Tripura University
(A Central University)

Curriculum

For

B. Tech in Mechanical Engineering

(5thSemester)

2021

5th SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours/week	Credit	Total Marks
1.	Humanities Science -5	HU 501	Professional Practice, Law and Ethics	2	0	0	2	2	100
2.	Program Core-13	PC ME 502	Heat Transfer	3	0	0	3	3	100
3.	Program Core-14	PC ME 503	Non Conventional Energy Sources	3	0	0	3	3	100
4.	Program Core-15	PC ME 504	Design of Machine Elements	3	0	0	3	3	100
5.	Program Core-16	PC ME 505	Manufacturing Process - II	3	0	0	3	3	100
6.	Program Core-17	PC ME 506	Kinematics and Theory of Machines	3	0	0	3	3	100
7.	Program Core-18	PC ME 507	Heat Transfer Lab	0	0	2	2	1	100
8.	Program Core-19	PC ME 508	Machine Design Sessional	0	0	2	2	1	100
9.	Program Core-20	PC ME 509	Manufacturing Technology Lab	0	0	4	4	2	100
10.	Summer Internship-1	SI ME 510	Industry Internship - I	0	0	0	0	1	100
			Total :	17	0	8	25	**22**	**1000**

Professional Practice, Law and Ethics

Course Code	HU 501
Course Title	Professional Practice, Law & Ethics
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Humanities Science (HS)
Number of classes	26 hours

Course Outcome:- After completion of the course, students will be able to:

CO Number	CO Description	K Level
CO 1	Develop ideas of the professionalism, values and ethics in a profession	K-3
CO 2	Develop a good insight into contracts and contracts management in engineering, arbitration and dispute resolution mechanisms	K-3
CO 3	Interpret laws governing engagement of labour in construction related works and other related areas	K-2
CO 4	Demonstrate an understanding of Intellectual Property Rights and Patents	K-2

Module1: Professionalism, Values and Ethics in Profession (6 hrs)

Professionalism: Professional characteristics, professional education, professional development in Industry.
Values and Ethics in Profession- Value system- goodness, means and ends; Ethics-ethical premises, expectation, conflicts and practices; Moral and ego, Ethics and morality
Right, virtue ethics and justice, utility and justice, privacy, challenges to privacy, privacy on the Internet.

ProfessionalEthics–DefinitionofEthics,ProfessionalEthics,BusinessEthics, CorporateEthics,EngineeringEthics,PersonalEthics;CodeofEthicsasdefinedinthewebsiteof InstitutionofEngineers(India);Profession,Professionalism,ProfessionalResponsibility, ProfessionalEthics;ConflictofInterest,GiftVsBribery,Environmentalbreaches,Negligence, Deficienciesin state-of-the-art;VigilMechanism,Whistleblowing,protecteddisclosures.

Module2: General Principles of Contracts Management and Arbitration (10 hrs)

IndianContractAct,1972andamendmentscoveringGeneralprinciplesofcontracting;Valid&VoidableContracts; Prime and Subcontracts Tenders, Request For Proposals,Bids&Proposals;BidEvaluation;Costescalation;Delays,Suspensions&Terminations;Timeextensions&ForceMajeure;DelayAnalysis;Liquidateddamages&Penalties;Insurance&Taxation.

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system*:* Arbitration–meaning,scopeandtypes–distinctionbetweenlawsof1940and1996;Arbitrationagreements–essentialandkinds,validity,referenceandinterimmeasuresby court;Arbitrationtribunal–appointment,challenge,jurisdictionofarbitraltribunal,powers,grounds ofchallenge,procedureandcourtassistance;AwardincludingFormandcontent,Groundsforsetting asideanaward, Enforcement, Appeal and Revision.

Module3:EngagementofLabour&otherconstruction-relatedLaws (5 hrs)

Role of Labour inCivilEngineering;Methodsofengaginglabour-onrolls,laboursub-contract,pieceratework; IndustrialDisputesAct,1947;Collectivebargaining;IndustrialEmployment(StandingOrders)Act, 1946;Workmen'sCompensationAct,1923;Building&OtherConstructionWorkers(regulationof employment and conditions of service)Act(1996) and Rules (1998);RERAAct2017, NBC 2017.

Module4:LawrelatingtoIntellectualproperty (5 hrs)

Introduction–meaning of intellectual property, main forms ofIP,Copyright,Trademarks,PatentsandDesigns,Secrets;CopyRightsAct,1957,Meaningofcopyright–computer programs,Ownershipofcopyrightsandassignment,Criteriaofinfringement,PiracyinInternet–RemediesandproceduresinIndia;LawrelatingtoPatentsunderPatentsAct,1970including ConceptandhistoricalperspectiveofpatentslawinIndia.Processofobtaining patent–application,examination,oppositionandsealingofpatents.Durationofpatents–lawandpolicy considerations, Infringement and related remedies;

References / Suggested Learning Resources:

1. B.S. Patil,Legal Aspectsof BuildingandEngineeringContracts, 1974.
2.TheNationalBuildingCode,BIS,2017
3.MeenaRao(2006), Fundamental conceptsinLawof Contract, 3rdEdn.ProfessionalOffset
1 . NeelimaChandiramani(2000),TheLawofContract:AnOutline,2ndEdn.AvinashPublications Mumbai
5.Avtarsingh(2002),Lawof Contract, EasternBookCo. 7.Dutt(1994), IndianContractAct,Eastern LawHouse
6.T. Ramappa(2010),Intellectual PropertyRightsLawinIndia,AsiaLawHouse
9.Baretext(2005),RighttoInformationAct
7.O.P.Malhotra,Lawof Industrial Disputes,N.M. TripathiPublishers
8.Ethics inEngineering- M.W.Martin&R.Schinzinger, McGraw-Hill
9.EngineeringEthics,National InstituteforEngineeringEthics,USA.
1. Ethics & Mgmt and Ethos , Ghosh, VIKASH
2. Business Ethics; Concept and Cases, Velasqez, Pearson

****

Heat Transfer

Course Code	PC ME 502
Course Title	Heat Transfer
Number of Credits	3 (L: 3, T:0, P: 0)
Prerequisites	Thermodynamics
Course Category	Program Core (PC)
Number of classes	36 hours

Course Outcome:

After completing this course, the students will be able to

CO Number	CO Description	K-level
CO-1	Distinguish the phenomena of steady and unsteady conduction.	K2
CO-2	Comprehendthe concepts of convection.	K3
CO-3	Analyze thermal radiation.	K4
CO-4	Evaluate the functionsof heat exchangers and illustrate Boiling.	K5

Course Content:

Module 1: Heat Conduction:(10 hours)

Introduction to three modes of heat transfer, Derivation of heat balance equation- Steady one dimensional solution for conduction heat transfer in Cartesian, cylindrical and spherical geometry, concept of conduction and film resistances, critical insulation thickness, lumped system approximation and Biot number, heat transfer through pin fins- Two dimensional conduction solutions for both steady and unsteady heat transfer-approximate solution to unsteady conduction heat transfer by the use of Heissler charts.

Module 2: Heat Convection:(8 hours)

Heat convection,basic equations, boundary layers- Forced convection, external and internal flowsNatural convective heat transfer- Dimensionless parameters for forced and free convection heat transfer-Correlations for forced and free convection- Approximate solutions to laminar boundary layer equations (momentum and energy) for both internal and external flow- Estimating heat transfer rates in laminar and turbulent flow situations using appropriate correlations for free and forced convection.

Module 3: Radiation Heat Transfer: (8 hours)

Interaction of radiation with materials, definitions of radiative properties, Stefan Boltzmann's law, black and gray body radiation, Calculation of radiation heat transfer between surfaces using radiative properties, view factors and the radiosity method.

Module 4: Heat Exchangers and Boiling: (10 hours)

Types of heat exchangers, Analysis and design of heat exchangers using bothLMTD and ε-NTU methods. Boiling and Condensation heat transfer, Pool boiling curve. Introduction mass transfer, Similarity between heat and mass transfer.

References / Suggested Learning Resources:

1. A. Bejan, Heat Transfer John Wiley, 1993.
2. J.P.Holman, Heat Transfer, Eighth Edition, McGraw Hill, 1997.
3. F.P.Incropera, and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley, Sixth Edition, 2007.
4. MassoudKaviany, Principles of Heat Transfer, John Wiley, 2002 5. Yunus A Cengel, Heat Transfer : A Practical Approach, McGraw Hill, 2002.

****

Non Conventional Energy Sources

Course Code	PC ME 503
Course Title	Non Conventional Energy Sources
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Program Core (PC)
Number of classes	38 hours

Course Outcome:

After completing this course, the students will be able to

CO Number	CO Description	K-level
CO-1	Discussthe prospects of renewable energy sources and Describe the use of solar energy withrespect to applications like-heating, cooling, power generation, drying, etc.	K1
CO-2	Apply the principles of biomass conversion technologies and wind energy to solve practical problems.	K3
CO-3	Explain the concept of geothermal energy &ocean energy.	K2
CO-4	Summarize the operation of fuel cell and utilization of hydrogenas alternative fuel.	K2

Course Content:

Module 1: Introduction & Solar Energy: (10 hours)

Renewable and non-renewable energy sources, trends in energy consumption, Global and National scenarios, Prospects of renewable energy sources, Energy Management.

Solar Energy: Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, measurement of solar radiation, flat plate collectors, concentrating collectors, Solar air heaters-types, solar driers, Storage of solar energy-thermal storage, Photo voltaics – solar cells & its applications.

Module 2: Energy from Biomass&Wind Energy: (12 hours)

Calorific value of Biomass samples, Pyrolysis, Biomass conversion technologies, Biogas generation plants, classification, advantages and disadvantages, constructional details, site selection, digester design

consideration, filling a digester for starting, maintaining biogas production, Fuel properties of bio gas, utilization of biogas.
Basic system principles, Assessment of wind available, Design principles, Manufactured designs, Sizing and storage of energy, System efficiency, Overview of wind industry.

Module 3: Geothermal Energy & Ocean Energy: (10 hours)
Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages, and application of geothermal energy.
Ocean Thermal Electric Conversion systems like open cycle, closed cycle, Hybrid cycle. Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy.

Module 4: Fuel Cells & Hydrogen Energy: (6 hours)
Design principle and operation of fuel cell, Types of fuel cells, conversion efficiency of fuel cell, applications of fuel cells.
Hydrogen Production methods, Hydrogen storage, hydrogen transportation, utilization of hydrogen gas, hydrogen as alternative fuel for vehicles.

References / Suggested Learning Resources:

1. G.D. Rai, 2010, *Non-conventional energy sources*, Khanna Publishers.

2. Saeed and Sharma, 2013, *Non Conventional Energy Resources*, S.K. Kataria& Sons

3. S P Sukhatme, *Solar Energy-Principles of Thermal Collection & Storage*, Tata McGraw Hill Publishing Company Ltd.

4. Jay Cheng, 2009, *Biomass to Renewable Energy Processes*, CRC press

5. B H Khan, *Non-Convention Energy Resources,* McGraw Hill Education (India) Pvt. Ltd.

****

Design of Machine Elements

Course Code	PCME 504
Course Title	Design of Machine Elements
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Strength of Materials
Course Category	ProgramCore (PC)
Number of classes	36 hours

Course Outcome:-
After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Analyze the influence of steady and variable stresses in machine component.	K4

CO-2	Apply the concepts of design to temporary and permanent joints.	K3
CO-3	Design the power transmission elements like shafts, keys and couplings	K5
CO-4	Design different types of Clutches and Brakes.	K5

Course Content:-

Module 1*:* Fundamentals of Design:(9hours)
Introduction to the design process,Factors influencing machine designLimits, fits and standardization, preferred numbers,Simple stresses, Stress strain relationship, Factor of safety, Direct, Bending and torsional stress equations, Theories of failures, Stress Concentration, Design for static loading, Design for variable loading.

Module 2:Temporary and Permanent Joints (9hours)
Design of Bolted joints including eccentric loading, Design of Welded joints, riveted joints,Knuckle joints, Cotter joints.

Module 3:Design of Shaft, Keys and Couplings: (9hours)
Design of solid and hollow shafts based on strength and rigidity. Design of Keys,Shaft Coupling, Requirements of a Good Shaft Coupling, Types of Shafts Couplings, Design of flangeand muffcouplings.

Module 4:Design of Clutches and Brakes**: (9hours)**
Design of Clutches: Necessity of a clutch in an automobile, types of clutches, friction materials and its properties. Design of single plate, multi-plate and cone clutches based on uniform pressure and uniform wear theories.
Design of Brakes: Different types of brakes, Concept of self-energizing and self-locking of brakes. Design of band brakes, block brakes and internal expanding brakes.

References/ Suggested Learning Resources: -

1. Shigley, J.E., Mechanical Engineering Design, 5th ed., McGraw-Hill,
2. Bhandari, V.B., ―Design of Machine element‖ Tata McGraw-Hill
3. Bhandari, V.B., ―Introduction to Machine Design‖ Tata McGraw-Hill
4. Khurmi, R.S., Gupta, J.K., ― A Text book of Machine Design‖ S. Chand Publication.
5. Deutschman, D., Michels, W.J. and Wilson, C.E., Machine Design Theory and Practice, Macmillan,
6. Juvinal, R.C., Fundamentals of Machine Component Design, John Wiley,
7. Spottes, M.F., Design of Machine elements, Prentice-Hall India,
8. R. L. Norton, Mechanical Design – An Integrated Approach, Prentice Hall.

Manufacturing Process - II

Course Code	**PC ME 505**
Course Title	Manufacturing Process - II
Number of Credits	**3 (L: 3, T: 0, P: 0)**
Prerequisites	**Nil**
Course Category	Program Core (PC)
Number of classes	**36 hours**

Course Outcome:

	At the end of the course, the student will be able to:	
CO1	Select proper tools, jigs and fixture for machining operation.	K3

CO2	Use of different heat treatment methods.	K3
CO3	Design different types of plastics and composite fabrication methods.	K4
CO4	Choose various Flexible Manufacturing Systems.	K4

Course Content:

Module 1: Tools, Jig and Fixture for Machining Processes.: (07 hours)

Tooling for conventional and non-conventional machining processes: Mould and die design, Press tools, cutting tools; Holding tools: Jigs and fixtures, principles, applications and design; press tools – configuration, design of die and punch; principles of forging die design.

.

Module 2:Metallurgy of Iron: (10 hours)

Terms Involved in Metallurgy, Important Ores of Iron, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace, their Composition, and application. Commercial Forms of Iron - Pig Iron / Cast Iron, Wrought or Malleable Steel, their composition, types, properties & applications. Constitution of alloys, Iron – Iron carbide equilibrium diagram. Classification of steel and cast Iron: their microstructures, properties, and applications. Heat Treatments.

Module 3: Processing of Plastics and Composites: (10 hours)

Types of plastics – Processing of thermo plastics – Extrusion, Inspection blow, Rotatromalmoulding processes – Calendaring, Film blowing, Thermo forming Processing of thermosets - Compression, Transfer, Jet Moulding processes – Bonding of thermoplastics- Laminated plastic — Composites- types- Fabrication Methods advantages, limitations, and applications.Overview of Powder Metallurgy technique - Advantages - applications - Powder preform forging -powder rolling - Tooling and process parameters.

Module 4:Flexible Manufacturing Systems(FMS): (09 hours)

Introduction to FMS– development of manufacturing systems – benefits – majorelements – types of flexibility – FMS application and flexibility –single product, singlebatch, n – batch scheduling problem – knowledge-based scheduling system.Computer Control and software for Flexible Manufacturing Systems, Applications of FMS,and factory of the future.

References / Suggested Learning Resources:

1.Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2.Joshi, P.H. “Jigs and Fixtures”, Second Edition, Tata McGraw Hill Publishing Co., Ltd.,
3. Donaldson, Lecain and Goold “Tool Design”, III rd Edition Tata McGraw Hill, 2000.
4. G.S. Upadhyay and Anish Upadhyay, “Materials Science and Engineering”, Viva Books Pvt. Ltd., New Delhi.
5. Kenneth G. Budinski and Michael K. Budinski, “Engineering Materials”, PHI.
6. Sydney H.Avner, “Introduction to Physical Metallurgy”, McGraw Hill Book Company.
7. Raouf, A. and Ben-Daya, M., Editors, “Flexible manufacturing systems: recent development”, Elsevier Science, 1995.

****

Kinematics and Theory of Machine

Course Code	PC ME 506
Course Title	Kinematics and Theory of Machine
Number of Credits	3 (L: 3, T: 0, P: 0)

Prerequisites	---
Course Category	Program Core (PC)
Number of classes	36 hours

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Demonstrate the mechanisms, their motion and the inversions of four bar mechanisms.	K2
CO-2	Analyzing the velocity, acceleration at any point in a link and joints of mechanisms.	K4
CO-3	Analysis of cam follower motion for the motion specifications and friction in machine elements.	K4
CO-4	Explain the concepts of toothed gearing and kinematics of gear trains and the effects of motion transmission in machine components.	K3

Course Content:-

Module 1: Basics of Mechanisms (9 hours)
Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Straight line generators, Dwell mechanisms, Ratchets and Escapements, Universal Joint.

Module 2: Kinematics of Linkage Mechanisms (9 hours)
Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method – Velocity and acceleration polygons – Velocity analysis using instantaneous centers – Kinematic analysis by complex algebra methods – Vector approach – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

Module 3: Kinematics of Cam Mechanisms (9 hours)
Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic, cycloidal and polynomial motions – Derivatives of follower motions – Pressure angle and undercutting – sizing of cams.
Friction in Machine Elements: Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes.

Module 4: Gears and Gear Trains (9 hours)
Law of toothed gearing – Involutes and cycloidal tooth profiles –Spur Gear terminology and definitions – Gear tooth action – contact ratio – Interference and undercutting – Non-standard gear teeth – Helical, Bevel, Worm, Rack and Pinion gears [Basics only] – Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains – Differentials.

Text / References Book:

1. Dr. R K Bansal, Strength of Materials, Laxmi Publications (P) Ltd.
2. Rattan, S.S, "Theory of Machines", 3rd Edition, Tata McGraw-Hill.
3. Thomas Bevan, 'Theory of Machines', 3rd Edition, CBS Publishers and Distributors.
4. Cleghorn, W. L, "Mechanisms of Machines", Oxford University Press.
5. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill.
6. Allen S. Hall Jr., "Kinematics and Linkage Design", Prentice Hall.

7. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines', Affiliated East-West Pvt. Ltd., New Delhi.
8. Rao.J.S. and Dukkipati.R.V. 'Mechanisms and Machine Theory', Wiley-Eastern Ltd., New Delhi.
9. John Hannah and Stephens R.C., 'Mechanics of Machines', Viva Low-Prices Edition.
10. V.Ramamurthi, Mechanics of Machines, Narosa Publishing House.
11. Khurmi, R.S.,"Theory of Machines",14th Edition, S Chand Publications
12. Shigley, J.E and Uicker, J.J: Theory of Machines and Mechanisms, Oxford University Press
13. Green, W.G: Theory of Machines, 2nd Edition, Blackie, London, 1992.
14. Hollowenko, A.R: Dynamics of Machinery, John wiley and sons. Inc. New York, 1955.
15. Wilson, Kinematics and Dynamics of Machinery, 3rd Edition, Pearson Education.

****

Heat Transfer Lab

Course Code	PC ME-507
Course Title	Heat Transfer Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Heat Transfer and Thermodynamics
Course Category	Program Core (PC)
Number of classes	20 hours

Course Outcome:

After completing this course, the students will be able to

CO Number	CO Description	K-level
CO-1	Explain the thermal conductivity of compositewall and other systems.	K2
CO-2	Calculate the collected data for heat transfer coefficient underconvections.	K3
CO-3	Determine the emissivity and Stefan-Boltzmann Constant of amass.	K3
CO-4	Analyze the effectiveness of heatexchanger.	K4

Course Content:

List of experiments:*(Minimum 6 experiments to be performed)*

1. Thermal conductivity measurement using guarded plateapparatus.
2. Thermal conductivity measurement of pipe insulation using lagged pipeapparatus.
3. Determination of heat transfer coefficient under natural convection from a verticalcylinder.
4. Determination of heat transfer coefficient under forced convection from atube.

5. Determination of Thermal conductivity of compositewall.
6. Determination of Thermal conductivity of insulatingpowder.
7. Heat transfer from pin-fin apparatus (natural & forced convectionmodes)
8. Determination of Stefan – Boltzmannconstant.
9. Determination of emissivity of a greysurface.
10. Effectiveness of Parallel / counter flow heatexchanger.

References / Suggested Learning Resources:

1. https://www.bitswgl.ac.in/lab-manuals-mech/4.Ht%20lab_mannual.PDF.
2. Lab manuals available in the laboratory.

****

Machine Design Sessional

Course Code	PC ME 508
Course Title	Machine Design Sessional
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Design of Machine Elements
Course Category	Program Core (PC)
Number of classes	20 hours

Course Outcome:-
After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Design different types of temporary and permanent joints.	K5
CO-2	Apply the concepts of design totransmission elements like shafts.	K3
CO-3	Design different types of coupling.	K5
CO-4	Design different types of Clutches and Brakes.	K5

List of Experiments*(Minimum 6 experiments to be performed).*

1. To design and draw a knuckle joint.
2. To design and draw a cotter joint.
3. To design and draw a riveted joint
4. To design and draw a welded joint.
5. To design and draw a shaft subjected to torsion, bending moment and combined torsion and bending.
6. To design and draw a flange coupling.
7. To design and draw a muff coupling.
8. To design and draw a disc clutch based on uniform pressure and uniform wear theories

9. To design and draw ablock brake.

10. To design and draw an internal expanding brake

References / Suggested Learning Resources: -

9. 1. Shigley, J.E., Mechanical Engineering Design, 5th ed., McGraw-Hill,
10. Bhandari, V.B., ―Design of Machine element‖ Tata McGraw-Hill
11. Bhandari, V.B., ―Introduction to Machine Design‖ Tata McGraw-Hill
12. *Khurmi, R.S., Gupta, J.K., ― A Text book of Machine Design‖ S. Chand Publication.*
13. Deutschman, D., Michels, W.J. and Wilson, C.E., Machine Design Theory and Practice, Macmillan,
14. Juvinal, R.C., Fundamentals of Machine Component Design, John Wiley,
15. Spottes, M.F., Design of Machine elements, Prentice-Hall India,
16. R. L. Norton, Mechanical Design – An Integrated Approach, Prentice Hall,

****

Manufacturing Technology Lab

Course Code	PC ME 509
Course Title	Manufacturing Technology Lab
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Manufacturing Technology
Course Category	Program Core (PC)
Number of classes	40 hours

Course Outcome:

After completion of the course, students will be able :

	CO Description	K-level
CO1	To do CNC Turning operation	**K3**
CO2	To perform Electric Discharge Machining operation	**K4**
CO3	To perform Fiber laser cutting of stainless-steel sheet	**K4**
CO4	To perform Gear manufacturing operation.	**K4**

List of Experiments *(Minimum 10 experiments to be performed).*

Sl. No.	Practical Exercises
1.	To perform CNC Turning operation
2.	To perform Computer Controlled Cutting of wooden object
3.	To perform 3D Machining
4.	To perform PCB design & fabrication
5.	To perform Interface & Application Programming
6.	To perform Digital Fabrication of Flexible Circuit board
7.	To perform 3D scanning.
8.	To perform Molding and Casting of Polyurethane parts
9.	To perform Digital Fabrication and Project Development
10.	To perform Electric Discharge Machining operation
11	To perform Fiber laser cutting of stainless-steel sheet

12	To perform Crankshaft Forming operation.
13	To perform Connecting Rod forming operation
14	To perform Screw head manufacturing operation.
15	To perform Gear manufacturing operation.
16	To perform Bar shearing operation.
17	To perform Medical implants operations
18	To perform Ripple process

References/ Suggested Learning Resources: -

1. *http://msvs-dei.vlabs.ac.in/msvs-dei/Metal_Forming.php*
2. *http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpAM/index.html*
3. *http://fab-coep.vlabs.ac.in/Introduction.html*
4. *http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpMM/index.html*
5. *http://mrmsmtbs-iitk.vlabs.ac.in/home*
6. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited,Mumbai
7. Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
8. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
9. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India,1998. 5. Rao P.N., "Manufacturing Technology"

****

Industry Internship– I

Course Code	SI ME 510
Course Title	Industry Internship – I
Number of Credits	1 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Summer Internship (SI)
Number of classes	-

Course Outcome:-

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Solve real life challenges in the workplace by analysing work environment and conditions, and selecting appropriate skill sets acquired from the course of study	K-3
CO-2	Develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organisational setting	K-3
CO-3	Demonstrate the skill to communicate and collaborate effectively and appropriately with different professionals in the work environment through written and oral means	K-2
CO-4	Show professional ethics by displaying positive disposition during internship.	K-2

CO-5	Decide career options by considering opportunities in company, sector, industry, professional, educational advancement and entrepreneurship;	K-5

Course Content:-

The industry internship aims to provide the student with:

1. A practice-oriented and 'hands-on' working experience in the real world or industry, and to enhance the student's learning experience.

2. An opportunity to develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organisational setting.

3. An opportunity to further develop and enhance operational, customer service and other life-long knowledge and skills in a real world work environment.

4. Pre-employment training opportunities and an opportunity for the company or organisation to assess the performance of the student and to offer the student an employment opportunity after his/her graduation, if it deems fit.

Each student shall

1) Identify an internship program of relevance in his/her branch of engineering to undergo during summer break between 4^{th} and 5^{th} semester,
2) Get approval of the concerned HOD,
3) Undergo the industry internship program for minimum 4 weeks duration
4) Prepare their own report
5) Present in the class among fellow students and faculty members / deliver viva voce.
6) Submit the report and participation/course completion certificate.

****
****