1701MF101 ADVANCED OPTIMIZATION TECHNIQUES L T P C

2 2 0 3

AIM:

- To introduce the various advanced optimization techniques and theiradvancements.

OUTCOMES: Employability.

After learning the course the students should be able to:
Apply classical optimization techniques
Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
Apply genetic algorithms to combinatorial optimization problems
Apply neural networks to real world problems
Evaluate and compare solutions by various swarm approaches for a given problem.

UNITI INTRODUCTION 7

Optimization – Historical Development – Engineering applications of optimization – Statement of an Optimization problem – classification of optimization problems. Classical optimization Techniques – Linear Programming, Non-linear Programming, Integer Programming.

UNITII FUZZY SYSTEMS 10

Basic definition and terminology, Fuzzy Set Theory, Membership function, Fuzzy set operations, properties of fuzzy sets, fuzzy elation, operations on fuzzy relations, fuzzy logic system components – features of membership function, fuzzification, membership value ssignment, fuzzy decision making, fuzzy system, fuzzy rule-based systems, rule based systems, likelihood and truth qualification, ggregation of fuzzy rules, defuzzifization methods, Applications of fuzzy logic system- Blood pressure during anesthesia, image processing quipment, home heating system..

UNITIII ARTIFICIAL NEURAL NETWORKS 9

ntroduction – Activation functions, types of activation functions, neural network architechtures, single layer feed forward network, multi ayer feed forward network, Neural netwok applications- inverted pendulum neurocontroller, neural network in forecasting, neural networks n control.

UNITIV GENETIC ALGORITHM 10

ntroduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and chema theorem.; Genetic algorithms operators- methods of selection, crossover and mutation, simple GA(SGA), other types of GA, ;eneration gap, steady state GA, Applications of GA

UNITV SWARM INTELLIGENCE 9

Swarm intelligence, Various animal behaviors, Ant Colony optimization, swarm intelligence in bees, flocks of birds, shoals of fish, ant-based routing, Particle Swarm optimization

TOTAL: 45 PERIODS

REFERENCES:

. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International P)Ltd.,New Delhi, 2000.
. S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.

. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.

. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 2004, Pearson Education.

. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007. ISBN: 10: 81-265-1075-7.

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1702MF102 POLYMERS AND COMPOSITE MATERIALS **L T P C**
3 0 03

AIM:

To impart knowledge on types, physical properties and processing of polymer matrix composites, metal matrix composites and ceramics matrix composites.

OBJECTIVES:

- To study matrix material, reinforcements of polymer matrix composites, MMC and ceramic matrix composites.
- To develop knowledge on processing, interfacial properties and application ofcomposites.

UNIT I PROCESSINGOFPOLYMERS **9**

Chemistry and Classification of Polymers – Properties of Thermo plastics – Properties of Thermosetting Plastics - Extrusion – Injection Moulding – Blow Moulding – Compression and Transfer Moulding – Casting – Thermo Forming. General Machining properties of Plastics – Machining Parameters and their effect – Joining of Plastics – Thermal bonding – Applications.

UNIT II FIBERS AND MATRIXMATERIALS **9**

Fibers – Fabrication, Structure, properties and applications – Glass fiber, Boron fiber, carbon fiber, organic fiber, ceramic and metallic fibers - whiskers–Fabrication of Matrix materials – polymers, metals and ceramics and their properties – interfaces – Wettability – Types of bonding at theinterface
– Tests for measuring interfacial strength - Physical and chemical properties.

UNITIII PROCESSING OF POLYMERMATRIXCOMPOSITES **9**

Thermoset matrix composites: hand layup, spray, filament winding, Pultrusion, resin transfer moulding, autoclave moulding - bag moulding, compression moulding with Bulk Moulding Compound and sheet Moulding Compound – thermoplastic matrix composites – film stacking, diaphragm forming, thermoplastic tape laying, injection moulding – interfaces in PMCs - structure, properties and application of PMCs –recycling ofPMCs.

UNIT IV PROCESSING OF METALMATRIXCOMPOSITES **9**

Metallic matrices: aluminium, titanium, magnesium, copper alloys – processing of MMCs: liquid state, Solid state, in situ fabrication techniques – diffusion bonding – powder metallurgy techniques- interfaces in MMCs – mechanical properties – machining of MMCs – Applications.

UNITV PROCESSING OF CERAMIC MATRIX COMPOSITESAND CARBON-CARBON COMPOSITES **9**

Processing of CMCs: cold pressing, sintering, reaction bonding, liquid infiltration, lanxide process – in situ chemical reaction techniques: chemical vapour deposition, chemical vapour impregnation,sol-gel
– interfaces in CMCs – mechanical properties and applications of CMCs – Carbon-carbon Composites –applications.

TOTAL: 45 PERIODS

REFERENCES:

1. Krishnan K Chawla, Composite Materials: Science and Engineering, International Edition, Springer, 2012,ISBN:978-0-387-74364-6.
2. Mallick P.K., Fiber Reinforced Composites: Materials, Manufacturing and Design, CRC press, New Delhi, 2010,ISBN:0849342058.
3. Jamal Y. Sheikh-Ahmad, Machining of Polymer Composites, Springer, USA, 2009. ISBN: 978-0- 387-35539-9.
4. Mallick, P.K. and Newman.S., Composite Materials Technology, Hanser Publishers,2003.
5. Harold Belofsky, Plastics, Product Design and Process Engineering, Hanser Publishers,2002.
6. Seamour, E.B. Modern Plastics Technology, Prentice Hall,2002
7. Said Jahanmir, Ramulu M. and PhilpKoshy, Machining of Ceramics and Composites, Marcel Dekker Inc., New York, 1999, ISBN:0-8247-0178-x.
8. ASM Handbook – Composites, Vol-21, 2001, ISBN: 978-0-87170-703-1.

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COURSE OUTCOMES: Employability / Entrepreneurship.

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

. Classify different types of polymers and composites and understand the properties and machining parameters of different polymers.

. Understand different types of fibers and matrix materials and their properties.

. Design and fabricate the various polymer matrix composites and analyse their properties

.Design and synthesis the various metal matrix composites

. Design and fabricate the various ceramic matrix composites and carbon – carbon composites

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1702MF103 MATERIALS TESTING ANDCHARACTERIZATIONTECHNIQUES **L T PC**
3 0 03

AIM

This course aims to impart knowledge on various techniques of material characterization.

OBJECTIVES

On completion of the course the students are expected to be knowledgeable in microstructure evaluation, crystal structure analysis, electron microscopy, Chemical Thermal Analysis, static and dynamic mechanical testing methods.

UNIT I MICRO AND CRYSTALSTRUCTUREANALYSIS **10**

Principles of Optical Microscopy – Specimen Preparation Techniques – Polishing and Etching – Polarization Techniques – Quantitative Metallography – Estimation of grain size – ASTM grain size numbers – Microstructure of Engineering Materials - Elements of Crystallography – X- ray Diffraction
– Bragg's law – Techniques of X-ray Crystallography – Debye – Scherer camera – Geiger Diffractometer – analysis of Diffraction patterns – Inter planer spacing – Identification of Crystal Structure, Elements of Electron Diffraction.

UNIT II ELECTRONMICROSCOPY **9**

Interaction of Electron Beam with Materials – Transmission Electron Microscopy – Specimen Preparation – Imaging Techniques – BF & DF – SAD – Electron Probe Microanalysis – Scanning Electron Microscopy – Construction & working of SEM – various Imaging Techniques – Applications- Atomic Force Microscopy- Construction & working of AFM - Applications .

UNIT III CHEMICAL ANDTHERMALANALYSIS **9**

Basic Principles, Practice and Applications of X-Ray Spectrometry, Wave Dispersive X-Ray Spectrometry, Auger Spectroscopy, Secondary Ion Mass Spectroscopy, Fourier Transform Infra Red Spectroscopy (FTIR)- Proton Induced X-Ray Emission Spectroscopy, Differential Thermal Analysis, Differential Scanning Calorimetry (DSC) And Thermo Gravitymetric Analysis (TGA)

UNIT IV MECHANICAL TESTING –STATICTESTS **8**

Hardness – Brinell, Vickers, Rockwell and Micro Hardness Test – Tensile Test – Stress – Strain plot
– Proof Stress – Torsion Test - Ductility Measurement – Impact Test – Charpy&Izod – DWTT - Fracture Toughness Test, Codes and standards for testing metallic and composite materials.

UNIT V MECHANICAL TESTING –DYNAMICTESTS **9**

Fatigue – Low & High Cycle Fatigues – Rotating Beam & Plate Bending HCF tests – S-N curve – LCF tests – Crack Growth studies – Creep Tests – LM parameters – AE Tests-modal analysis - Applications of Dynamic Tests.

TOTAL: 45 PERIODS

REFERENCES:

1. Culity B.D., Stock S.R& Stock S., Elements of X ray Diffraction, (3rd Edition). Prentice Hall,2001.
2. Dieter G.E., Mechanical Metallurgy, (3rd Edition), ISBN: 0070168938, McGraw Hill,1988.
3. Davis, H.E., Hauck G. &Troxell G.E., The Testing of engineering Materials, (4th Edition), McGraw Hill, College Divn.,1982.
4. Suryanarayana A. V. K., Testing of metallic materials, (2nd Edition), BS publications,2007.
5. Newby J., Metals Hand Book- Metallography & Micro Structures, (9th Edition), ASM International, 989.
6. ASM Hand book-Materials characterization, Vol – 10,2004.

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COURSE OUTCOMES: At the end of this course, the students would be able to: Employability / Entrepreneurship.

CO1	Determine the Micro structure and crystal structure analysis of Manufacturing Materials.
CO2	Develop the microstructure of material using different electron microscopy.
CO3	Determine the Chemical and thermal analysis of materials.
CO4	Determine the mechanical properties using different static test.
CO5	Determine the mechanical properties using different dynamic test.

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1702MF104 INDUSTRIAL AUTOMATION AND MECHATRONICS L TPC

0 3 0 3

OBJECTIVES:

This syllabus is formed to create knowledge in Industrial Automation and Mechatronics systems and impart the source of concepts and techniques, which have recently been applied in practical situation. It gives the frame work of knowledge that allows engineers and technicians to develop an interdisciplinary understanding and integrated approach to engineering.

UNITI INDUSTRIAL AUTOMATION **8**

Role of automation in industries, Benefits of automation –Introduction to fluid power, Advantages of fluid power, Application of fluid power system -Types of fluid power systems -Introduction to automation tools: Low cost automation, PLC, DCS, SCADA -Automation strategy evolution.

UNIT II INTRODUCTION TO MECHATRONICS **8**

Introduction to Mechatronics-systems – Mechatronics approach to modern engineering and design – Need of Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics – Mechatronics elements.

UNITIII SENSORS AND TRANSDUCERS **12**

Introduction – Performance Terminology – Potentiometers – Strain gauges – LVDT – Eddy current sensor – Hall effect sensor – Capacitance sensors – Digital transducers – Temperature sensors – Optical sensors – Piezo electric sensor-ultrasonic sensors – Proximity sensors – Signal processing techniques.

UNITIV ACTUATORS **8**

Switching Devices, Classification of actuators – Electrical actuators – Solid state relays, solenoids, D.C. motors, Servo motors, Stepper motors – Interfacing with microcontroller through H-bridge Circuits – Piezoelectricactuators.

UNIT V MECHATRONICSYSTEMS **9**

Design process-stages of design process – Traditional and Mechatronics design concepts – Case studies – Engine management system, Automatic camera, Automatic wishing machine, Pick and placerobots.

TOTAL: 45 PERIODS

REFERENCES:

1. R.K.Rajput.A Text Book of Mechatronics, Chand &Co,2007
2. W.Bolton,-MechatronicslPearson Education Limited,2004
3. M.A. Mazidi& J.G. Mazidi, 8051 Micrcontroller and embedded systems,2002
4. Devadasshetty, Richard A. Kolk, -Mechatronics System Designl, PWS Publishing Company, 2001.

COURSE OUTCOMES: At the end of this course, the students would be able to: Employability

CO1 : Understand the concepts of industrial automation

CO2 : Discuss the components of Mechatronic systems

CO3 : Select the suitable sensors and transducers in an automation application

CO4 : Select the most appropriate actuators for an engineering application

CO5 : Explain mechatronic systems with case studies

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1702MF105 **ROBOT DESIGN&PROGRAMMING** **L TP C**
3 0 03

AIM:

- To impart knowledge in the area of Robot designing and programming in Robotic languages.

OBJECTIVES:

- To teach the students about the kinematic arrangement of robots and its applications in the area of manufacturingsectors
- To expose the students to build a robot for any type ofapplication

UNIT I INTRODUCTION **9**

Definition, Need Application, Types of robots – Classifications – Configuration, work volume, control loops, controls and intelligence, specifications of robot, degrees of freedoms, end effectors – types, selection applications.

UNIT II ROBOT KINEMATICS **9**

Introduction – Matrix representation Homogeneous transformation, forward and inverse – Kinematic equations, Denvit – Hartenbers representations – Inverse Kinematic relations. Fundamental problems with D-H representation, differential motion and velocity of frames – Jacobian, Differential Charges between frames:

UNIT III ROBOT DYNAMICS ANDTRAJECTORYPLANNING **9**

Lagrangeon mechanics, dynamic equations for sing, double and multiple DOF robots – static force analysis of robots, Trajectory planning – joint space, Cartesian space description and trajectory planning – third order, fifth order - Polynomial trajectory planning

UNIT IV ROBOT PROGRAMMING &AITECHNIQUES **9**

Types of Programming – Teach Pendant programming – Basic concepts in A1 techniques – Concept of knowledge representations – Expert system and its components.

UNITV ROBOT SENSORSANDACTUATORS **9**

Design of Robots – characteristics of actuating systems, comparison, microprocessors control of electric motors, magnetostrictive actuators, shape memory type metals, sensors, position, velocity, force, temperature, pressure sensors – Contact and non contact sensors, infrared sensors, RCC, vision sensors.

TOTAL: 45 PERIODS

REFERENCES

1. Saeed.B.Niku, ‚Introduction to Robotics, Analysis, system, Applications', Pearson educations, 2002
2. Groover.M.P. Industrial Robotics, McGraw – Hill International edition,1996.
3. Wesley E Snyder R, ‚Industrial Robots, Computer Interfacing and Control', Prentice Hall International Edition,1988.
4. GordonMair,‚IndustrialRobotics',Prentice Hall (U.K.)1988

COURSE OUTCOMES: At the end of this course, the students would be able to: Employability

CO1 : Apply their knowledge on calculation of end effector coordinate position and angle based onthe application.

CO2 : Calculate force involved in the robot while under operation (i.e. gripping force).

CO3 : Compute the trajectory of robot based on both joint space and Cartesian space.

CO4 : Understand the traditional programming in robot and Modern AI Techniques.

CO5 : Identify appropriate sensors and actuators based on the application.

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1704MF106 **CAD /CAM LAB** L TPC
0 0 4 2

AIM:

- To impart the knowledge on training the students in the area of CAD/CAM

OBJECTIVES:

- To teach the students about the drafting of 3D components and analyzing the same using various CAD packages and programming of CNC machines
- To train them to use the various sensors

CAM LABORATORY

1. Exercise on CNC Lathe: Plain Turning, Step turning, Taper turning, Threading, Grooving& canned cycle
2. Exercise on CNC Milling Machine: Profile Milling, Mirroring, Scaling & canned cycle.
3. Study of Sensors, Transducers & PLC: Hall-effect sensor, Pressure sensors, Strain gauge, PLC, LVDT, Load cell, Angular potentiometer, Torque, Temperature & Optical Transducers.

CAD LABORATORY

2D modeling and 3D modeling of components such as

1. Bearing
2. Couplings
3. Gears
4. Sheet metal components
5. Jigs, Fixtures and Die assemblies.

TOTAL: 60 PERIODS

COURSE OUTCOMES: At the end of this course, the students would be able to: Employability / Entrepreneurship

CO1	Develop the CNC program to produce cylindrical components using CNC turning machine
CO2	Develop the CNC program to produce Non cylindrical components using CNC turning machine
CO3	Demonstrate about Different Sensors.
CO4	Prepare the 3D assembly model of bearing, coupling and gears .
CO5	Prepare the 3D assembly model of jigs, fixture components .

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1704MF107 **INDUSTRIAL AUTOMATION AND MECHATRONICS LAB** L T PC
0 0 21

AIM

- To impart practical knowledge on industrial automation

OBJECTIVE

- To train the students to have a hands on training of the basic concepts of various industrial automation and Mechatronics systems

EXPERIMENTS

1. Simulation of single and double acting cylindercircuits
2. Simulation of Hydrauliccircuits
3. Simulation of electro pneumaticcircuits
4. Simulation of electro hydrauliccircuits
5. Simulation of PLCcircuits
6. Software simulation of fluid power circuits using a software package.
7. Simulation of various Mechatronics systems using hardware components

TOTAL: 60 PERIODS

COURSE OUTCOMES: At the end of this course, the students would be able to: Employability

:O1 : Development of hydraulic circuits for specific system

:O2 : Create the pneumatic circuits using autoSIM software.

:O3 : Apply PLC programming and implement it on PLC kits

:O4 : Simulate fluid power circuits using a software package

:O5 : Simulate model of a mechatronics system.

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I704MF108 **COMMUNICATION SKILLS LAB I** **L T P C**
0 0 2 1

Objectives

- To prepare students for taking BEC Vantage level examination which is an International Benchmark for English language proficiency of Cambridge English Language Assessment (CELA).
- To communicate for essential business needs.
- To acquire skills for using English in workplace effectively.

OUTCOMES Skill development

The students will be able to

1. Enable students to get International recognition for work and study.
2. Use English confidently in the International business environments.
3. Take part in business discussion, read company literature, write formal and informal business correspondences and listen and understand business conversations.

UNIT I GRAMMAR AND VOCABULARY

Comparison of adjectives – forming questions – asking complex questions – expressing purpose and function – tenses – onditionals – time statements – modal verbs – active and passive voice – articles – direct and indirect speech – cause and effect – relative ronouns – expressions followed by – ing forms – countable / uncountable – acronyms – marketing terms / vocabulary – financial terms – ollocations – discourse markers. 6

UNIT II LISTENING

Purposes of listening – features of listening texts – potential barriers to listening – specific listening skills – strategies to use when istening– distinguishing relevant from irrelevant information – gap filling exercise – multiple-choice options – note completion – matching nd multiple choice questions – listening for specific information, gist, topic, context and function. 7

UNIT III SPEAKING

Word and sentence stress – clear individual sounds – turn taking – initiating and responding - intonation patterns – pronunciation – nother tongue intrusion– conversation practice – turn-taking and sustaining the interaction by initiating and responding appropriately. 6

UNIT IV READING

Purposes of reading – potential barriers to reading – paraphrasing – identifying facts and ideas – skimming and scanning for nformation – matching statements with texts– spotting reference words – understanding text structure – understanding the ideas in a text – listinguishing between the correct answer and the distractor – understanding cohesion in a text – deciphering contextual meaning of words nd phrases – cloze – proof reading – transcoding. 5

UNIT V WRITING

Paragraphing a text – using appropriate connectives – editing practice –Longer Documents: writing a proposal. 6

Total: 30 Hours

REFERENCES:

. Guy Brook-Hart, BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book, 1st Edition, Cambridge Jniversity Press, New Delhi, 2006.
.. Cambridge Examinations Publishing, Cambridge BEC VANTAGE – Self-study Edition, Cambridge University Press, UK, 2005.

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1701MF201	ADVANCED MACHINING TECHNOLOGY	L TP C 3 0 03

AIM:

- To impart knowledge in the area of advanced machining processes.

COURSE OUTCOMES At the end of this course, the students would be able to:

Employability

1. Understand various metal cutting process and analyse their parameters.
2. optimize the process parameters of different mechanical based advanced machining process.
3. Summarizes the merits and demerits of the chemical energy based non-traditional manufacturing process
4. Analyse the process parameters of thermal energy based un - conventional machining process.
5. Design and development of different hybrid advanced machining processes.

CUTTING **L 8**

Metal Cutting Technology: Introduction to metal cutting - tool nomenclature and cutting forces - thermal aspects of machining - tool materials - tool life and tool wear - traditional and nontraditional machining – high speed machining

UNITII ENERGY PROCESSES **MECHANICAL 10**

Mechanical Processes: Ultrasonic Machining - Water Jet Machining - Abrasive Jet Machining - Abrasive Water Jet Machining - Ice Jet Machining - Magnetic Abrasive Finishing

UNITIII ENERGY PROCESSES **CHEMICAL 9**

Chemical and Electrochemical Processes: Chemical Milling - Photochemical Milling – Electropolishing - Electrochemical Machining - Electrochemical Drilling - Shaped Tube Electrolytic Machining

UNITIV ENERGY PROCESSES **THERMAL 9**

Thermal Processes: Electric Discharge Machining - Laser Beam Machining - Electron Beam Machining - Plasma Beam Machining - Ion Beam Machining

UNITV PROCESSES **HYBRID 9**

Hybrid Processes: Electrochemical Grinding, Honing, Superfinishing and Buffing – Ultrasonic and Laser Assisted ECM – Electroerosion Dissolution Machining - Abrasive Electrodischarge Machining - EDM with Ultrasonic Assistance

TOTAL: 45 PERIODS

REFERENCES

. Bhattacharya "Metal Cutting Theory and Practice", New Central Book Agency (p) Ltd., Calcutta1984.
. Boothroy .D.G. and Knight. W.A "Fundamentals of Machining and Machine tools", Marcel Dekker, New York, 1989.
. Hassan Abdel – Gawad El-Hofy "Advanced Machining Processes", McGraw, New York, 2005.
. Wellar, E.J. "Non-Traditional Machining Processes", Society of Manufacturing Engineers Publications, 2nd Edition, Michigan, 1984.
. Metals Handbook. Vol. 16, Machining. Materials Park; OH: ASM International, 1995.
. Kalpakjian, S "Manufacturing Process for Engineering Materials", MA:Addison-Wesley, 1997.
. Brown, J "Advanced Machining Technology Handbook", New York: McGraw-Hill, 1998.
. McGeough, J "Advanced Methods of Machining", London. New York: Chapman and Hall, London, 1988.
. Rumyantsev, E and Davydov, A "Electrochemical Machining of Metals", Moscow:Mir Publishers, 1984.

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\702MF202 **FLEXIBLE TOOLING AND AUTOMATED INSPECTION** **L T P C**

3 0 0 3

AIM:

To impart knowledge in the area of Tooling in Manufacturing and Inspection.

COURSE OUTCOMES: Employability.

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

. Understand various types of tooling in manufacturing industries.

. Understand the flexible tooling for Non traditional machining.

. Design and develop tooling for Micro manufacturing

. Understand different smart inspections using modern tools.

. Design and develop robots for automated inspection.

UNIT-1 INTRODUCTION **09**

ntroduction to Principles of Tooling in Manufacturing-Economics of Tooling- Pre -Design Product and Process Analysis -Automated ooling for Machining-Tool Changers-Tool Presets

UNIT-2 FLEXIBLETOOLING 09

lexible Tooling –Tooling for Forming- Evolution of Dies, Forging, Bending and Drawing and Extrusion Processes- Tooling for Casting rocesses –Mechanization –Flexible tooling in Non Traditional Manufacturing

UNIT-3 MICRO-MANUFACTURING **09**

ooling for Micro Manufacturing-Tooling for Physical and Mechanical joining Processes-Tooling for CMM-Tool handling Robots.

UNIT-4 VISUAL REALISM **09**

rinciples of Gauging - New concepts for gaging, inspection, checking, machine vision, and robotic testing. Smart Inspection Systems - echniques and Applications of Intelligent Vision -Stages of automated visual inspection (AVI) and "smart" inspection systems- examples

UNIT-5 ARTIFICIAL INTELLIGENCE **09**

pplication of conventional and artificial intelligence techniques in AVI. AVI process, from illumination, image enhancement, segmentation nd feature extraction, through to classification, and includes case studies of implemented AVI systems-Robots in Automated Inspection utorial: Design of Tooling Layout for Automats, Die Design, Modular Fixture Design ractice: Exercises in CMM and Robots for Inspection

Total Hrs: 45 Periods

References

. Mikell P Groover Fundamentals of Modern Manufacturing: Materials, Processes, and Systems John Wiley and Sons 2012

.. Stephen Murphy In-Process Measurement and Control: 32 (Series Manufacturing Engineering and Materials Processing) CRC Press 1990

. Boothroyd, G. (2005). Assembly automation and product design (Vol. 536). Boca Raton, FL: Taylor & Francis.

. Stanley L. Robinson, Richard Kendall Miller Automated Inspection and Quality Assurance 1989 CRC Press

. Duc T. Pham and R J Alcock Smart Inspection Systems: Techniques and Applications of Intelligent Vision Academic Press

. Black, J. Temple. The Design of the Factory with a Future. McGraw-Hill Companies, 1991

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\702MF203 ADVANCES IN CASTING AND WELDING L TPC

3 0 0 3

AIM:

- To refresh the knowledge on basic concepts and to impart knowledge on advances in casting and weldingprocesses.

OBJECTIVES:

- To study the metallurgical concepts and applications of casting and welding process.
- To acquire knowledge in CAD of casting and automation of welding process.

UNIT I CASTINGDESIGN **8**

Heat transfer between metal and mould — Design considerations in casting – Designing for directional solidification and minimum stresses - principles and design of gating andrisering

UNIT II CASTINGMETALLURGY **8**

Solidification of pure metal and alloys – shrinkage in cast metals – progressive and directional solidification — Degasification of the melt-casting defects – Castability of steel , Cast Iron, Al alloys , Babbit alloy and Cu alloy.

UNIT III RECENT TRENDS IN CASTING ANDFOUNDRYLAYOUT **8**

Shell moulding, precision investment casting, CO_2 moulding, centrifugal casting, Die casting, Continuous casting, Counter gravity low pressure casting, Squeeze casting and semisolid processes. Layout of mechanized foundry – sand reclamation – material handling in foundry pollution control in foundry — Computer aided design of casting.

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UNITIV WELDING METALLURGYANDDESIGN **10**

Heat affected Zone and its characteristics – Weldability of steels, cast iron, stainless steel, aluminum, Mg , Cu , Zirconium and titanium alloys – Carbon Equivalent of Plain and alloy steels Hydrogen

embrittlement – Lamellar tearing – Residual stress – Distortion and its control . Heat transfer and solidification - Analysis of stresses in welded structures – pre and post welding heat treatments – weld joint design – welding defects – Testing of weldment.

UNITV RECENT TRENDSINWELDING **11**

Friction welding, friction stir welding – explosive welding – diffusion bonding – high frequency induction welding – ultrasonic welding – electron beam welding – Laser beam welding –Plasma welding – Electroslag welding- narrow gap, hybrid twin wire active TIG – Tandem MIG- modern brazing and soldering techniques – induction, dip resistance, diffusion processes – Hot gas, wave and vapour phase soldering. Overview of automation of welding in aerospace, nuclear, surface transport vehicles and under waterwelding.

TOTAL: 45 PERIODS

COURSE OUTCOMES: Employability

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

CO1: To gain an understanding and appreciation of the breadth and depth of metal forming processes

CO2: Recognize the strong interrelationships between different bulk forming process

CO3: To become familiar with some of the sheet metal forming processes

CO4: Concepts such as powder metallurgy and some special forming methods are elaborately understood by the students

CO5: Identification of metal forming parameters such as friction, temperature, the resistance of the material etc., necessary for producing efficient, accurate and defect free product and the application of the forming process can be understood by students

REFERENCES:

1. ASM Handbook, Vol 15, Casting,2004
2. ASM Handbook vol.6, welding Brazing & Soldering,2003
3. Jain P.L., Principles of Foundry Technology,TataMcGrawHill Publishers,2003
4. Parmer R.S., Welding Engineering and Technology, KhannaPublishers,2002
5. Srinivasan N.K., Welding Technology, Khanna Tech Publishers,2002
6. Heineloper& Rosenthal, Principles of Metal Casting, Tata McGraw Hill,2000.
7. Carrry B., Modern Welding Technology, Prentice Hall Pvt Ltd.,2002
8. Cornu.J. Advanced welding systems – Volumes I, II and III, JAICO Publishers,1994.
9. Iotrowski – Robotic welding – A guide to selection and application – Society of mechanical Engineers,1987.

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1702MF204	THEORY OFMETAL FORMING	L T P C
		3 0 0 3

AIM:

- To impart knowledge on plasticity, surface treatment for forming of various types of metal forming process.

OBJECTIVES:

- To study the basic concepts of metal forming techniques and to develop force calculation in metal formingprocess.
- To study the thermo mechanical regimes and its requirements of metalforming

UNITI THEORYOFPLASTICITY 9

Theory of plastic deformation – Yield criteria – Tresca and Von-mises – Distortion energy – Stress- strain relation – Mohr's circle representation of a state of stress – cylindrical and spherical co-ordinate system – upper and lower bound solution methods – Overview of FEM applications in Metal Forming analysis.

UNITII THEORY AND PRACTICE OF BULKFORMINGPROCESSES 8

Analysis of plastic deformation in Forging, Rolling, Extrusion, rod/wire drawing and tube drawing – Effect of friction – calculation of forces, work done – Process parameters, equipment used – Defects – applications – Recent advances in Forging, Rolling, Extrusion and Drawing processes – Design consideration in forming.

UNITIII SHEETMETALFORMING 8

Formability studies – Conventional processes – H E R F techniques – Superplastic forming techniques – Hydro forming – Stretch forming – Water hammer forming – Principles and process parameters – Advantage, Limitations andapplication

UNITIV POWDER METALLURGY AND SPECIALFORMINGPROCESSES 9

Overview of P/M technique – Advantages – applications – Powder preform forging – powder rolling – Tooling, process parameters and applications. - Orbital forging – Isothermal forging – Hot and cold isostatic pressing – High speed extrusion – Rubber pad forming – Fine blanking – LASER beam forming

UNITV SURFACE TREATMENT AND METALFORMINGAPPLICATIONS 9

Experiment techniques of evaluation of friction in metal forming selection – influence of temperature and gliding velocity – Friction heat generation – Friction between metallic layers – Lubrication carrier layer – Surface treatment for drawing, sheet metal forming, Extrusion, hot and cold forging.

Processing of thin Al tapes – Cladding of Al alloys – Duplex and triplex steel rolling – Thermo mechanical regimes of Ti and Al alloys during deformation – Formability of welded blank sheet – Laser structured steel sheet - Formability of laminated sheet.

TOTAL: 45 PERIODS

COURSE OUTCOMES: Employability

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

. Explain the casting design.

.. Explain the casting metallurgy

. Express the knowledge of recent trends in casting and foundry layout

.identify the welding metallurgy and design

. Express the knowledge of recent trends in welding

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1702MF205	PRECISION MACHINING:	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To impart knowledge on various micro/nano finishing techniques for the production of required components.

UNIT I INTRODUCTION **9 Hours**

Micro- manufacturing- types- micromachining- classification- mechanical advanced micro- machining processes.

UNIT II MEMS **9 Hours**

Advanced nano finishing processes-Micro Electro Mechanical Systems (MEMS) - Nano Electro Mechanical Systems (NEMS).

UNIT III MICRO MACHING - 1 **9 Hours**

Lithography-diamond turning- micro drilling - micro milling - Electrical Discharge Micro-Machining (EDMM) - Electro Chemical Micro-Machining (ECMM).

UNIT IV MICRO MACHING - 2 **9 Hours**

Wire Electrical Discharge Micro-Machining (EDMM)- Laser Micro-Machining (LMM) - Types of Lasers Nano finishing- magnetorheological finishing process-micro/nano finishing with flexible flow of abrasives- Electrolytic In-process Dressing (ELID) Grinding.

UNIT V ELECTRONMICROSCOPY **9 Hours**

Profilometers - optical microscopy - confocal laser scanning microscopy- Scanning Electron Microscope (SEM)-Atomic Force Microscope (AFM).

TOTAL: 45 HOURS

COURSE OUTCOMES: Employability -

On the Successful completion of the course, Students will be able to

CO1: Recognize the various micro machining techniques.

CO2: Apply various micro/nano finishing techniques for the production of required components

CO3: State the metrological principles and techniques for the evaluation of precision machined components.

REFERENCES:

1. M.J. Madou, "Fundamentals of Micro Fabrication", CRC Press, 2002
2. V.K.Jain, "Introduction to Micromachining", Narosa Publishing House, 2010
3. Mark J. Jackson, "Micro Fabrication and Nano machining", Taylor and Francis, 2006
4. SeropeKalpakjian, "Manufacturing Engg. and Technology", Pearson Education, 2005
5. Yi Qin, "Micro-Manufacturing Engineering and Technology", Elsevier Publication,2010

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1704MF206	METAL FORMING LABORATORY	L T PC 0 0 4 2

AIM

- To impart practical knowledge on bulk metal forming and sheet metal formingprocesses

OBJECTIVE

- To train the students to have an hands on having the basic concepts of metal forming processes and to determine some metal forming parameters for a givenshape.

EXPERIMENTS

1. Determination of strain hardening exponent
2. Determination of strain rate sensitivity index
3. Construction of formability limit diagram
4. Determination of efficiency in water hammer forming
5. Determination of interface friction factor
6. Determination of extrusion load
7. Study on two high rolling process

Course outcomes Employabilim.

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

CO1: Identify the strain hardening exponent of the given material

CO2 Be familiar with the formability limit diagram and extrusion load

CO3: Concept of strain rate sensitivity index can be understood

CO4: Recognize the interface friction factor

CO5: To be familiar with the two high rolling process

TOTAL: 60 PERIODS

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1704MF207 **TECHNICAL SEMINAR** L T PC

0 0 2 1

COURSE OBJECTIVES

- To expose students to the real working environment and get acquainted with the organization
- To set the stage for future recruitment by potential employers.Structure, business operations and administrative functions.

COURSE OUTCOMES Skill development

1. Apply effective strategies in literature searches using libraries resources, an other e-databases.
2. Critical thinking within Seminar is grounded on the processes of analysis, synthesis and evaluation necessary to read with understanding.

The students are expected to make a presentation on the state of research on a particular topic based on current journal publications in that topic. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

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1704MF208 **COMMUNICATION SKILLS LAB II** **L T PC**

0 02 1

COURSE OBJECTIVES

- To prepare students for taking BEC Vantage level examination conducted by the Language Assessment (CELA).
- To communicate appropriately in business contexts.
- To acquire skills for using English in business environment.

COURSE OUTCOMES Skill development

The students will be able to

1. Enable students to acquire business terms for communication.
2. Use English confidently in the business contexts.
3. Take part in business discussion and write formal and informal business correspondences.

UNIT I SPEAKING

Non-verbal communication – agreeing / disagreeing, reaching decisions, giving and supporting opinions – making mini presentations – extending on conservations – collaborative task – tongue twisters.

15

UNIT II WRITING

Business letters – fax – Shorter Documents: e-mail - memo – message - note – report writing – formal / informal styles.

15

Total: 30 Hours

REFERENCES

1. Guy Brook-Hart, BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book, 1st Edition, Cambridge University Press, New Delhi, 2006.

2. Cambridge Examinations Publishing, Cambridge BEC VANTAGE – Self-study Edition, Cambridge University Press, UK, 2005.

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1703MF003 **MICRO ELECTRO MECHANICAL SYSTEMSAND NANO TECHNOLOGY** **L T P C 3 0 0 03**

AIM:

- To inspire the students to expect to the trends in manufacturing of micro components and measuring systems to nanoscale.

OBJECTIVES: Employability.

- To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be aware of microactuators.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques

UNIT I OVER VIEW OF MEMSANDMICROSYSTEMS **6**

Definition – historical development – properties, design and fabrication, micro-system, microelectronics, working principle ,applications and advantages ofmicro system. Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds - silicon piezo resistors, Gallium arsenide, quartz, polymers for MEMS, conductive polymers.

UNIT II FABRICATION PROCESSES AND MICROSYSTEM PACKAGING **10**

Photolithography, photo resist applications, light sources, ion implantation, diffusion–Oxidation - thermal oxidation, silicon dioxide, chemical vapour deposition, sputtering - deposition by epitaxy – etching – bulk and surface machining – LIGA process – LASER, Electron beam ,Ion beam processes – Mask less lithography. Micro system packaging –packaging design– levels of micro system packaging -die level, device level and system level – interfaces in packaging – packaging technologies- Assembly of Microsystems

UNIT III MICRODEVICES **9**

Sensors – classification – signal conversion ideal characterization of sensors micro actuators, mechanical sensors – measurands - displacement sensors, pressure sensor, flow sensors, Accelerometer , chemical and bio sensor - sensitivity, reliability and response of micro-sensor - micro actuators – applications.

UNIT IV SCIENCE ANDSYNTHESIS OFNANOMATERIALS **10**

Classification of nano structures – Effects of nano scale dimensions on various properties – structural, thermal, chemical, magnetic, optical and electronic properties fluid dynamics –Effect of nano scale dimensions on mechanical properties - vibration, bending, fracture.

Nanoparticles, Sol-Gel Synthesis, Inert Gas Condensation, High energy Ball Milling, Plasma Synthesis, Electro deposition and other techniques. Synthesis of Carbon nanotubes – Solid carbon source based production techniques – Gaseous carbon source based production techniques – Diamond like carbon coating. Top down and bottom up processes.

UNIT V CHARACTERIZATION OFNANOMATERIALS **11**

Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, confocal LASER scanning microscopy - transmission electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

TOTAL: 45 PERIODS

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1703MF011	RAPID PROTOTYPING	L	T	P	C
		3	0	0	3

PREREQUISITE :

1. Manufacturing Technology – I
2. Manufacturing Technology – II

COURSE OBJECTIVES:

1. To make the students to understand the importance of time compression technologies
2. To make the students to understand the Selection of appropriate technology for the application
3. To make the students to have knowledge on Exposure to RP software packages

UNIT I INTRODUCTION **9 Hours**

Introduction- Need for the compression in product development. History of RP systems. Survey of applications. Growth of RP industry. Classification of RP systems.

UNIT II RP PROCESS-1 **9 Hours**

Principle, process parameters, process details and applications of various RP processes - Stereo lithography systems. Laser Sintering, Fused Deposition Modeling, Laminated Object.

UNIT III RP PROCESS-2 **9 Hours**

Manufacturing, Solid Ground Curing, Laser Engineered Net Shaping, 3D Printing, Laser Melting, Cladding.

UNIT IV RAPID TOOLING **9 Hours**

Rapid Tooling: Indirect rapid tooling Direct rapid tooling , soft tooling Vs hard tooling, Rapid Manufacturing Process Optimization- Factors influencing accuracy, data preparation errors, part building errors, errors in finishing, influence of part build orientation.

UNIT V RP SOFTWARES **9 Hours**

Software for RP: STL files, overview of solid view, magics, mimics, magics communicator, etc., internet based softwares, collaboration tools. RP Technology selection. Decision Making. Life Cycle Assessment of RP processes. Sustainability issues.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. 3-D Printing
2. Sustainable Manufacturing
3. Advanced Rapid prototyping software

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 Understand the importance of time compression technologies
CO2 Selection of appropriate technology for the application
CO3 Exposure to RP software packages
CO4 Understand the different rapid tooling process
CO5 Analyze the rapid prototyping using relevant software.

Employability.

REFERENCES:

1. Pham D T and Dimov S S, "Rapid Manufacturing", Verlag, 2001.
2. Paul F Jacobs, "Stereo lithography and other RP&M Technologies", SME, 1996.
3. Terry Wohlers, "Wohlers Report 2001", Wohlers Associates, 2008.
4. Prasad H and Badrinarayanan, K S, "Rapid Prototyping and Tooling", SPI-Pageturners, Bangalore, India, 2013.

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17I5MF016	HEAT TREATMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

Engineering Materials and Metallurgy

COURSE OBJECTIVES:

1. To make the students to have knowledge on identify the effect of heat treatment in alloying elements
2. To make the students to have knowledge on apply surface modification techniques
3. To make the students to have knowledge on find the defects occurring in heat treated parts

UNIT I INTRODUCTION **9 Hours**

Iron - Carbon Equilibrium Diagram. Effect of alloying element on properties of steel and heat treatments. Types and application of heat treatments in manufacturing industries.

UNIT II TTT PROCESS **9 Hours**

TTT & CCT diagram for steels-Various heating media used for heat treatment, furnaces. Temperature and atmosphere control- Selection of furnace for heat treatment.

UNIT III HEAT TREATMENT PROCESS **9 Hours**

Heat Treatment Processes. Annealing – Normalising. Hardenability studies, Jominy end quench test. Grossman's experiments - Tempering, Austempering and Martempering. Thermomechanical treatments.

UNIT IV SURFACE MODIFICATION TECHNIQUES **9 Hours**

Surface Modification Techniques: Induction hardening, flame hardening, electron beam hardening and Laser beam hardening. Carburising, nitriding, carbonitriding, CVD and PVD processes, Ion implantation.

UNIT V DESIGN FOR HEAT TREATMENT **9 Hours**

Heat Treatment of Non-Ferrous Metals and Specific Alloy steels. Heat treatment of gray irons, white irons (malleabilising) and S.G.irons. Austempering of S.G.Iron. Defects: Defects in heat treated parts, causes and remedy Design for heat treatment.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Heat treatment for metal matrix composite.
2. Heat treatment for high temperature application metal.
3. Design for smart material heat treatment.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 Identify the effect of heat treatment in alloying elements
CO2 Apply surface modification techniques
CO3 Find the defects occurring in heat treated parts
CO4 Understand the different surface modification techniques
CO5 Design heat treatment for different metals.

employability.

REFERENCES:

1. Rajan and Sharma "Heat Treatment Principles and Techniques" – Prentice Hall of India (P) Ltd. New Delhi, 2004.
2. Prabhudev, K.H., "Handbook of Heat Treatment of Steels", Tata - McGraw Hill Publishing Co., New Delhi, 2000.
3. VijendraSingh, "Heat Treatment of Metals", Standard Publishers Distributors, Delhi, First edition 1998.
4. American Society for Metals, "Metals Handbook Vol.4", ASM Metals Parks, Ohio, USA, 2001.
5. Karl-Erik Thelning, "Steel and its Heat Treatment", Butterworths London, second edition 1984.
6. Novikov I. "Theory of Heat Treatment of Metals", MIR Publishers, Moscow, 1978.

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17MEV017	INDUSTRIAL WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

Knowledge on waste water and treatment

COURSE OBJECTIVES:

1. To impart knowledge on the concept and application of Industrial pollution prevention
2. To impart knowledge on the cleaner technologies
3. To educate about the industrial wastewater treatment and residue management.

UNIT I INTRODUCTION 8 Hours

Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling -generation rates, characterization and variables -Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II INDUSTRIAL POLLUTION PREVENTION & WASTE MINIMISATION 8 Hours

Prevention vis a vis Control of Industrial Pollution - Benefits and Barriers – Waste management Hierarchy - Source reduction techniques - Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis - Pay-back period - Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III INDUSTRIAL WASTEWATER TREATMENT 10 Hours

Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation - Removal of Inorganic Constituents - Precipitation, Heavy metal removal , Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Electrodialysis & Evaporation - Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes - Treatability Studies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT 9 Hours

Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse . Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

UNIT V CASE STUDIES 10 Hours

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Recent industrial waste management methodologies
2. Advanced treatment techniques

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 Understand the wastewater monitoring and treatment requirements

CO2 Define the Principles of pollution prevention and mechanism of oxidation processes.

CO3 Suggest the suitable technologies for the treatment of wastewater.

CO4 Discuss about the wastewater characteristics

CO5 Design the treatment systems

Employability.

REFERENCES:

1. Industrial wastewater management, treatment & disposal, Water Environment
2. Lawrance K.Wang, Yung . Tse Hung, Howard H.Lo and Constantine Yapijakis, " Handbook of Industrial and Hazardous waste Treatment", Second Edition, 2004.
3. Metcalf & Eddy/ AECOM, water reuse Issues, Technologies and Applications, The Mc Graw- Hill companies, 2007.
4. Nelson Leonard Nemerow, "Industrial waste Treatment", Elsevier, 2007.
5. W Wesley Eckenfelder, "Industrial Water Pollution Control", Second Edition, Mc Graw Hill, 1989.
6. Paul L. Bishop, "Pollution Prevention: - Fundamentals and Practice", Mc-Graw Hill International, Boston, 2000.

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1704MF301	Project Work – Phase I	L T P C 0 0 12 6

OBJECTIVES:

- To enable students to select and define a problem/need for analysis in the field of manufacturing engineering.
- To review and analyse literature/ data of selected problem for study and proposeobjective and scope of dissertation work.
- To develop hypothesis and identify methodology based on ethical, scientific andsystematic application of knowledge in the field of problem
- To design, model and experiment/develop optimal solution for problem beinginvestigated
- To analysis and interpretation of data, and synthesis of the information to provide valid conclusions and submit dissertation.

EVALUATION:

- A project topic may be selected based on the literature survey and the creative ideas of the students themselves in consultation with their project supervisor. The topic should be so chosen that it will improve and develop the skills to design, fabricate, analyse, test and research. Literature survey and a part of the project work be carried out in dissertation I.
- The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.
- A project report for dissertation I is to be submitted at the end.
- Project work evaluation is based on the Regulations of the Credit system for the Post graduate programmes of EGSPEC.

TOTAL: 90 PERIODS

OUTCOMES: Employability | Entrepreneurship | Skill development

CO1 : The students would apply the knowledge gained from theoretical and practical coursesin solving problems, so as to give confidence to the students to be creative and get trained in planning, organizing and coordination various components of dissertation work.

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1704MF401	Project Work – Phase II	L T P C
		0 0 28 14

OBJECTIVES:

- Based on practical experience in dissertation-I work, the students will be able to proposeand define a problem/need for analysis in the field of manufacturing engineering.
- To comprehensively review and analyse literature/ data to develop hypothesis andidentify methodology based on ethical, scientific and systematic application of knowledge in the field of problem
- To design experiments, develop model and conduct experiments/ simulations for development of sustainable and economical solution for problem being investigated
- To analyse and interpret data, and synthesize of the factual information's to arrive at valid conclusions
- To enable students to communicate technical information in form of oral presentation and technical report in form of dissertation

EVALUATION:

- The progress of the project is evaluated based on a minimum of three reviews.
- The review committee may be constituted by the Head of the Department.
- A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report
- Project work evaluation is based on the Regulations of the Credit system for Post graduate programmes of EGSPEC.

OUTCOMES:

Employability / Entrepreneurship / Skill Development

CO1 : The students' would apply the knowledge gained from theoretical and practical courses in solving problems, so as to give confidence to the students to be creative, well planned, organized, coordinated project outcome of the aimed work.

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