by Raghvan, V; Prentice Hall of India.
4. Introduction to Engineering Materials by Agrawal, B.K; Tata McGraw Hill, N. Delhi.

NPTEL Link for Material Science

https://onlinecourses.nptel.ac.in/noc18_mm05/preview

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For batch admitted in Academic Session 2024-25
Scheme of Evaluation

MITS

12241103 : Manufacturing Science

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Core-DC	Manufacturing Science	12241103	2	1	-	Major Evaluation: 30 marks Duration: 2 Hr

Course Objectives: To make students:

1. Able to learn the various methods and types of castings, welding processes, sheet metal forming, powder metallurgy

2. Able to examine the principles associated with basic operations involving the forming, machining and welding of engineering materials;

3. Aware of the necessity to manage manufacturing processes and systems for the best use of material and human resources.

Course Pre-Requisites: NIL

Syllabus

Unit-I Casting: Brief History, Basic principle & survey of casting processes. Sand casting, pattern materials, and allowances. Green and dry moulding, moulding methods, moulding sand properties and testing. Elements of mould and design considerations. Cores use, core materials and core making practice. Die, investment and centrifugal casting processes. Melting practice and concepts in solidification. Inspection and defects analysis. e-foundry, Casting process improvement by application of AI.

Unit-II Forming: Elastic and plastic deformation, Concept of strain hardening. Rolling, forging, extrusion, spinning, wire and tube drawing processes, machines and equipment's, parameters and force calculations.

Unit-III Sheet Metal Working: Role of sheet metal components. Cutting mechanism. Description of cutting processes like blanking. Piercing, lancing etc. Description of forming processes like bending cup drawing, coining, embossing etc. Basic elements of presses for sheet metal working. Punch and Die clearances and dieelements.

Unit-IV Welding: Principle of welding, soldering, brazing and adhesive bonding.Survey of welding and allied processes. Arc welding: power sources and consumables. MMAW, TIG& MIG processes and their parameter selection. Resistance Welding: principle and equipment. Spot, projection and Seam welding processes, Gas welding and cutting: Processes and equipment, Robot Welding.

Unit-V Powder Metallurgy: Powder manufacturing, compaction and sintering processes. Advantages and applications of powder metallurgy, Manufacturing of Powder metallurgy components.

Course Outcomes: After successful completion of this course students will be able to:

CO1- Select appropriate pattern materials and apply knowledge of pattern allowances to ensure accurate and efficient casting.
CO2- Explain the rolling process, differentiate between hot and cold rolling, and perform basic calculations related to rolling force, torque, and power requirements.
CO3- Develop the skills to calculate the correct punch and die clearances for various materials and thickness.

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CO4- Apply theoretical knowledge to practical scenarios, making informed decisions in welding process selection, parameter optimization, and equipment usage.
CO5- Explore the diverse applications of powder metallurgy in various industries, including automotive, aerospace, medical, and electronics, and evaluate the suitability of P/M for different applications.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	3	1	1	1	2	1	-	3	1	1
CO2	3	1	2	2	3	1	1	1	1	1	-	3	1	1
CO3	3	3	3	2	3	2	1	1	1	1	2	3	1	2
CO4	3	3	3	2	3	1	2	1	1	1	2	3	1	2
CO5	3	3	3	3	3	2	1	1	1	1	2	3	1	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Text &Reference Books

1. Jain R.K., Production Technology, Khanna Publishers, 2001.
2. Hajra Choudhry, Elements of Workshop Technology, Vol – II Media Promoters & Publishers, 1994.
3. Production Technology by HMT, Tata McGraw-Hill.
4.Chapman, W.A.J., Workshop Technology, Vol - II, Oxford & IBH Publishing Co. Ltd.,
5. Manufacturing Processes by Amstead, B.H., P.F. Oswald and M.L. Begeman, John Wiley and Sons Inc., New York.
6. Manufacturing Technology Vol. 1 by P.N. Rao.
7. Modern Manufacturing Process Engineering by Neibel, B.W., Alan B. Draper and R.A. Wysk, McGraw-Hill Publishing Co., New York.
8. Manufacturing Engineering and Technology by Kalpakjian, S, Addison-Wesley Publishing Co., New York.
9. Materials and Processes in Manufacturing by E. Paul DeGarmo, J. Temple Black, and Ronald Kohser, Macmillan Publishing Co., New York.
10. Introduction to Manufacturing Processes John A. Schey, McGraw-Hill Book Co., New York.

NPTEL Link for Manufacturing Process

http://nptel.ac.in/courses/112107145/

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12241104: Basic Mechanical Engineering

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Core-DC	Basic Mechanical Engineering	12241104	2	1	-	Major Evaluation: 30 marks Duration: 2 Hr

Course Objectives: To make the students:

1. Develop the fundamentals of Engineering materials, measurement and reciprocating machines.
2. Develop an ability to understand the Thermodynamic laws, steam generator and reciprocating machines for solving engineering problems.
3. Demonstrate Engines and Boiler fundamentals using models.

Course Pre-Requisites: NIL

Syllabus

UNIT-I:

Materials: Classification of engineering material, composition of cast iron and carbon steels on iron-carbon diagram and their mechanical properties; Alloy steel and their applications; Stress-Strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness and fatigue testing of materials.

UNIT-II:

Measurement: Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainty analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lathe drilling, milling and shaping machines.

UNIT-III

Fluids: Fluid properties, pressure, density and viscosity; pressure variation with depth, static and kinetic energy; Bernoulli's equation for incompressible fluids, viscous and turbulent flow, working principle of fluid coupling, pumps, compressors, turbines.

UNIT-IV

Thermodynamics: Zeroth, First, second and third law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, steam table, mollier chart, heating, ventilation, and air conditioning (HVAC) software. classification and working of boilers, Refrigeration, vapour compression cycles, coefficient of performance (COP),

UNIT-V

Reciprocating Machines: Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol and diesel IC engines.

Course Outcomes: After successful completion of this course students will be able to:

CO1. Apply the knowledge of material properties and testing methods to select appropriate materials for specific engineering applications.

CO2. Develop a foundational understanding of measurement principles, focusing on the accurate and precise measurement of physical quantities such as temperature, pressure, velocity, flow, strain, force, and torque.

CO3. Gain proficiency in the principles of fluid motion, including the concepts of static and kinetic energy in fluid systems.

CO4. Apply these thermodynamics laws to analyze energy exchanges and transformations in various thermodynamic systems.

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CO5. Study the Otto and Diesel cycles in detail, learning how these cycles govern the operation of internal combustion (IC) engines and influence their efficiency and performance.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	3	1	1	1	1	1	-	3	1	1
CO2	3	1	2	2	3	1	1	1	1	1	-	3	1	1
CO3	3	3	3	2	3	2	1	1	1	1	2	3	1	-
CO4	3	3	3	2	3	1	2	1	1	1	2	3	1	-
CO5	3	3	3	3	3	2	1	1	1	1	2	3	1	-

1 - Slightly; 2 - Moderately; 3 – Substantially

Reference Books:

1. Narula; Material Science; TMH
2. Agrawal B & CM; Basic Mechanical Engineering; TMH
3. Nag PK, Tripathi et al; Basic Mechanical Engineering; TMH
4. Rajput; Basic Mechanical Engineering;
5. Sawhney GS; Fundamentals of Mechanical Engibneering; PHI
6. Nakra and Chaudhary; Instrumentation and Measurement; TMH
7. Nag PK; Engineering Thermodynamics; TMH
8. Ganesan; Combustion Engines; TMH.

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12241109: Micro Project (Manufacturing Science/ Workshop)

Category	Title	Code	Credit-1			Practical paper
			L	T	P	
Project Based Learning (PBL)	Micro Project (Manufacturing Science/ Workshop)	12241109	--	-	2	Major Evaluation-30

Course Objectives:

1. To familiarize with the basics of tools and equipment used in fitting, carpentry, sheet metal, welding and smithy.
2. To with the production of simple models in the above trades.
3. To develop general machining skills in the students.

List of Experiments (Expandable)

1. Performance on mold making of Simple component.
2. Performance on pattern making of Simple component.
3. Performance on Metal Casting of Simple component.
4. Performance on Welding of simple work piece (Example Arc Welding)
5. Performance on Sheet Metal work of Simple component.
6. Performance on hot forging of Simple component.

Skill Based Projects: (Expandable)

1. Measurement and calibration using slip gauges
2. Performing energy audit using stroboscope and lux meter
3. Make a Free energy Steam Engine at home
4. Make an Air Compressor at home
5. Mini Bench Tapping machine project
6. Make a Robotic Arm
7. Tornado in a bottle
8. Make a Hydraulic Lift
9. Thermal Expansion project
10. Make a positive displacement pump

Course Outcome: After successful completion of this course students will be able to:

CO1. Discuss the hand tools, machine tools and power tools.
CO2. Utilize appropriate tools required for specific operation.
CO3. Apply safety measures required to be taken while using the tools in floor shops, Machine ships and carpentry shop.
CO4. Use the techniques, skills, and modern engineering tools necessary for manufacturing and production

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engineering.

CO5. **Conduct** experiments in the field of Production engineering.

CO6. **Design** a system, components, or process to meet desired needs, ethical, health and safety, manufacturability and sustainability.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	3	1	1	1	3	2	3	3	1	1
CO2	3	1	2	2	3	1	1	1	3	2	3	3	1	1
CO3	3	3	3	2	3	2	1	1	3	2	3	3	1	2
CO4	3	3	3	2	3	1	2	1	3	1	3	3	1	2
CO5	3	3	3	3	3	2	1	1	3	1	2	3	1	2
CO6	3	3	3	3	3	3	2	3	3	2	2	3	1	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Text & References Books:

1. Bawa HS; Workshop Practice, TMH
2. Rao PN; Manufacturing Technology-Vol.1 & 2, TMH
3. John KC; Mechanical Workshop Practice; PHI
4. HazraChoudhry; workshop Practice-Vol.1 & 2.
5. Jain R. K.; Production Technology

NPTEL Link for Manufacturing Practices

http://nptel.ac.in/courses/112107145/

Laboratory Work:

Relevant shop floor exercises involving practice in forging, Carpentry, fitting, pattern making, Sand casting, Moulding, Welding, Sheet metal fabrication techniques.

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12241105: Basic Electrical & Electronics Engineering

Category	Title	Code	Credit-2			Practical paper
			L	T	P	
ESC	Basic Electrical & Electronics Engineering	12241105	2	-	-	Major Evaluation-30

Course Objectives:

- To impart basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer, rotating electrical machine and its terminology.
- To make familiarize the students about the working of, various electronic circuits and its importance.

Unit I - D.C. Circuits Analysis: Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit II –Single-phase AC Circuits: Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.

Unit III- Magnetic Circuits & Resonance: Magnetic Circuits: Concept of MMF, flux and magnetic reluctance, Self and mutual inductances, Dot convention, coefficient of coupling and coupled circuits. Resonance: Series and Parallel resonance, Bandwidth, Q-factor and selectivity.

Unit IV- Single-phase Transformer & Rotating Electrical Machines: Single phase transformer, Basic concepts, construction and working principal, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.

Unit V - Digital Electronics, Devices & Circuits: Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates-symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations.

Recommended Books:

1. Basic Electrical and Electronics Engineering, D P. Kothari &I.J. Nagrath-Tata McGraw Hill
2. Basic Electrical and Electronics Engineering, V N Mittle& Arvind Mittal - Tata McGraw Hill
3. Basic Electrical and Electronics Engineering, S. K Bhattacharya - Pearson
4. Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
5. Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall
6. Basic Electrical Engineering - A.E. Fitzgerald, Higginbotham and Grabel - TMH
7. Integrated Electronics- Millmann& Halkias

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Course Outcomes

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

CO 1. Solve dc & ac circuits by applying fundamental laws & theorems
CO 2. Analyze magnetic circuits and resonance characteristics of ac electric circuits
CO 3. Describe the working principle, construction, applications of single phase transformer & rotating electrical machines
CO 4. Select the logic gates for various applications in digital electronic circuits.
CO 5. Explain the characteristics and parameters of Diode and Transistor.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO3	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO4	3	3	2	3	3	-	-	-	-	-	-	3	2	-
CO5	3	3	2	2	2	-	-	-	-	-	-	3	2	-

1 - Slightly; 2 - Moderately; 3 – Substantially

Electrical & Electronics Engineering Lab:

LIST OF EXPERIMENT

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem
3. To determine resistance & inductance of a choke coil.
4. To determine active & reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter & measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.

Course Outcomes:

After the completion of the lab, the student will be able to –

CO 1. Verify circuit theorems.
CO 2. Perform tests on transformer for determination of losses, efficiency & polarity.
CO 3. Acquire teamwork skills for working effectively in groups
CO 4. Prepare an organized technical report on experiments conducted in the laboratory

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	1	1	1	3	3	-

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CO2	3	3	3	3	2	-	-	-	1	1	1	3	3	-
CO3	-	-	-	-	-	2	1	2	3	2	3	3	3	-
CO4	-	-	-	-	2	1	2	2	2	3	3	3	3	-

1 - Slightly; 2 - Moderately; 3 – Substantially

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Annexure-III

Item ME3	To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. I semester along with their COs.

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12241109: Micro Project (Manufacturing Science/ Workshop)

Category	Title	Code	Credit-1			Practical paper
			L	T	P	
Project Based Learning (PBL)	Micro Project (Manufacturing Science/ Workshop)	12241109	--	-	2	Major Evaluation-30

Course Objectives:

1. To familiarize with the basics of tools and equipment used in fitting, carpentry, sheet metal, welding and smithy.
2. To with the production of simple models in the above trades.
3. To develop general machining skills in the students.

List of Experiments (Expandable)

1. Performance on mold making of Simple component.
2. Performance on pattern making of Simple component.
3. Performance on Metal Casting of Simple component.
4. Performance on Welding of simple work piece (Example Arc Welding)
5. Performance on Sheet Metal work of Simple component.
6. Performance on hot forging of Simple component.

(All students must prepare one micro project using the skills of experiment)

Skill Based Projects: (Expandable)

1. Measurement and calibration using slip gauges
2. Performing energy audit using stroboscope and lux meter
3. Make a Free energy Steam Engine at home
4. Make an Air Compressor at home
5. Mini Bench Tapping machine project
6. Make a Robotic Arm
7. Tornado in a bottle
8. Make a Hydraulic Lift
9. Thermal Expansion project
10. Make a positive displacement pump

Course Outcome: After successful completion of this course students will be able to:

CO1. **Discuss** the hand tools, machine tools and power tools.
CO2. **Utilize** appropriate tools required for specific operation.

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CO3. Apply safety measures required to be taken while using the tools in floor shops, Machine ships and carpentry shop.

CO4. Use the techniques, skills, and modern engineering tools necessary for manufacturing and production engineering.

CO5. Conduct experiments in the field of Production engineering.

CO6. Design a system, components, or process to meet desired needs, ethical, health and safety, manufacturability and sustainability.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	3	1	1	1	3	2	3	3	1	1
CO2	3	1	2	2	3	1	1	1	3	2	3	3	1	1
CO3	3	3	3	2	3	2	1	1	3	2	3	3	1	2
CO4	3	3	3	2	3	1	2	1	3	1	3	3	1	2
CO5	3	3	3	3	3	2	1	1	3	1	2	3	1	2
CO6	3	3	3	3	3	3	2	3	3	2	2	3	1	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Text & References Books:

1. Bawa HS; Workshop Practice, TMH
2. Rao PN; Manufacturing Technology-Vol.1 & 2, TMH
3. John KC; Mechanical Workshop Practice; PHI
4. HazraChoudhry; workshop Practice-Vol.1 & 2.
5. Jain R. K.; Production Technology

NPTEL Link for Manufacturing Practices

http://nptel.ac.in/courses/112107145/

Laboratory Work:

Relevant shop floor exercises involving practice in forging, Carpentry, fitting, pattern making, Sand casting, Moulding, Welding, Sheet metal fabrication techniques.

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Department of Mechanical Engineering

Annexure -IV

Item ME4	To discuss and recommend the scheme structure for the Batch admitted in 2024-25 academic session & syllabi of I semester PG Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) (M.E./M.Tech./MCA/MBA/MUP) along with their Course Outcomes (COs)

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Department of Mechanical Engineering

Scheme of Evaluation

M. Tech. I Semester *(Production Engineering)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Exam.	Duration of Exam.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	56241101	DC	Computational Techniques (DC-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	56241102	DC	Production Engineering- I (DC-2)	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
3.	56241103	DC	Maintenance Management (DC-3)	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	562411xx	DE	Departmental Elective (DE-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
5.	56241104	SPC	Computer Integrated Manufacturing (SC-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	56241105	DLC	Production Engineering Lab-I[#]	-	-	-	-	70	30	100	-	-	4	2	Experiential	SO	-
7.	56241106	SLP	Seminar/Presentation[$]	-	-	-	-	70	30	100	-	-	4	2	Mentoring	SO	-
8.	MOOCXXXX	NEC	Classified Novel Engaging Course (Activity Based Learning)	-	-	-	-	-	50	50	-	1	-	1	Interactive	SO	-
Total				100	100	150	150	140	110	750	13	03	08	20	-	-	-

MCQ: Multiple Choice Question PP: Pen Paper SO: Submission + Oral OB: Open Book

[#] During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

[$] Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-1		
S. No.	Course Code	Course Name
1.		Flexible Manufacturing Systems
2.		Ergonomics and Work Study
3.		Total Quality Management
4.		Production and Operations Management

Mode of Learning					Mode of Examination				Total Credits
Theory		Lab			Theory			Lab	
Face to Face	Online	Blended	Experiential	Experimental	PP	MCQ	OB	SO	
15	-	2	3	-	15	-	-	3	20
75	-	10	15	-	75	-	-	15	Credits *5

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56241101: Computational Techniques

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental core -(DC)	Computational Techniques	56241101	3	-	-	Major Evaluation: 30 Marks Duration-2hrs.

Objective of Course

Course Objectives:

1. To know about the formulation of L.P.P. & its solution
2. To explore the Nonlinear programming problem and dynamic programming
3. To describe Probability and random Process
4. To describe random sampling and hypothetical test
5. To perceive the Z-transform techniques

Syllabus

Unit 1:

Concept of LPP, LPP formulation, Graphical method for solving LPP with two variables, Simplex method, Duality theory, Transportation and Assignment problems. Non Linear Programming Problems (NLPP): Introduction of NLPP, constraints and non-constraint problems of maxima and minima, constraints in the form of equations.

Unit 2:

Introduction to game theory, competitive games, finite and infinite games, two person zero sum game, pure and mixed strategies, saddle point, maximin and minimax principle, solution of a rectangular game in terms of mixed strategies, Graphical method of (2xm) and (nx2) games.

Dynamic Programming: Basic concepts, Bellman's optimality principle, dynamic programming approach in decision making problems, optimal subdivision problems.

Unit 3:

Theory of Probability: Concept of probability, Random variable, discrete probability distributions, Continuous probability distributions, Moment generating function, Probability density function, some special distributions, bi-variate distribution, Random variable, conditional distribution function, Joint probability distribution function, Marginal probability distribution, cumulative probability distribution.

Unit 4:

Testing of Hypothesis, Basic concept of estimation, concept of theory of sampling, chi-square ($\chi 2$) distribution, t-distribution, Fisher's Z-distribution. Analysis of variance, one way and two-way classification.

Unit 5:

Z-transform and their properties, inverse Z-transform, convolution theorem, solution of difference equations by Z-transform. Basic concept of Bessel's function, Hankel transform and their properties, Parseval's theorem.

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Course Outcomes After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the solution of Linear and Non Linear Programming Problems.
CO2	Evaluate the problems related to game theory& dynamic programming.
CO3	Acquire the knowledge of Probability theory and Random Variable.
CO4	Analyze the test of hypothesis and Analysis of Variance.
CO5	Apply transforms for engineering applications.

Recommended Books:

1. I. Griva, S. G. Nash and A. Sofer: Linear and Non Linear Optimization, Society for Industrial & Applied, U. S. Mathematics , 2012.
2. F. B. Hildebrand: Methods of Applied Mathematics , Prentaince Hall, 1992.
3. H. C. Saxena: Mathematical Statistics, S Chand, 1986.
4. H. K. Dass: Advance Engineering Mathematics, S. Chand, 2018.
5. P. R. Thie and G. E. Keough: An Introduction to Linear Programming & Game Theory, Wiley India Private limited, 2008

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56241102: Production Engineering- I

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Core-DC	Production Engineering- I	56241102	3	-	--	Major Evaluation: 30 Marks Duration-2hrs.

Course Objective: To make the student to understand:

1. the basic principles and methods utilized in the joining and welding technology of engineering materials
2. how to handle welding equipment and weld/join materials practically
3. how to analyze, implement and maintain manufacturing system
4. methods of metal casting, casting defects and Gating system
5. methods of Moulding process, pattern design

Syllabus

Unit-I Introduction: - Metal casting vis-a-vis other processes, casting problems, design and introduction of moulds, melting, refining and pouring and liquid metal. Mechanism and Rate of Solidification on Metals and Alloys: - Nucleation and growth in pure metals and alloys, Solidification, solidification in actual castings, feeding resistance, rate of solidification.

Unit-II Riser Design and Placement: - Riser designs chvorinov's caines, NRL methods, placement of risers, effects of complex section and chills, case studies.Gating Design: - Gating principles, vertical gating, aspiration effects and its prevention, bottom gating system, horizontal-gating system, and case studies.

Unit-III Mould Production and Pattern Design: - Conventional moulding and core making processes, new moulding processes viz. Cold box, hot box, and vacuum moulding etc. pattern design considerations.

Die-Castings: - Recent trends, recasting, shell, lined die casting, ferrous die-casting. Non Mould materials and mould metal reactions: Structure of silica clay, various types of bonds, mould metal reactions, recent trends such as sand deformability index, role of atmospheres etc.Casting Design Considerations and Casting Defects: - Various casting design factors, casting defects, their causes and remedies.

Unit-IV Welding Technology: - Welding as compared with other fabrication processes, classifications of welding processes, fusion and pressure welding processes, weld-ability of metals, and metallurgy of welding. Weld design, stress distribution and temperature fields in the welds. Metal transfer and melting rate, recent developments in welding, explosive welding, laser beam welding, radio frequency induction welding etc. Specific application of welding e.g. cladding, metallizing, surfacing and fabrication.

Unit-V Welding of plastics, welding defects and inspection of welds, thermal cutting of metals, processes used for thermal cutting of metals. Recent developments in thermal cutting processes, cutting of cast iron, stainless steel and non-ferrous metals. Use of thermal cutting in fabrication of process machines and pressure vessels etc. Economics of welding: welding cost, productivity, post welding operations, standard time for welding & flame cutting, standard time & cost calculations.

Course Outcome: After successful completion of this course students will be able to:

1. **Describe** the causes of welding defects and how it can be prevented.
2. **Use** the basic manufacturing methods, measurements, automation and quality control.
3. **Apply** the principles of metallurgy during the welding process.
4. **Demonstrate** safe work habits that reflect concern and care for self, others and the environment.
5. **Employ** the principles of Moulding, casting and Gating design.

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6. **Perform** any of the metal joining techniques (welding, brazing and soldering) conveniently

Text & References Books:

1. Welding Processes & Technology - Dr. R.S. Parmar, Khanna Publishers, New Delhi.
2. Production Technology - R.C. Patel & C.G. Gupte, (Vol III) C. Jamnadas & Co. Mumbai
3. Welding Technology & Design - V. M. Radhakrishnan, Newage International (P) Ltd, Pub. N. Delhi
4. Welding Skills & Technology - Dave Smith, Gregg Division, MCGRAW- Hill Book Company
5. Welding Handbook, Seventh Edition, Vol-1, Welding Processes -Arc and Gas Welding and

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56241103: Maintenance Management

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Core(DC)	Maintenance Management	56241103	3	-	--	Major Evaluation: 30 Marks Duration-2hrs.

Course Objectives: To make the student to understand:

1. To learn the Maintenance Management, Maintenance Planning and Scheduling ,Computerized Maintenance Management Systems
2. To learn the Maintenance Organization Structure and Policies
3. To understand the Controlling Maintenance Costs , Life Cycle Cost Concepts
4. To learn the Optimizing Spare Parts Inventory Levels and Total Productive Maintenance Concepts.
5. To learn the overall configuration and Maintenance of Production Machines, Manufacturing System.

Syllabus

Unit-I Introduction, Requirements: - Maintenance Engg., Maintenance Management, Types of Maintenance. Break down, Preventive, Predictive. Routine, continuous Schedule. Maintenance contract, Contract Act, Repair. Activity. Operating Practices to reduce Maintenance. Issues, Problems, Selection of System, Renovation. Addition, Restoration & Control.

Unit-II Maintenance Organisation: - Function. Layout. Centralized and Decentralized Maintenance. Incentives. Human Factors, Maintenance of Plant, Pre-requisites, Programmes, Strategies, Policies.

Unit-III Work Measurement in Maintenance: - Work Authorization and Contract, Rating and Evaluation. Work simplification. Estimation of Repair and Maintenance cost. Cost control for efficient operation. Small Plant Maintenance Control.

Unit-IV Maintenance Store & Inventory Control: - Store Room Materials & Standard Spares. Spares Management. Introduction to computer in Maintenance. Automation Maintenance, Information by computers. Computerized Planning and scheduling. Total Productive Maintenance: Activities, Planned Maintenance, Autonomous Effects, Evaluation Organizations, Maintenance, Aims, Steps, Total Preventive Maintenance, Zero Break down.

Unit-V Maintenance of Production Machines: - Lath m/c, Drilling m/c, Milling m/c, Welding m/c, Shaper.

Course outcomes: After successful completion of this course students will be able to:

1. **State** Maintenance Key Performance Indicators
2. **Use** a preventive maintenance plan and monitor its implementation and review of technical reports.
3. **Select** highest quality of production and the continuation of the workflow.
4. **Implement** team based continuous Improvement in Maintenance
5. **Apply** knowledge about Managing Maintenance Spare Parts and Logistics

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6. **Perform** maintenance orders issued by the in charge, implemented and completed in the promised time for him and to make sure the machine is clean after the maintenance process.

Text & References Books:

1. Bikash Bhadury, 'Total Productive Maintenance". Allied Publisher Ltd. New Delhi.
2. BC langlay. "Plant Maintenance". Prentice-Hall International. New Jersey.
3. JD Pattern. Jr. "Maintainability and Maintenance Management". Instrument society of America, third edition.
4. P Gopalakrishnan and AK Banerji. "Maintenance and Spare Parts Management". Prentice-Hall of India (P) Ltd. New Delhi.

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562411xx: Production and Operations Management

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Elective -DE	Production and Operations Management	562411xx	3	-	-	Major Evaluation: 30 Marks Duration-2hrs..

Course Objective: To make the student to understand:

1. The role of operations management in the overall business strategy of the firm
2. Principles and applications relevant to the planning, design, and operations of manufacturing firms
3. How Enterprise Resource Planning and MRPII systems are used in managing operations
4. Layout planning, assembly line balancing and Inventory control system
5. The application of operations management policies and techniques to the service sector as well as manufacturing firms

Syllabus

Unit-I Introduction: - Functions within business organizations: Production, finance, marketing and other functions. The production management functions; design and operation of production system. Classification of production systems.

Forecasting: - Features common to all forecasts. Approaches to forecasting. Forecasts based on judgment and opinions. Analysis of time series data. Accuracy and control of forecasts. Choosing a forecasting technique.

Unit-II Design of Production Systems: - Capacity planning- importance of capacity decisions, defining and measuring capacity, determining capacity requirements.

Location Planning: - The need for location decisions, location factors evaluating alternative location.

Unit-III Layout Planning: - Need for layout decisions, basic layout types, designing layouts, assembly line balancing, computer-aided layout planning.

Product Design: - Need for product design, research and development, diversification, simplification, evaluation, standardization, reliability.

Unit-IV Work System Design: - Job design, work measurement, method study, work sampling, standard data, PMT system, operation and control of production system: intermediate-range planning - nature and scope of aggregate planning, techniques for aggregate planning.

Inventory Management: - Requirements for effective inventory management, EOQ models, quantity discount, safety stock, inventory control systems.

Unit-V Probabilistic Inventory Models: - MRP- An overview of MRP, MRP processing, MRP outputs, benefits and limitations of MRP. MRPI, MRP-II. Scheduling & Sequencing: -

Scheduling in high-volume systems; Scheduling & Sequencing in job shops. Criteria used in job shop models.

Course Outcomes: After successful completion of this course students will be able to:

1. Apply core features of the operations and production management function at the operational and strategic levels, specifically the relationships between people, process, technology productivity and quality

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2. **Discuss** core features of the operations and production management function at the operational and strategic levels, specifically the relationships between people, process, technology productivity and quality
3. **Analyze** Forecasting technique and layout planning
4. **Use** the Inventory models and job shop models in Industries
5. **Apply** the 'transformation model' to identify the inputs, transformation processes and outputs of an organization
6. **Describe** the boundaries of an operations system, and recognize its interfaces with other functional areas within the organization and with its external environment.

Text & References Books:

1. G. Free-Bell and J Balkwill. Management in Engineering. Prentice-Hall of India (P) Ltd, New Delhi, Second edition.
2. E S Buffa and Sareen Production and Operations Management. New Age International (P) Ltd. New Delhi.
3. W J Sivanesan Production/Operations Management. Richard D Irwin Inc.
4. J L Riggs. Production Systems: Planning Analysis and Control. John Wiley & sons New York, forth edition.
5. Production & Operations Management by Dr KC Arora, Laxmi Publications, New Delhi.

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Annexure- V

Item ME5	To review and finalize the syllabus/module of Classified Novel Engaging Course to be offered in I semester of PG programme.

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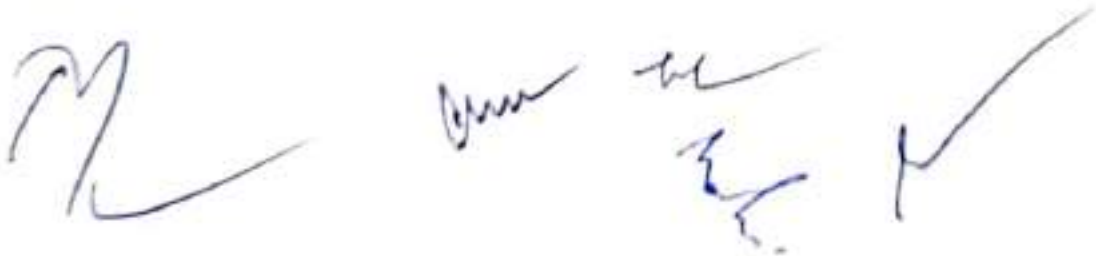
Name of Faculty Mentor	Dr. Amit Aherwar
Novel Engaging Course Title	Reference Management and Engineering Research
Objectives of Course	▪ To understand the importance of reference management ▪ To familiarize with reference management tools
Content	– Introduction to Reference Management – Reference Management Tools – Effective Research Strategies – Citation and Plagiarism Management – Advanced Reference Management Techniques – Applying Reference Management in Engineering Research
Contact Hours	15 Hrs
Mode of Delivery	Blended (online & Offline both)
Outcomes of Course	After completion of the course, students will be able to: ▪ Effectively use reference management tools ▪ Conduct and organize research efficiently ▪ Cite sources accurately and prevent plagiarism ▪ Integrate reference management with writing tools ▪ Adapt to emerging trends in reference management
External Mentors / Collaborations	Nil



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Department of Mechanical engineering

Annexure –VI

Item ME6	To review and finalize the scheme structure for the Batch admitted in 2024-25 academic session syllabi of I Research Methodology and Ethics Ph.D. Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU).

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Department of Mechanical engineering

General Scheme Structure for Doctor of Philosophy

(Batch admitted in Academic Session 2024-25 onwards)

Scheme of Evaluation

Doctor of Philosophy

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Exam.	Duration of Exam.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.		MC	Research Methodology and Ethics*	20	20	30	30	-	-	100	3	1	-	4	Face to Face	PP	2 Hrs
2.		DC	Course-1 (Traditional)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
3.		MOOC	Course-2 (NPTEL)*	20	20	30	30	-	-	100	2	1	-	3	Online	MCQ	2 Hrs
4.		DLC	Departmental Lab	-	-	-	-	70	30	100	-	-	4	2	Experimental	AO	-
5.			Open Seminar	-	-	-	-	70	30	100	-	-	2	1	Interactive	SO	-
Total Minimum 12 Credits for the student admitted after PG and Minimum of 24 credits for the students admitted directly after B.Tech. degree																	

* Research Methodology and Ethics: Mandatory course for all

*Course(s) can be offered through NPTEL

This scheme of evaluation shall continue for next semester till the minimum requirement of credits are earned by the student within the maximum permissible time

Abbreviations Used

L	Lecture
T	Tutorial
P	Practical
DLC	Departmental Laboratory Courses
MOOC	Massive Open Online Course
MC	Mandatory Course

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ALL BRANCHES SYLLABUS FOR Ph.D. COURSEWORK

RESEARCH METHODOLOGY AND ETHICS

(Common for all the branches)

OBJECTIVE:

To distinguish between the scientific method and general knowledge while laying the foundation for research.

To identify and apply appropriate research methodology in order to plan, conduct, and evaluate basic research.

To explore the statistical methods and tools in research.

To understand the philosophy of research and ethics, research integrity, and publication ethics.

To understand indexing and citation databases, open access publication, research metrics.

Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, types of Research, Research Approaches. Significance of Research, Research Methods v/s Methodology, Scientific Methods, Research Process, Criteria of Good Research. Define the Research Problem: Concept and need of Research problem, Identification of Research problem, defining and delimiting Research problem.

Research Design: Problem Definition, variables, research design concepts. Literature survey and review, Research design process, Errors in research. Data Collection and Representation: Primary Data Secondary Data, Data Presentation. Processing and Analysis of Data.

Data Collection: Collections of Primary Data, Collection of Data through questionnaire and Schedules, other Observation Interview Methods, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study, Focus Group Discussion, Techniques of developing research tools, viz. Questionnaire and rating scales etc. Reliability and validity of Research tools,

Descriptive Statistics: Measurement Scales, Sources of error in measurement, Measures of central Tendency (Mean, Medium, Modes), Measures of dispersion (Range, Mean Deviation, Standard Deviation), Moments, Moments Generating Function, Graphical representation of Data, Measures of Asymmetry (Skewness), Kurtosis, Correlation and Regression, and Curve fitting.

Sampling Methods and Distributions: Sampling Methods, Sampling Distribution of mean, Sampling Distributions of Variance. Testing of Hypotheses-1: Basic Concepts Concerning Testing of Hypotheses, Procedure for Hypothesis Testing, Flow Diagram for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Type I and Type II errors. Important Parametric Tests, Limitations of the Tests of Hypothesis, Chi-square Test, Non-Parametric Tests. Analysis of Variance components (ANOVA) for fixed effect model: Total, treatment and error of squares. Degrees of freedom, Confidence interval, some special distribution.

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Report Writing: Pre writing considerations. Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing. Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentation Literature review software.

Philosophy and Theory of Ethics:

Nature, scope and Meaning of Ethics. Role of judgment in ethics, Ethics with respect to science and research-Intellectual honesty and research integrity-Scientific, Conduct and Plagiarism. Redundant Publications: duplicate and overlapping publications. Publication ethics: definition introduction and Importance-Best practices/standards setting initiatives and guidelines. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types Violation of publication ethics, authorship and contributor ship-Identification of publication misconduct, complaints and appeals, Vanity Publications,

Reference Books:

1. C.R. Kothari: Research Methodology Methods and Techniques (Second Revised Edition), New Age. International Publication.
2. R. Panneerselvam, Research Methodology, PHI.
3. Ranjit Kumar, Research Methodology: a step-by-step guide for beginners, SAGE Publication Ltd.
4. Douglas C. Montgomery, Design and Analysis of Experiments, Wiley India, Fifth edition.
5. Douglas C. Montgomery and George C Runger: Applied Statistics & Probability for Engineers (Wiley India), Third edition.
6. K N Krishnaswamy, Appalyer Sivakumar and M Mathirattian: Research Methodology: Integration of Principles, Methods and Techniques (Pearson Education, New Delhi).

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