Subject Name	L	T	P	Credit
Entrepreneurship and Skill Development	2	0	0	2

Objectives:

- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Unit-1

Entrepreneurship:

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic growth, Factors affecting entrepreneurial growth.

Unit-2

Entrepreneurial Motivation

Major motives influencing an Entrepreneur – Achievement motivation training, self rating, business games, thematic appreciation test – stress management, entrepreneurship development programs – need, objectives.

Unit -3

Entrepreneur Business

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Unit -4

Finance and Accounting in relation to Entrepreneurship

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, and Taxation – Income Tax, GST.

Unit-5

Support to Entrepreneurs

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Outcomes:

- After completion of this course, student will be able to gain knowledge and skills needed to run a business successfully.

Text books:

- Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.

- Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.

Reference books:

- Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
- Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.
- Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.
- EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

Robotics (MEC761) Elective-IV

B. Tech. (VIII Semester) (CBCS Scheme)(04YDC)

w.e.f. (session2019-20)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Practical Examination	Continuous Evaluation	L	T	P		
	Mid Sem. Test (MST) F_1	End Sem. Test (EST) F_2							
Robotics **(MEC---) Elective-IV**	**30**	**60**		10	2	1		3	100

Course Objectives: To impart the knowledge of Robotic technology and its applications in Industry. Student will learn the robot hardware and software technology and its use in Industrial automation.

Unit I Introduction: Need and importance, basic concepts, structure and classification of industrial robots, terminology of robot motion, motion characteristics, resolution, accuracy, repeatability, robot applications.

Unit II End Effectors and Drive systems: Drive systems for robots, salient features and comparison, different types of end effectors, design, applications.

Unit III Sensors: Sensor evaluation and selection Piezoelectric sensors linear position and displacement sensing, revolvers, encoders, velocity measurement, proximity, tactile, compliance and range sensing. Image Processing and object recognition.

Unit IV Robot Programming: Teaching of robots, manual, walk through, teach pendant, off line programming concepts and languages, applications.

Unit V Safety and Economy of Robots: Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robots.

References:

1. Mittal RK, Nagrath IJ; Robotics and Control; TMH
2. Groover M.P,Weiss M, Nagel,OdreyNG; Industrial Robotics-The Appl; TMH
3. Groover M.P; CAM and Automation; PHI Learning

4. Spong Mark and Vidyasagar; Robot Modelling and control; Wiley India
5. Yoshikava ; Foundations of Robotics- analysis and Control; PHI Learning;
6. Murphy ; Introduction to AI Robotics; PHI Learning
7. FU KS, Gonzalez RC, Lee CSG; Robotics Control, sensing; TMH 8. Shimon, K; Handbook of Industrial Robots; John Wiley & Sons,.
9. Ghosal Ashitava; Robotics Fundamental concepts and analysis; Oxford
10. Saha S; Introduction to Robotics; TMH
11. Yu Kozyhev; Industrial Robots Handbook; MIR

Course Outcomes: Students have learned the knowledge of Robotic technology and its applications in Industry. Students have learned the robot hardware and software technology and its use in Industrial automation.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering
Syllabus of
Automobile Engineering
B.Tech (VI Semester) (04YDC)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Practical Examination	Continuous Evaluation	L	T	P		
	Mid Sem. Test (MST)	End Sem. Test (EST)							
Automobile Engineering	**30**	**60**	**-**	**10**	3	-	-	3	**100**

Course objective: The student will be made to learn:

✤ The anatomy of the automobile in general ✤ The location and importance of each part ✤ The functioning of the automobile components like gear box, clutch, brakes, steering, axles and wheels ✤ Suspension, frame, springs and other connections ✤ Emissions, ignition, controls, electrical systems.

Unit-I

Development of automobile; classification of automobiles; main parts of automobiles; specifying an automobile; effect of different drives like front wheel/rear wheel/four wheel drive; Introduction to chassis; principal function of chassis;
Conventional, semi forward & full forward chassis; Location of engine in a vehicle; Description & function of frame; Conventional frame, integral frame, semi integral frame, loads acting on a frame, Driver's visibility and methods for improvement, safety aspects of vehicles.

Unit-II

Introduction to steering; Primary functions, Secondary functions; Front axle beam; Loads on front axle; Types of stub axle, Elliot, reversed Elliot, lamoine, reversed Lamoine; Front wheel assembly; main parts of steering system; types of steering gears; Wheel alignment & its significance; camber; castor; toe-in; toe-out; setback; thrust angle; kingpin inclination;

Condition for true rolling motion; Lock positions; Centre point steering; Slip angle; Cornering force; relationship between slip angle & cornering force; Cornering power; Understeer; oversteer.

Unit-III

Transmission System: Necessity of a clutch; Classification of clutches i.e. friction clutches & fluid flywheel; Different type of clutches: single plate, multi-plate clutch, diaphragm clutch, centrifugal clutch, roller & spring clutch; Different types of gear box, Sliding mesh gearbox, Constant mesh gearbox, Synchromesh gear box and their performance at different vehicle speed; Double declutching;
Automatic transmission principle; torque converter; fluid coupling; Propeller shaft; constant velocity universal joint; differential gearbox.

Unit-IV

Introduction & objective of suspension system, Suspension movements, Bumping, Pitching, Main components of suspension system; Rigid suspension, Independent suspension, Function & constructional details of shock absorber, Type of springs, coil spring, leaf spring, Air spring, Torsion bar, Shackle positioning, shackle at rear end, Shackle at front end;

Brakes: Principle; Brakes applied on front wheels only, brakes applied on rear wheels only, brakes applied on all the four wheels; Braking systems, Components of braking systems, Type of brakes, mechanical brakes, hydraulic brakes; Self-Energisation of brakes, Air bleeding of hydraulic brakes; anti-lock brake systems (ABS), types of wheels and tyres, tyre specifications.

Unit-V

Introduction to electrical & control system, Storage battery, Construction & operation of lead acid battery; Battery operated vehicles, Importance of maintenance; Introduction to Emission standards, pollution control, Pollutants from the vehicles, Indian standards for automotive vehicles: Bharat-I and Bharat-II Norms Euro-I and Euro-II norms; fuel quality standards, Catalytic converters, Fuel additives, Modern trends in automotive engine efficiency and emission control.

Text Books:

1. Automobile Engineering Vol- I & II by Dr. Kirpal Singh, Standard Pub.& Dist.
2. Automobile Technology by Dr. N.K.Giri, Khanna Pub.

Reference Books:

1. Automotive Mechanics by W.Crouse , Tata Mc Graw Hill
2. Automobile Engineering by G.B.S.Narang, Khanna Pub

Course Outcomes:

The students will be able to

✤ Identify the different parts of the automobile ✤ Explain the working of various parts like power transmission, clutch, brakes ✤ Describe how the steering and the suspension systems operate. ✤ Understand the environmental implications of automobile emissions ✤ Develop a strong base for understanding future developments in the automobile industry

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Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

Nanotechnology (MEC-763)

B.Tech.(VIII - Semester) (CBCS Scheme)(04YDC)

W.e.f. (**session 2019- 20**)

Subject Name & Code	Maximum Marks Allotted						Hours/ Week			Credits	Total Marks
	Theory			Practical							
	End Sem Test (EST)	Mid Sem Test (MST)	Continuous Evaluation	End sem	Mid Sem	Continuous Evaluation	L	T	P		
Conceptual Nanotechnology	**60**	**30**	**10**	**---**	**----**	**----**	**3**	**1**	**--**	**4**	**100**

- **Course Objectives:**

(i) Elucidate emerging needs in nanotechnology environment, health; and safety, and incorporate them into basic education that can be immediately employed in industry;
(ii) the development of nanotechnology provides a basis for the formulation of drugs and medicinal products for cancer patients.
(iii) the study of the subject Nanotechnology provides a comprehensive set of baseline characterization parameters that enables cancer biologists, drug and diagnostic developers, and clinical oncologists to apply their tools to solving problems of the cancer patients.
(iv) The subject is strongly connected to the latest innovations in the field of research programmes at the modern industry.

UNIT I: Introduction

Definition of Nanosystem, Scientific revolutions – evolution of Nanotechnology , Time and length scale in structures, Dimensionality and size dependent phenomena – Surface to volume ratio -Fraction of surface atoms – Surface energy, surface defects-Properties at nanoscale (optical, mechanical, electronic ,and magnetic) .

UNIT II - Nanomaterials and their classification

concept of Nanomaterials, dimensionality based Classification such as : Quantum Dots, Wells and Wires , nano materials Carbon- based Classification : bucky balls , nano tubes , grapheme, Metal based nano materials : nano gold , nano silver and metal oxides , Nano composites, Nano polymers, Nano glasses, Nano ceramics ,Biological nano materials .

UNIT III - Nanomaterial Synthesis

Chemical Methods: Metal Nano crystals by Reduction , Solvo thermal Synthesis,

Photochemical Synthesis, Sono chemical Routes, Chemical Vapor Deposition (CVD), Metal Oxide – Chemical Vapor Deposition (MOCVD), Physical Methods: Ball Milling, Physical Vapor Deposition (PVD)Electro deposition , Spray Pyrolysis, Flame Pyrolysis, DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).

UNIT IV – Characterization And Fabrication Of Nanostructures

Nanofabrication: lithography, Photolithography and its limitation, Electron beam lithography (EBL), Nano imprint, Soft lithography patterning. wet and dry etching , Mask Making Characterization: Field Emission Scanning Electron Microscopy (FESEM), Environmental Scanning Electron Microscopy (ESEM), High Resolution Transmission Electron Microscope (HRTEM) , Scanning Tunneling Microscope (STM), Surface enhanced Raman spectroscopy (SERS), X-ray Photoelectron Spectroscopy (XPS) , Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), fabrication of arrays of si micro / nano structures based on atom lithography .

UNIT V – Industrial Applications of Nanotechnology

Solar energy conversion and catalysis, Molecular electronics and printed electronics,- Nano electronics, Polymers with a special architecture, Liquid crystalline systems , Linear and nonlinear optical and electro-optical properties, Applications in displays and other devices, Nanomaterials for data storage, Photonics, Plasmonics , Chemical and biosensors -Nanomedicine and Nanobiotechnology, Nanotoxicology challenges.

Text Books :

(1) Pradeep T., “A Textbook of Nanoscience and Nanotechnology”, Tata McGraw Hill Education Pvt. Ltd.,

(2) Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press,

(3) Rao C. N., A. Muller, A. K. Cheetham, “Nanomaterials Chemistry”, Wiley- VCH .

(4) Ohtsu M,K., Kobayashi,T.Kawazoe and T.Yatsui, “Principals of Nanophotonics (Optics and Optoelectronics)”,CRC press,

(5) Prasad P.N., “Introduction to Biophotonics”, CRC press.

Course Outcomes:

By the end of subject study a student will have :

(i) thorough knowledge of the general principles of physics, chemistry, electronics, that play a role on the nanometer scale

(ii) insight into the materials, fabrication and other experimental techniques that can be used on the nanoscale, as well as their limitations

(iii) understanding of the formation of complex macro systems which are unique in their operations and possess new functionalities in the field of engineering.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

CAD/CAM/CIM (MEC770)

B. Tech. (VIII Semester) (CBCS Scheme)(04YDC)

w.e.f. (session2019-20)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Practical Examination	Continuous Evaluation	L	T	P		
	End Sem. Test (EST) F_2	Mid Sem. Test (MST) F_1							
CAD/CAM/CIM (MEC---)	**40**	**20**	10	30	2	1	2	4	100

Course Objectives: CAD/CAM/CIM is a advance Course for Mechanical Engineers to Understand the Working Principals of Automation in Industry. This Course is Essential to Understand the CNC technology, robotics, group technology, modelling and simulation.

Unit 1 Introduction: Information requirements of mfg organizations; business forecasting and aggregate production plan; MPS, MRP and shop floor/ Production Activity Control (PAC); Mfg as a system, productivity and wealth creation; production processes on volume-variety axes; importance of batch and job shop production; CIM definition and CIM wheel, evolution and benefits; CIM as a subset of Product Life Cycle (PLC) mgt; design for mfg (DFM) and concurrent engg; product design in conventional and CIM environment; terms like CAD, CAE, CAM, CAP, CAPP, CATD and CAQ.

Unit 2 Graphics and standards: Raster scan, coordinate systems for model (M/ WCS) user and display; database for graphic modeling; PDM, PIM, EDM; define EDM, features of EDM; basic transformations of geometry- translation, scaling, rotation and mirror; introduction to modeling software; need for CAD data standardization; developments in drawing data exchange formats; GKS, PHIGS, CORE, IGES, DXF STEP DMIS AND VDI; ISO standard for exchange of Product Model data-STEP and major area application protocols.

Unit 3 Geometric Modeling: Its use in analysis and mfg; 2D and 3D line, surface and volume models; linear extrusion and rotational sweep; Constructive Solid Geometry (CSG); basics of boundary presentation- spline, Bezier, b-spline, and NURBS; sculpture surfaces, classification, basics of coons, Bezier, b-spline and ruled surfaces; tweaking, constraint based parametric modeling; wire-frame modeling, definition of point, line and circle; polynomial curve fitting; introduction to rapid prototyping.

Unit 4 Numeric control and part programming: Principles of NC machines, CNC, DNC; NC modes of point to point, -line and 2D, 3D contouring; NC part programming; ISO standard for coding, preparatory functions(G)- motion, dwell, unit, preset, cutter compensation, coordinate and plane selection groups; miscellaneous (M) codes; CLDATA and tool path simulation; ISO codes for turning tools and holders; ATC, modular work holding and pallets; time and power estimation in milling, drilling and turning; adaptive control, sequence control and PLC; simple part programming examples.

Unit 5 Group Technology: Importance of batch and job shop production; merits of converting zigzag process layout flow to smooth flow in cellular layout, Production Flow Analysis (PFA) and clustering methods; concept of part families and coding; hierarchical, attribute and hybrid coding; OPITZ, MICLASS and DCLASS coding; FMS; material handling; robots, AGV and their programming; agile mfg; Computer Aided Process Planning (CAPP), variant/ retrieval and generative approach.

References:

1. Dr. Vikram Sharma, CAD/CAM/CIM, Katson.
2. S.Kant Vajpay; Principles of CIM; PHI
3. Rao PN; CAD/CAM;TMH
4. Groover MP; Automation, Production Systems & CIM; P.H.I.
5. Rao PN, Tiwari NK, Kundra TK; Computer Aided Manufacturing; TMH
6. Alavudeen A, Venkteshwarn N; Computer Integrated Mfg; PHI
7. Radhakrishnan P, Subramanian S and Raju V; CAD/CAM/CIM; New age Pub

List of Experiments (please expand it):

1. 2D drafting on CAD software.
2. 3D modeling of CAD software.
3. Study of CNC Machines.
4. Study & Learning of G & M Codes.
5. Prepare a Job on CNC Machines.
6. Study of 3-D printing

Course outcome: Learned about the Automation and concepts of CNC technology, Group Technology, simulation and modeling, 3-D printing Robots and AGV.

Mandsaur University, Mandsaur (M.P.)

Department of Mechanical Engineering

Syllabus of

Renewable Energy Technology (MEC780)

B.Tech.(VIII-Semester)

W.e.f. (session201**8**-1**9**)

Subject Name &Code	Maximum Marks Allotted						Hours/ Week			Credits	Total Marks
	Theory			Practical							
	End Sem Test (EST)	Mid Sem Test (MST)	Continuous Evaluation	End sem	Mid Sem	Continuous Evaluation	L	T	P		
Energy Conversion System-II (MEC560)	40	20	10	30	-	-	2	1	2	4	100

Course Objectives:

- Graduates will demonstrate the ability to use basic knowledge in mathematics, science and engineering and apply them to solve problems specific to mechanical engineering (Fundamental engineering analysis skills).
- Graduates will demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results (Information retrieval skills).
- Graduates should be capable of self-education and clearly understand the value of life-long learning (Continuing education awareness).
- Graduates will develop an open mind and have an understanding of the impact of engineering on society and demonstrate awareness of contemporary issues (Social awareness).
- Graduate will be able to design a system to meet desired needs within environmental, economic, political, ethical health and safety, manufacturability and management knowledge and techniques to estimate time, resources to complete project (Practical engineering analysis skills).

Course Outcomes:

- Introduction to Renewable Energy Sources, Principles of Solar Radiation, Different Methods of Solar Energy Storage and its Applications, Concepts of Solar Ponds, Solar Distillation and Photo Voltaic Energy Conversion
- Introduction to Flat Plate and Concentrating Collectors ,Classification of Concentrating Collectors
- Introduction to Wind Energy, Horizontal and Vertical Access Wind Mills, BioConversion
- Types of Bio-Gas Digesters and Utilization for Cooking Geothermal Energy Resources
- Types of Wells and Methods of Harnessing the Energy, Ocean Energy and Setting of OTEC Plants
- Tidal and Wave Energy and Mini Hydel Power Plant, Need and Principles of Direct Energy Conversion
- Concepts of Thermo-Electric Generators and MHD Generators

UNIT – I: Statistics on conventional energy sources and supply in developing countries, Definition Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES. Classification of NCES – Solar, Wind, Geothermal, Bio-mass, Ocean Energy Sources, comparison of these energy sources.

UNIT – II: Solar Energy-Energy available form Sun, Solar radiation data, Solar energy conversion intoheat, Flat plate and Concentrating collectors, Mathematical analysis of Flat plate collectors and collector efficiency, Principle of Natural and Forced convection, Solar engines-Stirling, Brayton engines, Photovoltaic, p-n junction, solar cells, PV systems, Stand-alone, Grid connected solar power satellite.

UNIT – III : Wind energy conversion, General formula -Lift and Drag- Basis of wind energy conversion – Effect of density, frequency variances, angle of attack, and wind speed. Windmill rotors Horizontal axis and vertical axis rotors. Determination of torque coefficient, Induction type generators- working principle.

UNIT – IV: Nature of Geothermal sources, Definition and classification of resources, Utilization forelectric generation and direct heating, Well Head power generating units, Basic features Atmosphericexhaust and condensing, exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels, Biomass gasification, Constructional details of gasifier, usage of biogas for chulhas, various types of chulhas for rural energy needs.

UNIT – V : Wave, Tidal and OTEC energy- Difference between tidal and wave power generation, Principles of tidal and wave power generation, OTEC power plants, Operational of small cycle experimental facility, Design of 5 Mw OTEC pro-commercial plant, Economics of OTEC, Environmental impacts of OTEC. Status of multiple product OTEC systems.

TEXT BOOKS:

- Non – Conventional Energy Sources. G.D.Rai.
- Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi, 2003
- K M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, New Delhi, 2003.
- Ramesh R & Kumar K U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 2004

Mandsaur University, Mandsaur (M.P.)

Department of Mechanical Engineering

Syllabus of

Industrial Safety and Disaster Management B.Tech.(VIII)

(Open Elective) W.e.f. (session2019-20)

Subject Name &Code	Maximum Marks Allotted						Hours/ Week				
	Theory			Practical							
	End Sem Test (EST)	Mid Sem Test (MST)	Continuous Evaluation	End sem	Mid Sem	Continuous Evaluation	L	T	P	Credits	Total Marks
Industrial Safety and Disaster Management	60	30	10		-	-	2	1		3	100

Course Objectives: 1. To know about Industrial safety programs and toxicology, Industrial laws, regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods 3. To analyse industrial hazards and its risk assessment

UNIT-I: Understanding of Industrial disaster-Concept of disaster, Different approaches ,Concept of Risk Levels of disasters ,Disaster phenomena and events, Introduction to Industrial Safety Engineering &accident causation model

UNIT-2: **Disaster management mechanism-**Concepts of risk management and crisis management Disaster management cycle Response and Recovery Development, Prevention, Mitigation and Preparedness Planning for relief

Capacity building -Capacity building: Concept Structural and non-structural measures Capacity assessment; strengthening capacity for reducing risk Counter-disaster resources and their utility in disaster management Legislative support at the state and national levels

UNIT-3 Coping with disaster -Coping strategies; alternative adjustment processes Changing concepts of disaster management Industrial safety plan; safety norms and survival kits Mass media and disaster management

Planning for disaster management-Strategies for disaster management planning Steps for formulating a disaster risk reduction plan Disaster management Act and Policy in India Organisational structure for disaster management in India Preparation of state and district disaster management plans

UNIT-4: Types of industrial disasters & case study of various industrial disasters- types of industrial disaster ,nuclear explosions ,case study(nuclear explosion) on “Chernobyl ,fukushima-

Daiichi", chemical explosions ,case study (chemical explosion) on "oppau explosions" ,fire explosions , case study (fire explosions) on" texas explosions", toxic chemical /gas leakage , case study (gas leakage) on "Bhopal gas tragedy", chemical pollution case study on "minamata disease", mining industry disaster

UNIT-5: Industrial disaster analysis &control - Safety Engineering & Accident causing mechanisms, Preliminary Hazard List, Preliminary Hazard Analysis, Hazard and operability study (HAZOP), Identification of Failure Modes, Failure Modes and Effects Analysis (FMEA), Application of Hazard Identification Techniques, FAULT TREE ANALYSIS (FTA)- Construction, Energy Control Model and Hazard Control Hierarchy, Safety Function Deployment, Ranking of Design Solutions: AHP approach, Quantification of Basic Events for Non-repairable Components, Quantification of Systems Safety and Reliability Block Diagram, Systems Safety Quantification: Truth Table Approach, Systems Safety Quantification: Structure Function.

References:

1.Chakrabarty, U. K**. Industrial Disaster Management and Emergency Response**, Asian Books Pvt. Ltd., New Delhi 2007

2.**nptel**- Department of Industrial and Systems Engineering Indian Institute of Technology, Kharagpur

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Course Outcomes: By the end of the course the students will be able to

1. Analyze the effect of release of toxic substances

2. Understand the industrial laws, regulations and source models.

3. Apply the methods of prevention of fire and explosions.

4. Understand the relief and its sizing methods.

5. Understand the methods of hazard identification and preventive measures.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

OPTIMIZATION TECHNIQUES (Open Elective)

B.Tech.(VIII-Semester) (CBCS Scheme)

w.e.f. (session 2019-20)

Subject Name &Code	Maximum Marks Allotted						Hours/ Week			Credits	Total Marks
	Theory			Practical			L	T	P		
	End Sem Test (EST)	Mid Sem Test (MST)	Continuous Evaluation	End sem	Mid Sem	Continuous Evaluation					
(Open Elective) Optimization Techniques	60	30	10	-	-	-	2	1		3	100

Course Objectives:

1. Set to familiarize the students with standard methods of solving Optimisation problems.
2. Provide students with the basic mathematical concepts of optimization.
3. Understand the theory of optimization methods and algorithms for solving various types of optimization problems.
4. Emphasize the modeling skills necessary to describe and formulate optimization problems.
5. Avail knowledge to solve and interpret optimization problems in engineering.

UNIT-I: OPTIMIZATION TECHNIQUES:

Introduction to Optimization Techniques, Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function –objective function surfaces – classification of Optimization problems, Graphical Method. Classical Optimization Techniques, Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable, Optimization with equality constraints, Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints, Kuhn-Tucker Conditions, Constraint Qualification.

UNIT-2 LINEAR PROGRAMMING:

Introduction, Applications of Linear Programming, Standard Form of a Linear Programming Problem, Geometry of Linear Programming Problems, Definitions and Theorems, Solution of a System of Linear Simultaneous Equations, Pivotal Reduction of a General System of Equations, Motivation of the Simplex Method, Simplex Algorithm, Two Phases of the Simplex Method, Revised Simplex Method, Duality in Linear Programming, Decomposition Principle, Sensitivity or Post-optimality Analysis, Transportation Problem, Karmarkar's Interior Method, Quadratic Programming.

UNIT-3: NONLINEAR PROGRAMMING I: One-Dimensional Minimization Methods: Introduction, Unimodal Function; ELIMINATION METHODS: Unrestricted Search, Exhaustive Search, Dichotomous Search , Interval Halving Method , Fibonacci Method, Golden Section

Method, Comparison of Elimination Methods; INTERPOLATION METHODS: Quadratic Interpolation Method , Cubic Interpolation Method, Direct Root Methods, Practical Considerations.

UNIT-4: NONLINEAR PROGRAMMING II: Unconstrained Optimization Techniques:
Introduction; DIRECT SEARCH METHODS: Random Search Methods, Grid Search Method, Univariate Method, Pattern Directions, Powell's, Simplex Method; INDIRECT SEARCH (DESCENT) METHODS: Gradient of a Function, Steepest Descent (Cauchy) Method, Conjugate Gradient (Fletcher–Reeves) Method, Newton's Method, Marquardt Method, Quasi-Newton Methods, Davidon–Fletcher–Powell Method, Broyden–Fletcher–Goldfarb–Shanno Method, Test Functions

UNIT-5: NONLINEAR PROGRAMMING III: Constrained Optimization Techniques:
Introduction, Characteristics of a Constrained Problem; DIRECT METHODS: Random Search Methods, Complex Method, Sequential Linear Programming, Basic Approach in the Methods of Feasible Directions; INDIRECT METHODS: Transformation Techniques, Basic Approach of the Penalty Function Method, Interior Penalty Function Method, Convex Programming Problem, Exterior Penalty Function Method, Penalty Function Method for Parametric Constraints, Augmented Lagrange Multiplier Method, Checking the Convergence of Constrained Optimization Problems.

References:

1. Rao, S. S., "Engineering Optimization (Theory and Practice)", New Age International Pub.
2. Arora, Jasbir S. , "Introduction to Optimum Design", Elsevier Academic Press
3. Deb, K., "Optimization for Engineering Design-Algorithms and Examples", PHI Learning Private Limited, New Delhi