R18

M.Tech – CAD&M

Draft Course Structure (For I& II year)

Master of Technology

Computer Aided Design and Manufacturing (ME)

I YEAR I SEMESTER

S. No	COURSECODE	SUBJECT	L	T	P	C
1	18HS0845	Computational Methods	3	0	0	3
2	18ME3001	Computer Integrated Manufacturing	3	0	0	3
PROFESSIONAL COURSE ELECTIVE-I						
3	18ME3011	Geometric Modeling	3	0	0	3
	18ME3012	CNC Technology & Programming				
PROFESSIONAL COURSE ELECTIVE-II						
4	18ME3013	Quality Engineering and Manufacturing	3	0	0	3
	18ME3014	Computer Aided Process Planning				
5	18ME3002	Computer Aided Design Lab	0	0	4	2
6	18ME3003	Computer Modeling Lab	0	0	4	2
7	18HS0823	Research Methodology and IPR	2	0	0	2
AUDIT COURSE-1						
8	18HS0818	English for Research Paper Writing	2	0	0	0
	18CE1029	Disaster Management				
	18HS0825	Sanskrit For Technical Knowledge				
	18HS0826	Value Education				
		Contact periods/week	**16**	**0**	**8**	**18**
			Total/Week 24			

R18 **M.Tech – CAD&M**

I YEAR II SEMESTER

S .No	COURSECODE	SUBJECT	L	T	P	C
1.	18ME3004	Finite Element Methods	3	0	0	3
2.	18ME3005	Rapid Prototyping	3	0	0	3
PROFESSIONAL COURSE ELECTIVE-III						
3.	18ME3015	Advances in Manufacturing Technology	3	0	0	3
	18ME3016	Advanced Optimization Techniques				
PROFESSIONAL COURSE ELECTIVE-IV						
4	18ME3017	Computer Graphics	3	0	0	3
	18ME3018	Robotics				
5	18ME3006	Virtual lab in Manufacturing Engineering	0	0	4	2
6	18ME3007	Computer Aided Analysis Lab	0	0	4	2
AUDIT COURSE-II						
7	18HS0829	Constitution of India	2	0	0	0
	18HS0827	Pedagogy Studies				
	18HS0828	Stress Management by Yoga				
	18HS0819	Personality Development through Life Enlightenment Skills				
8	18ME3008	Mini-Project	0	0	4	2
		Contact periods/week	**14**	**0**	**12**	**18**
			Total/Week 26			

II YEAR I SEMESTER

S. No	COURSECODE	SUBJECT	L	T	P	C
PROFESSIONAL COURSE ELECTIVE-V						
1	18ME3019	Mechatronics	3	0	0	3
	18ME3020	Mechanics of Composites				
OPEN ELECTIVE						
2	18HS0824	Business Analytics	3	0	0	3
	18ME3121	Industrial Safety				
	18ME3021	Advances in Operations Research				
	18CE1028	Cost Management of Engineering Projects				
	18ME3022	Composite Materials				
	18EE2128	Waste to Energy				
3	18ME3009	Dissertation Phase – I	0	0	20	10
		contact periods/week	**6**	**0**	**20**	**16**
			Total/Week 26			

II YEAR II SEMESTER

S No.	COURSECODE	SUBJECT	L	T	P	C
1	18ME3010	Dissertation Phase – II	0	0	32	16
Contact periods/week			**0**	**0**	**32**	**16**
			Total/Week 32			

Total Number of Credits= 18 +18+16+16 = 68

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I M.Tech - I Sem (CAD&M)

(18HS0845) Computational Methods

L	T	C
3	0	3

Course Educational Objectives:

- *A conceptual understanding of computational methods commonly used for analysis and design of aerospace systems.*
- *A working knowledge of computational methods including experience implementing them for model problems drawn from aerospace engineering applications.*
- *A basic foundation in theoretical techniques to analyze the behavior of computational methods.*

Course Outcomes:

- *At the end of the course student would demonstrate competence with understanding the theoretical and practical aspects of the use of computational methods. They would be able to establish the limitations, advantages, and disadvantages of different computational methods. Further, they would be able to implement computational methods for solving various engineering problems.*

UNIT-I

Numerical Methods To Engineering Problems: Examples, Solving sets of equations – Matrix notation – Determinants and inversion – Iterative methods – Relaxation methods – System of non-linear equations – computer programs

UNIT-II

Numerical Integration: Newton-Cotes integration formulas – Simpson's rules, Gaussian quadrature. Adaptive integration

Optimization: One dimensional unconstrained optimization, multidimensional unconstrained optimization –direct methods and gradient search methods, constrained optimization

UNIT-III

Boundary Value Problems And Characteristic Value Problems: Shooting method – Solution through a set of equations – Derivative boundary conditions – Rayleigh – Ritz method – Characteristic value problems.

UNIT-IV

Numerical Solutions Of Partial Differential Equations: Laplace's equations – Representations as a difference equation – Iterative methods for Laplace's equations – Poisson equation – Examples – Derivative boundary conditions – Irregular and non – rectangular grids – Matrix patterns, sparseness – ADI method – Finite element method.

Parabolic Partial Differential Equations: Explicit method – Crank-Nickelson method – Derivative boundary condition – Finite element for heat flow – computer programs.

UNIT-V

Hyperbolic Partial Differential Equations: Solving wave equation by finite differences-stability of numerical method –method of characteristics-wave equation in two space dimensions-computer programs.

Curve Fitting And Approximation Of Functions: Least square approximation fitting of non-linear curves by least squares –regression analysis- multiple linear regression, non linear regression - computer programs.

Text Books:

1. *Numerical Methods for Engineers,* Steven C.Chapra, Raymond P.Canale, Tata Mc-Graw hill, 2010.
2. *Applied numerical analysis,* Curtis F.Gerald, partick.O.Wheatly,Addison-wesley,1989
3. *Numerical methods,* Douglas J..Faires,Riched Burden, Brooks/Cole publishing company,2nd Edition 1998..

References:

1. *Numerical Mathematics and computing,* Ward cheney &David Kincaid, Brooks/Cole publishing company, 4th Edition, 1999.
2. M*athematical Methods for Physics and Engineering,*Riley K.F.M.P.Hobson&Bence S.J, Cambridge university press,1999.

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I M.Tech - I Sem (CAD&M)

(18ME3001) Computer Integrated Manufacturing

L	T	C
3	0	3

Course Educational Objectives:

- *To impart knowledge about the integration of interdisciplinary fields of computer aided design, computer aided manufacturing, automatic identification system, automatic storage &retrieval system as a whole. To design and analysis various automatic material handling systems and to make the students aware about various techniques of data collection and its availability to automated subsystems.*

Course Outcome:

The students will be able to:

- *Solve the design problems of different type of transfer mechanism.*
- *perform design and analysis of automatic storage and retrieval system.*
- *evaluate the space requirements of different storage system.*

UNIT-I

Introduction: Fundamental concepts in Manufacturing and Automation, Automation Strategies, Economic analysis in production, fundamentals of CAD / CAM, product cycle and CAD/CAM, Automation and CAD/CAM, Scope of CIM, Automated flow lines, Transfer mechanisms, methods of Line balancing.

UNIT-II

Numerical Control Machines: Introduction- basic components of an NC system-the NC procedure- NC coordinate system, NC motion control system- application of numerical control-Economics of Numerical control.

NC Part Programming: Introduction - The Bunch tape in NC - Tape code format - manual part programming. NC programming with manual data input.

UNIT- III

Computer Controls In NC: NC controllers' technology - Computer Numerical Control (CNC), Direct Numerical control (DNC).

Group Technology: Part families, parts classification and coding, production flow analysis, Composite part concept, Machine cell design, benefits of GT.

UNIT-IV

Flexible Manufacturing Systems: Components of FMS, FMS Work stations, Material Handling Systems, and Computer Control system, FMS layout configurations and benefits of FMS.Agile manufacturing systems

UNIT -V

Computer Aided Process Planning Systems: Approaches to Computer aided Process Planning (CAPP) - Generative and Retrieval CAPP systems, benefits of CAPP, Material Requirement Planning(MRP), mechanism of MRP, benefits, and Capacity Planning.

Computer Integrated Manufacturing: Adaptive control machining systems. adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring, hierarchical structure of computers in manufacturing, and computer process control.

Text Books:

1. *Automation, Production systems and Computer Integrated Manufacturing Systems* – Mikel P.Groover, PHI Publishers,2015.

References:

1. *CAD/CAM*- Mikell P.Groover, and Emory W.Zimmers.Jr. PHI Publishers, 2000.
2. *Computer Aided Design and Manufacturing*, K.Lalit Narayan, K.Mallikarjuna Rao, MMM Sarcar, PHI Publishers,2008
3. *CAD/CAM/CIM*, Radhakrishnan and Subramanian, New Age Publisher, 2001

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I M.Tech - I Sem (CAD&M)

PROFESSIONAL COURSE ELECTIVE-I
(18ME3011) Geometric Modeling

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3	0	3

Course Educational Objectives:

- *learn the modeling of curves using Bezier and B-spline approximations*
- *extend these definitions to surfaces*
- *understand both rational polynomial curves and NURBs*
- *learn surface subdivision and reconstruction techniques*
- *work with unstructured, polygonal representations of geometry*

Course Outcomes:

At the end of the course, the student will:

- *understand the need for, and the different applications of geometric modelling techniques*
- *understand some of the technical solutions*
- *be able to reason about the range of solutions to problems involving 3D objects*

UNIT–I

Introduction: Definition, Explicit and Implicit equations, parametric equations.
Cubic Splines-1: Algebraic and geometric form of cubic spline, tangent vectors, parametric space of a curve, blending functions, four point form, Reparametrization, truncating and subdividing of curves.

UNIT–II

Cubic Splines-2: Graphic construction and interpretation, Composite pc curves.
Bezier Curves: Bernstein basis, equations of Bezier curves, Properties, Derivatives.

UNIT–III

B-Spline Curves: B-Spline basis, Equations, Knot vectors, Properties, and Derivatives.

UNIT–IV

Surfaces: Bicubic surfaces, Coon's surfaces, Bezier surfaces, B-Spline surfaces, Surfaces of revolutions, Sweep surfaces, Ruled surfaces, Tabulated cylinder, Bilinear surfaces, Gaussian curvature.

UNIT–V

Solids: Tricubic solid, Algebraic and Geometric form.
Solid Modeling Concepts: Wire frames, Boundary representation, Half space modeling, Spatial cell, Cell decomposition, classification problem.

Text Books:

1. *CAD/CAM Theory & Practice*, Ibrahim Zeid, Tata McGraw Hill, 2009.
2. *Elements of Computer Graphics*, Roger & Adams Tata McGraw Hill, 2001.

References:

1. *Geometric Modeling*, Micheal E. Mortenson, John Wiley & Sons, 2006.
2. *Computer Aided Design and Manufacturing*, K.Lalit Narayan, K.Mallikarjuna Rao, MMM Sarcar, PHI Publishers, 2008.

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PROFESSIONAL COURSE ELECTIVE-I
(18ME3012) CNC Technology & Programming

Course Educational Objectives:

- *This course covers Fundamentals and concepts of CNC machining centers, NC part programming, Programming through CAD/CAM, and Maintenance and Troubleshooting the CNC machine tools.*

Course Outcomes:

The students will be able to:

- *Understand fundamentals of NC/CNC*
- *Learn and Write NC Part Programming*
- *Learn Tooling for NC/CNC*
- *Learn Maintenance and Trouble Shooting of CNC Machine Tools*

UNIT–I

Introduction To CNC Machine Tools: Evolution of Computerized control in manufacturing, Components, Working principle of CNC, DNC and Machining centers.

Constructional Features Of CNC Machine Tools: Introduction, Spindle drives, Transmission belting, axes feed drives, Slide ways, Ball screws.

UNIT–II

Accessories: Work tables, Spindles, Spindle heads, Beds and Columns, Tooling – Automatic Tool changer (ATC).

Feedback Devices: Introduction, Digital incremental displacement measuring systems, Incremental rotary encoders, Moire fringes, Digital absolute measuring system.

UNIT–III

Electro-Magnetic Analogue Position Transducers: Principle, advantages, characteristics, Synchros, Synchro-Resolvers, Inductors, Laser interferometer.

Control Systems And Interface: Open and closed loop systems, Microprocessor based CNC systems, block diagram of typical CNC system, description of hard ware and soft interpolation systems, Standard and optional features of CNC control systems.

UNIT–IV

APT Programming: APT language structure, APT geometry, Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to point motion commands, continuous path motion commands, post processor commands, control commands, Macro subroutines, Part programming preparation for typical examples

UNIT–V

Economics And Maintenance Of CNC Machine Tools: Introduction, factors influencing selection of CNC machines, Cost of operation of CNC machines, Maintenance features of CNC machines, Preventive maintenance, Documentation, Spare parts, Training in Maintenance.

Text Books:

1. *Computer Numerical Control Machines* – Dr.Radha Krishnanan, New Central Book Agency,1989
2. *Computer Numerical Control Machines* – Hans B.Keif and T. Frederick Waters Macmillan/McGraw Hill,2012

References:

1. *CNC Machines* – B.S. Aditahn and Pabla, new age international publishers,2005
2. *CNC Machining technology* – Graham T. Smith, Springer – Verlag,1993
3. *Computer Numerical Machine tools* - G.E. Thyer, NEWNES , second Edition,1991

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PROFESSIONAL COURSE ELECTIVE-II
(18ME3013) Quality Engineering and Manufacturing

Course Educational Objectives:

- *Students will recognize manufacturing organizations, including job shops, flow lines, assembly lines and work cells.*
- *Students will have a basic understanding of time and motion study, work sampling, and process flow charting.*
- *Students will be able to solve basic scheduling problems for assembly lines, job shops*
- *Students will be able to produce short technical reports individually and in teams.*

Course Outcomes:

- *Select and use rational sampling, conduct reliability tests and analyze data.*
- *Analyze the measurement system.*
- *Compute process capabilities.*
- *Understand quality engineering methods and tools.*

UNIT-I

Quality Value And Engineering: An overall quality system, quality engineering in production design, quality engineering in design production processes.

Loss Function And Quality Level: Derivation and use of quadratile loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances (N-type-, S-type and L-type)

UNIT-II

Tolerance Design And Tolerancing: Functional limits, tolerance design for N-type, L-type and S-type characteristics, tolerance allocation for multiple components.

UNIT-III

Parameter And Tolerance Design: Introduction to parameter design, signal to noise ratios, parameter design strategy, Introduction to tolerance design, tolerance design using the loss function, identification of tolerance design factors.

UNIT-IV

Design Of Experiments: Introduction, Task aids and Responsibilities for DOE process steps, DOE process steps description.

Analysis Of Variance (Anova): no-WAY ANOVA, One-way ANOVA, two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

Orthogonal Arrays: Typical test strategies, better test strategies, efficient test strategies, conducting and analyzing an experiment.

UNIT-V

Interpolation Of Experimental Results: Interpretation methods, percent contribution, estimating the mean ISO-9000 Quality system, BDRE,6-sigma, bench marking, quality circles-brain storming-fishbone diagram-problem analysis.

Text Books:

1. *Taguchi Techniques for Quality Engineering*, Philip J.Ross , McGraw Hill Intl. 2nd Edition, 2005.

References:

1. *Quality Engineering in Production systems*, G.Taguchi, A.Elasayed et al, Mc.Graw Hill Intl. Edition, 1989.
2. *Taguchi Methods Explained: Practical Steps To Robust Design*, Papan P.Bagchi , Prentice Hall Ind. Pvt. Ltd. New Delhi, 2001

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PROFESSIONAL COURSE ELECTIVE-II
(18ME3014) Computer Aided Process Planning

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Course Educational Objectives:

- *The objective of the course is to introduce students to the fundamentals of computer aided process planning and its role in the manufacturability evaluation of product designs through effective selection of processes and support parameters.*

Course Outcomes:

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

- *Generate the structure of automated process planning system and uses the principle of generative and retrieval CAPP systems for automation*
- *Select the manufacturing sequence and explains the reduction of total set up cost for a particular sequence*
- *Explain the generation of tool path and solve optimization models of machining processes*
- *Create awareness about the implementation techniques for CAPP*

UNIT–I

Introduction To CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.

UNIT–II

Generative CAPP System: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

Retrieval CAPP System: Significance, group technology, structure, relative advantages, implementation, and applications.

UNIT–III

Selection Of Manufacturing Sequence: Significance, alternative manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.

Determination Of Machining Parameters: Reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.

UNIT–IV

Determination Of Manufacturing Tolerances: design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach**,** integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach.

Generation Of Tool Path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods.

UNIT–V

Implementation techniques for CAPP: MIPLAN system, Computer programming languages for CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

Text Books:

1. *Automation Production systems and Computer Integrated Manufacturing System* – 'Mikell P.Groover, Tata McGraw Hill, 2001.
2. *Computer Aided Design and Manufacturing*, Dr.Sadhu Singh, Khanna Publishers, 2009.

References:

1. *Computer Aided Engineering*, David Bedworth, Tata McGraw Hill , 2001.
2. *Computer Aided Design & Manufacturing*, Rarid M.L Amirouche, Prentice Hall, 1992.
3. *Computer Aided Design & Manufacturing; Methods & Tools*, U.Rembold and R Dillmann- Springer, 2000.

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I M.Tech - I Sem (CAD&M)

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0	4	2

(18ME3002) Computer Aided Design Lab

List of Experiments:

I Introduction to CAD software
II. 2D drafting using Auto CAD (Two exercises)
III. 3D modeling using Auto CAD (Any four exercises)
Introduction to 3D modeling using AutoCAD software
1. Modeling of Component in 3D – Drawing of steps
2. Modeling of Component in 3D – Machine Elements
3. Modeling of Component in 3D – Machine Link 1
4. Modeling of Component in 3D – Machine Link 2
5. Modeling of Component in 3D – Bracket
6. Modeling of Component in 3D – Dovetail stop
7. Geometric Modeling Using Pro-E or CATIA or solid works or iron CAD (Any four exercises)
i) CAMERA Body
ii) Automobile Spring
iii) Assembly of Screw Jack
iv) Assembly of Flange Coupling

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(18ME3003) Computer Aided Modeling Lab

List of Experiments:

1. Introduction to SOLIDWORKS software
2. Modeling of Component in 3D -Riveted joint for Plates
3. Modeling of Component in 3D -Bolt & Nut
4. Modeling of Component in 3D -Piston
5. Modeling of Component in 3D -Screw Jack
6. Modeling of Component in 3D -Connecting rod
6. Modeling of Component in 3D -Flange Coupling
7. Modeling of Component in 3D -Propeller Shaft

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I M.Tech - I Sem (CAD&M)

(18HS0823) Research Methodology and IPR

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Course Educational Objectives:

- *Understand some basic concepts of research and its methodologies.*
- *Identify appropriate research topics.*
- *Enrich knowledge to their research field.*
- *Process for filing Patent.*

Course Outcomes:

- *Understood the Meaning of research problem, Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.*
- *Got the knowledge of How to get new ideas.*
- *Acquired the knowledge of various government and NGO or agencies for Research Funding.*

UNIT-I:

Introduction: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT–II

Literature Studies: Effective literature studies approaches, analysis, Plagiarism, Research ethics.

UNIT–III

Report Writing: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright.

Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications**,** New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. *Resisting Intellectual Property*, Taylor & Francis Ltd ,2007.
2. *Industrial Design*, Mayall ,McGraw Hill, 2002
3. *Product Design*, Niebel , McGraw Hill, 2004

Reference Books:

1. *Research methodology*: *An introduction for science & engineering students*. Stuart Melville and Wayne Goddard, 2005
2. *Research Methodology*: *A Step by Step Guide for beginners*, Ranjit Kumar, 2 nd Edition, 2006

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(18HS0818) English for Research Paper Writing

L	T	C
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Course objectives:

Students will be able to:

- *Understand that how to improve your writing skills and level of readability.*
- *Learn about what to write in each section.*
- *Understand the skills needed when writing a Title.*
- *Ensure the good quality of paper at very first-time submission*.

Unit-I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Unit-II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts and Introduction.

Unit-III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit-IV

Key skills needed when writing a Title, key skills needed when writing abstract, key skills needed when writing an Introduction, skills when writing a Review of the Literature.

Unit-V

Skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills needed when writing the Conclusions.

Text Books:

1. Writing for Science, Goldbort R (2006) Yale University Press.
2. How to Write and Publish a Scientific Paper, Day R (2006) Cambridge University Press
3. Handbook of Writing for the Mathematical Sciences Highman N (1998), SIAM. Highman's Books.
4. English for Writing Research Papers, Adrian Wallwork , Springer New York Dordrecht. Heidelberg London, 2011.

(AUTONOMOUS)

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(18CE1029) Disaster Management

Course *Objective:-*

- *The objectives of this subject is to give the basic knowledge of Environmental Hazards and disasters.*
- *The syllabus includes the basics of Endogenous and Exogenous hazards and gives a suitable picture on the different types of hazard and disaster mitigation methods.*

Course Outcomes:

On completion of the course the students will have knowledge on

- *Types of disasters and their effects on environment*
- *Causes of disasters*
- *Disaster management through engineering applications*

UNIT-I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

UNIT –II

Types of Environmental hazards & Disasters: Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters – Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards – Exogenous Hazards

UNIT–III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides – Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions – Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes – Hazardous effects of - earthquakes - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

UNIT –IV

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters infrequent events: Cyclones – Lightning – Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters: - Floods- Droughts- Cold waves- Heat waves. Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation).Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Planetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion Soil Erosion:-- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical

hazards/ disasters: Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes: - Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters: - Population Explosion.

UNIT –V

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Text books:

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Disaster Mitigation: Experiences and Reflections by Pardeep Sahni
4. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

References:

1. The Environment as Hazards by Kates, B.I & White, G.F, Oxford Publishers, New York, 1978
2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000
3. Disaster Management by H.K. Gupta (Ed), Universiters Press, India, 2003
4. Space Technology for Disaster Mitigation in India (INCED) by R.B. Singh, University of Tokyo, 1994.

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(18HS0825) Sanskrit for Technical Knowledge

Course Objectives:

- *To get a working knowledge in illustrious Sanskrit, the scientific language in the world.*
- *Learning of Sanskrit to improve brain functioning.*
- *Learning of Sanskrit to develop the logic in mathematics, science & other subjects Enhancing the memory power.*
- *The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.*

Course Output

Students will be able to

- *Understanding basic Sanskrit language*
- *Ancient Sanskrit literature about science & technology can be understood*
- *Being a logical language will help to develop logic in students*

Unit-I

Alphabets in Sanskrit, Past/Present/Future Tenses, Simple Sentences

Unit-II

Order, Introduction of roots, Technical information about Sanskrit Literature

Unit-III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Text Books:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

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(18HS0826) Value Education

Course Objectives

Students will be able to

- *Understand value of education and self- development*
- *Imbibe good values in students*
- *Let the should know about the importance of character*

Course outcomes

- Students will be able to:
- Knowledge of self-development.
- Learn the importance of Human values.

Unit-I

Values and self-development – Social values and individual attitudes. Work ethics and Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements.

Unit-II

Importance of cultivation of values; Sense of duty. Devotion, Self-reliance; Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature and Discipline.

Unit-III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Unit-IV

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

Text Books:

1. *Values and Ethics for organizations Theory and practice*, Chakroborty, S.K. Oxford University Press, New Delhi, 2010.
2. *Value Education*, N. Venkataiah, APH Publishing Corporation, 1998.

Reference Books:

1. *Value Education and Quality Teaching*: The double Helix effect, 2010
2. *Values Education and lifelong learning*: Principles, Policies, and Programs, N Aspin, D Chapman, Springer Publication.

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I M.Tech - II Sem (CAD&M)

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(18ME3004) Finite Element Methods

Course Educational Objectives:

- *To understand the basic matrix operation to form a global matrix equation and enforce the concept of steps in obtaining solutions for a 1-D and 2-D structures.*

Course Outcomes:

Students undergoing this course are able to

- *Use finite element software to stimulate physical behaviors of Mechanical structures.*
- *Apply FEA principles for components and assembly design.*

UNIT – I

Formulation Techniques: Methodology, Engineering problems and governing differential equations, finite elements., Variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, Galerkin and weighted residual methods, calculus of variations

UNIT – II

One-Dimensional Finite Element Methods: Bar elements, temperature effects. Element matrices, assembling of global stiffness matrix, Application of boundary conditions, Elimination and penalty approaches, solution for displacements, reaction, stresses, temperature effects, Quadratic Element, Heat transfer problems: One-dimensional, conduction and convection problems on fins.

UNIT – III

Trusses: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, temperature effects.

Beams And Frames: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses.

UNIT – IV

Two Dimensional Problems: CST, LST, four nodded and eight nodded rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Heat Transfer problems: Conduction and convection, examples: - two-dimensional fin.

Isoparametric Formulation: Concepts, sub parametric, super parametric elements, numerical integration.

UNIT – V

Finite Elements In Structural Dynamics: Dynamic equations, Eigen value problems, and their solution methods, simple problems.

Convergence: Requirements for convergence, h-refinement and p-refinement, complete and incomplete interpolation functions, Pascal's triangle.

Text Books:

1. *Introduction to Finite element in Engineers,* Tiruapathi R Chandruputla and Ashok D. Belegundu, Pearson Publishers.2012.

References:

1. *Finite element method in Heat transfer and fluid dynamics,* J.N. Reddy, CRCpress,1994
2. *Finite Element Method,*Zienckiwicz O.C. & R. L. Taylor, McGraw-Hill,1983.
3. *Finite Element of Nonlinear continua,* J. N. Oden, McGraw-Hill, New York, 1971
4. *Finite element procedures,*K. J. Bathe, Prentice-Hall, 1996

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I M.Tech - II Sem (CAD&M)

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(18ME3005) Rapid Prototyping

Course Educational Objectives:

- *To provide the students with an understanding of the basic fundamentals of rapid prototyping.*
- *To learn its fabrication techniques, materials and various areas of defects and improvements in Rapid Prototyping.*

Course Outcome

- *The student will be able to apply solid modeling concepts and techniques in RP*
- *Analyze and implement the different algorithms associated with STL file errors.*
- *Able to calculate the layer thickness in different layering techniques and carry out design manipulations for the generation of support structure.*
- *Able to identify, characterize and select the ideal materials for a given Rapid Prototyping system.*

UNIT-I

Introduction: Need for the compression in product development, History of RP system, Survey of applications, Growth of RP industry and classification of RP system.

Stereo Lithography System: Principle, Process parameter, Process details, Data preparation, Data files and machine details, Applications.

UNIT-II

Fusion Decomposition Modeling: Principle, process parameter, Path generation, Applications.

Solid ground curing: Principle of operation, Machine details, Applications,

Laminated Object Manufacturing: Principle of Operation, LOM materials, Process details, Applications.

UNIT –III

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer, Genisys Xs printer HP system 5, Object Quadra system.

UNIT–IV

Laser Engineering Net Shaping (Lens)

Rapid Tooling: Indirect Rapid tooling- Silicon rubber tooling- Aluminum filled epoxy tooling Spray metal tooling, Cast kriksite, 3Q keltool, etc, Direct Rapid Tooling Direct. AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft, Tooling vs. hard tooling.

Software For RP: STL files, Overview of Solid view, magics, imics, magic communication, etc. Internet based software, Collaboration tools.

UNIT-V

Rapid Manufacturing Process Optimization: Factors influencing accuracy, Data preparation error, Part building error, Error in finishing, Influence of build orientation.

Allied Process: Vacuum casting, surface digitizing, Surface generation from point cloud, Surface modification- Data transfer to solid models.

Text Books:

1. *Rapid manufacturing*- N.Hopkinson , RJM Hauge, Wiley publishers, 2006
2. *Stereo lithography and other RP & M Technologies*, Paul F.Jacobs SME, NY, 1996
3. *Rapid prototyping & Engineering applications*- Frank w. Liou CRC Press Taylor & Francis Group, 2007

References:

1. *Rapid Manufacturing* - Flham D.T & Dinjoy S.S , Verlog London , 2004
2. *Rapid automated*- Lament wood, Indus Press New York.

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I M.Tech - II Sem (CAD&M)

PROFESSIONAL COURSE ELECTIVE-III
(18ME3015*)* Advances in Manufacturing Technology

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Course Educational Objectives:

This course contributes to the following Program Learning Outcomes:

- *In-depth understanding of specialist bodies of knowledge within the engineering discipline.*
- *Application of systematic engineering synthesis and design processes.*
- *Fluent application of engineering techniques, tools and resources.*

Course Outcome:

- *Define and describe the fundamentals and principals of advanced manufacturing Technology*
- *Apply relevant theories to solve manufacturing problems*
- *Explain manufacturing processes via experimental and theoretical analyses*
- *Relate manufacturing theory to practice through laboratory experiments*
- *Improve a manufacturing process either working in a team or individually*

UNIT-I

Welding Processes: Fusion and Solid state welding process, Automation in Welding, Design aspects of welds, Weldability of aluminum alloys, titanium alloys and High strength low alloy steels, Non destructive testing of welds, Residual stresses and distortion in weldments.

Surface Processing Operations: Plating and Related Processes, Physical Vapor Deposition, Chemical Vapor Deposition, Organic Coatings, Porcelain Enameling and other Ceramic coatings, Thermal and Mechanical Coating Processes.

UNIT–II

Abrasive Jet Machining: Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent developments.

Ultrasonic Machining: Elements of the process, machining parameters, effect of parameters on surface finish and metal removal rate, mechanics of metal removal process parameters, economic considerations, applications and limitations.

UNIT–III

Electro-Chemical Processes: Fundamentals of electro chemical machining, metal removal rate in ECM, Tool design, Surface finish and accuracy economics aspects of ECM.

Wire EDM Process: General Principle and applications of Wire EDM, Mechanics of metal removal, Process parameters, selection of tool electrode and dielectric fluids, methods of surface finishing and machining accuracy.

UNIT-IV

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, principle, advantages, and limitations, comparison of thermal and non-thermal processes.

Plasma Arc Machining: Principle, machining parameters, effect of machining parameters on surface finish and metal removal rate, applications, limitations Laser Beam Machining: Principle, effect of machining parameters on surface finish, applications, and limitations.

UNIT–V

Rapid Prototyping: Working principle methods-Steriolithography, Laser sintering, Fused deposition method, applications and limitations

Nano Technology: Nano milling processes, wet milling, dry milling, nano materials, fabrication of nano tubes, advantages of nano tubes, mechanical properties.

Text Books:

1. *Manufacturing Technology*, P. N. Rao, TMH Publishers, 2009.
2. *Fundamentals of Modern Manufacturing*, Mikell P. Groover, John Wiley & Sons Publishers, 2002.

References:

1.*Production Technology* , HMT, Tata McGraw Hill, 2001.
2.*Manufacturing Science*, G.S.Sawhney, IK International Publishers House Pvt. Ltd, 2015
3.*Welding Processes and Technology*, Dr.R.S. Parmer, Khanna Publishers, 2003
4. *Introduction to Nanotechnology* - Poole and Owens, Wiley, 2003.

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I M.Tech - II Sem (CAD&M)

PROFESSIONAL COURSE ELECTIVE-III
(18ME3016) Advanced Optimization Techniques

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Course Educational Objectives:

To enable the student to

- *Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.*
- *Learn classical optimization techniques and numerical methods of optimization.*
- *Know the basics of different evolutionary algorithms.*
- *Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.*

Course Outcome:

Upon completion of the subject, students will be able to:

- *Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.*
- *Use classical optimization techniques and numerical methods of optimization.*
- *Describe the basics of different evolutionary algorithms.*
- *Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas.*

UNIT–I

Linear Programming: Two-phase simplex method, Big-M method, duality, interpretation, applications.

Assignment Problem: Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT–II

Classical Optimization Techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.

Numerical Methods For Optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT-III

Genetic Algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT–IV

Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems.

UNIT-V

Applications Of Optimization In Design And Manufacturing Systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

Text books:

1. *Optimal design*, Jasbir sing Arora, Mc Graw Hill, Publishers, Fourth Edition, 2012
2. *Optimization for Engineering Design*, Kalyanmoy Deb, PHI Publishers , 2nd Edition, 2012
3. *Engineering Optimization* – S.S.Rao, New Age Publishers, Forth Edition , 2009

References:

1. *Foundation of generic Optimization*,R. Lowen and A.Verschoren, Spinger publishers, 2008
2. *Genetic Programming*, John R . Koza. Forrest H BENNett, MK Publishers,1999.
3. *Multi objective Optimization*, Kalyanmoy Deb, PHI Publishers.

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I M.Tech - II Sem (CAD&M)

PROFESSIONAL COURSE ELECTIVE-IV
(18ME3017) Computer Graphics

L	T	C
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Course Educational Objectives:

There are three main objectives of the course:

- *To provide students with a foundation in graphics applications programming .*
- *To introduce students with fundamental concepts and theory of computer graphics .*
- *To give basics of application programming interface (API) implementation based on graphics pipeline approach.*

Course Outcome:

- *Learn the principles and commonly used paradigms and techniques of computer graphics.*
- *Develop a facility with the relevant mathematics of computer graphics.*
- *Be able to write basic graphics application programs including animation .*
- *Be able to design programs to display graphic images to given specifications.*

UNIT–I

Introduction To Computer Graphics: Color CRT raster scan monitors, plasma display & liquid crystal display monitors, computer input devices, hard copy devices.

Raster Scan Graphics: Line drawing algorithms – DDA & Bresenham algorithms, circle generation, general function Rasterization, displaying lines, characters and polygons.

UNIT–II

Filling Algorithms: polygon filling, edge fill algorithm, seed fill algorithm, fundamentals of Antialiasing and half toning.

Line Clipping: Simple visibility algorithm, Cohen-Sutherland subdivision line clipping algorithm, mid point sub division algorithm.

UNIT–III

Polygon Clipping: polygon clipping, reentrant polygon clipping – Sutherland – Hodgeman algorithm, character clipping, 3D- clipping.

Transformations: Cartesian and homogeneous coordinate systems two dimensional and three dimensional transformations – scaling, rotation, Shearing, Zooming, viewing transformation, reflection, rotation about an axis, concatenation.

UNIT–IV

Rendering: Hidden line removal algorithms, surface removal algorithms, painters, Warnock, Z-buffer algorithm.

UNIT–V

Shading Algorithms: Constant intensity algorithm, Phong's shading algorithm, gourand shading algorithm, Comparison of shading algorithms.

Text Books:

1. *Procedural elements for computer graphics*, D.F.Rogers, Tata McGraw-Hil, 1985.
2. *Computer Graphics*, Donald Hearn & M.P. Bakers, Person Education Publishers, 2nd Edition, 2008.
3. *Computer GraphicsA Programming Approach*-SHarrington, McGraw HillPublishing Co.7th Edition, 1987.

References:

1. *Computer Graphics*-Donald Hearn & M.P. Bakers Tata McGraw-Hill.
2. Computer Graphics *Programming, GKS –The Graphics Standard*, EnderleG., Kansy K. Andpfaff G., 2ndEdition, Springer

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I M.Tech - II Sem (CAD&M)

PROFESSIONAL COURSE ELECTIVE-IV
(18ME3018) Robotics

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Course Educational Objectives:

- *Course covers fundamentals of robot working, programming and integration in a manufacturing process. It starts with examples of robotics idea over history and continue with a numerous of examples in nowadays robot applications on different areas of human activities.*
- *Topics to be covered include robot mechanical, power, measuring and control system, robot kinematics, dynamic, control and programming. Special chapter of mobile robots will cover mobile robot kinematics, path planning and control. Overview of nowadays research in robotics and view of the robotics impact in human future*

Course outcomes:

- *Upon completion of the course, students will be able to understand:*
- *Importance of robotics in today and future goods production*
- *Robot configuration and subsystems*
- *Principles of robot programming and handle with typical robot*
- *Working of mobile robots*

UNIT–I

Introduction And Robot Kinematics: Definition need and scope of Industrial robots – Robot anatomy – Work volume – Precision movement – End effectors – Sensors. Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics – Methods for orientation and location of objects.

UNIT–II

Matrix Transformations: Introduction, robots as a mechanisms, matrix representation-representation of a point in a space, representation of a vector in space, representation of a frame at the origin of a reference frame, representation of a frame in a reference frame, representation of a rigid body. Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis, representation of combined transformations, transformations relative to the rotating, inverse of transformation matrices.

UNIT–III

Differential Motions And Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame, calculation of Jacobian, relation between Jacobian and the differential operator, Inverse Jacobian.

UNIT–IV

Dynamic Analysis And Forces: Introduction, Lagrangian mechanics, Effective moments of inertia, dynamic equations for multi-degree of freedom robots-kinetic energy, potential energy, the Lagrangian, robot's equations of motion, static force analysis of robots.

Trajectory Planning: Introduction, path Vs trajectory, basics of trajectory planning, joint space trajectory planning-third order polynomial trajectory planning, fifth order polynomial trajectory planning, Cartesian-space trajectories.

UNIT–V

Robot Sensors: Introduction, sensor characteristics, Position sensors-potentiometers, encoders, LVDT, Resolvers, time of travel displacement sensor, Velocity sensors-Encoders, Tachometers, differentiation of position signal, Accelerating sensors, force and pressure sensors-piezoelectric, force sensing resistor, strain gauges, Torque sensors, light and infrared sensors, touch and tactile sensors, proximity sensors-magnetic proximity sensors, optical proximity sensors, Ultrasonic proximity sensors, inductive proximity sensors, capacitive proximity sensors, eddy current proximity sensors, sniff sensors.

Text Books:

1. *Introduction to Robotics – Analysis, System, Applications*, Saeed B. Niku, PHI Publications.2011.
2. *Robotics Control, Sensing, Vision and Intelligence*, K.S.Fu, R.C. Gonzalez and C.S.G. Lee, Mc Graw Hill, 1987
3. *Industrial Robotics* – Mikell P. Groover & Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey – Mc Graw Hill, 1986

References:

1. *Robot Modeling and Kinematics* – Rachid Manseur, Firewall Media Publishers (An imprint of Laxmi Publications Pvt. Ltd., New Delhi)
2. *Robot Analysis and Control* - H. Asada and J.J.E. Slotine John Willey & Sons.
3. *Fundamentals of Robotics*: Analysis and control, Robert J. Schilling, Prentice Hall, 1990.

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I M.Tech - II Sem (CAD&M)

(18ME3006) Virtual Lab in Manufacturing Engineering

L	P	C
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FAB Lab

1. Computer Controlled Cutting of wooden object
2. 3D Machining
3. PCB design & fabrication
4. Interface & Application Programming
5. Digital Fabrication of Flexible Circuit board
6. 3D scanning
7. Molding and Casting of Polyurethane parts.
8. Digital Fabrication and Project Development .

Micro Machining Lab

1. To study pulsed-heating of materials
2. To study erosion mechanism from Lazarenko's model
3. To study various thermal models for EDM
4. To study influence of process parameters on the Wire EDM
5. Laser hardening using NdYAG laser system
6. Laser spot welding using NdYAG laser system
7. Study of Electrochemical machining process
8. Study the effect of process parameters in electrochemical grinding

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I M.Tech - II Sem (CAD&M)

	L	P	C
(18ME3007) Computer Aided Analysis Lab	**0**	**4**	**2**

List Of Experiments

Introduction to ANSYS

Structural Analysis

1) Truss Member

2) Simply Supported Beam

3) Plate with hole

4) Taper Cross Section

Thermal Analysis

1) Conductive Heat Transfer Analysis in Rectangular 2D Component.

2) Conductive Heat Transfer Analysis in Different Geometry 2D Components

Mat Lab

1) Construct Perceptron, train and test the performance

2) Construct Back Propagation Network, train and test the performance

3) Construct Radial Basis Function Network, train and test the performance

4) Build fuzzy logic membership functions through MATLAB tool box.

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I M.Tech - II Sem (CAD&M)

(18HS0829) Constitution of India

L	T	C
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Course Objectives:

Students will be able to:

- *Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.*
- *To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.*
- *To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.*

Unit-I

History of Making of the Indian Constitution:

History, Drafting Committee, (Composition & Working)

Unit-II

Philosophy of the Indian Constitution: Preamble, Salient Features.

Unit-III

Contours of Constitutional Rights & Duties:

Fundamental Rights- Right to Equality- Right to Freedom- Right against Exploitation- Right to Freedom of Religion- Cultural and Educational Rights- Right to Constitutional Remedies Directive Principles of State Policy- Fundamental Duties.

Unit-IV

Organs of Governance: Parliament- Composition- Qualifications and Disqualifications- Powers and Functions- Executive- President- Governor- Council of Ministers- Judiciary, Appointment and Transfer of Judges, Qualifications- Powers and Functions

Unit-V

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments),

Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Election Commission:

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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I M.Tech - II Sem (CAD&M)

(18HS0827) Pedagogy Studies

L	T	C
2	0	0

Course Objectives:

Students will be able to:

- *Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.*
- *Identify critical evidence gaps to guide the development.*

Course Outcomes

Students will be able to understand:

- *What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?*
- *What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?*
- *How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?*

Unit-I

Introduction and Methodology:

Aims and rationale, Policy background, Conceptual framework and Terminology. Theories of learning, Curriculum, Teacher education.Conceptual framework, Research questions**.** Overview of methodology and Searching.

Unit-II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit-III

Evidence on the effectiveness of pedagogical practices. Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit-IV

Professional development: alignment with classroom practices and follow-up support. Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes

Unit-V

Research gaps and future directions

Research design – Contexts- Pedagogy- Teacher education- Curriculum and assessment- Dissemination and research impact.

Text Books:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, ‘learning to read’ campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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I M.Tech - II Sem (CAD&M)

(18HS0828) Stress Management by Yoga

L	T	C
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Course Objectives:

- *To achieve overall health of body and mind*
- *To overcome stress*

Course Outcomes:

Students will be able to:

- *Develop healthy mind in a healthy body thus improving social health also*
- *Improve efficiency.*

Unit-I

Definitions of Eight parts of yoga (Ashtanga)

Unit-II

Yam and Niyam. Do`s and Don'ts in life:

i) Ahinsa, satya, astheya, bramhacharya and aparigraha.

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

Unit-III

Asan and Pranayam:

i) Various yog poses and their benefits for mind & body.

ii) Regularization of breathing techniques and its effects-Type of pranayam.

Text Books:

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur Model Curriculum of Engineering & Technology PG Courses [Volume-I] [47].

2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department) Kolkata.

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I M.Tech - II Sem (CAD&M)

(18HS0819) Personality Development through Life Enlightenment Skills **L T C**
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Course Objectives:

- *To learn to achieve the highest goal happily.*
- *To become a person with stable mind, pleasing personality and determination.*
- *To awaken wisdom in students.*

Course Outcomes

Students will be able to:

- *Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.*
- *The person who has studied Geeta will lead the nation and mankind to peace and prosperity.*
- *Study of Neetishatakam will help in developing versatile personality of students.*

Unit-I

Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom)
Verses- 29,31,32 (pride & heroism)
Verses- 26,28,63,65 (virtue)
Verses- 52,53,59 (dont's)
Verses- 71,73,75,78 (do's)

Unit-II

Approach to day to day work and duties.
Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
Chapter 18-Verses 45, 46, 48.

Unit-III

Statements of basic knowledge.
Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
Chapter 12 -Verses 13, 14, 15, 16,17, 18
Personality of Role model. Shrimad BhagwadGeeta:
Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
Chapter 4-Verses 18, 38,39
Chapter18 – Verses 37,38,63

Text Books.

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, 4. Rashtriya Sanskrit Sansthanam, New Delhi.

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II M.Tech - I Sem (CAD&M)

PROFESSIONAL COURSE ELECTIVE-V
(18ME3019) Mechatronics

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Course Educational Objectives:

- *To understand the working of modern mechanical system, deals with sensors, actuators and controllers in specific ,Sensors and Transducers ,Actuation Systems System Models and Controllers Programming Logic Controllers and ,Design of Mechatronics Systems .*

Course outcomes:

- *Classify various sensors, transducer and actuators according to the applications.*
- *Explain various system models and controllers.*
- *Select a controller for a mechanical and Mechatronics system.*

UNIT–I

Introduction: Definition of Mechatronics products, design considerations and tradeoffs. Overview of Mechatronic products. Intelligent machine Vs Automatic machine economic and social justification.

UNIT–II

Actuators And Drive Systems: Mechanical, Electrical, hydraulic drive systems, Characteristics of mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations. **Motion Control:** Control parameters and system objectives, Mechanical Configurations, Popular control system configurations. S-curve, motor/load inertia matching, design with linear slides.

UNIT–III

Motion Control Algorithms: Significance of feed forward control loops, shortfalls, fundamentals concepts of adaptive and fuzzy – control. Fuzzy logic compensatory control of transformation and deformation non- linearity's.

Architecture Of Intelligent Machines: Introduction to Microprocessor and programmable logic controls and identification of systems. System design classification, motion control aspects in design.

UNIT–IV

Manufacturing Data Bases: Data base management system, CAD/CAM data bases, graphic data base, introduction to object oriented concepts, objects oriented model language interface, procedures and methods in creation, edition and manipulation of data.

UNIT–V

Sensor Interfacing: Analog and digital sensors for motion measurement, digital transducers, human-Machine and machine- Machine inter facing devices and strategy.

Machine Vision: Feature and pattern recognition methods, concepts of perception and cognition in decision-making.

Text Books:

1.*Mechatronics and the design of intelligent machines & system*-D,Bradley , D.Seward, D.Dawson, S.Burge , Stanley Thornes Publishers LTD,2000

2.*Designing intelligent machines,* open university, London.Michel B.Histand and david G. Alciatore.

3.*Introduction to Mechatronics and Measurement systems*,.DavidG.Alciatore R MichesB.Histand, Tata McGraw Hill,2008

References:

1. *Control sensors and actuators*, CW. desilva, CRC press Taylor Group ,2007.

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II - M.Tech I Sem (CAD&M)

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PROFESSIONAL COURSE ELECTIVE-V
(18ME3020) Mechanics of Composites

Course Educational Objectives:

- *To understand the mechanical behavior of composite materials*
- *To get an overview of the methods of manufacturing composite materials.*

Course Outcomes:

- *Upon completion of this course, the students will have an overview of the mechanical behavior and application of composite materials*

UNIT–I

Basic Concepts And Characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites,
Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetting plastics, Metal matrix and ceramic composites.

UNIT–II

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.

UNIT–III

Coordinate Transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

UNIT–IV

Elastic Behavior Of Unidirectional Composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.
Strength Of Unidirectional Lamina: Micro mechanics of failure, Failure mechanisms, Strength of an orthotropic lamina, Strength of a lamina under tension and shear maximum stress and strain criteria, application to design.

UNIT–V

Analysis Of Laminated Composite Plates : Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

Manufacturing Methods: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

Text Books:

1. *R. M. Jones, Mechanics of Composite Materials*, McGraw Hill Company, New York, 1975.
2. *Engineering Mechanics of Composite Materials* by Isaac and M.Daniel, Oxford University Press, 1994.

References:

1.Analysis and performance of fibre Composites, B. D. Agarwal and L. J. Broutman, Wiley-Interscience, New York, 1980.
2. *Analysis of Laminated Composite Structures*, L. R. Calcote ,VanNostrandRainfold, New York, 1969.

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II M.Tech-I Semester (CAD&M)

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OPEN ELECTIVE
(18HS0824) Business Analytics

Course Objective:

- *The course is to understand the management and administration,*
- *functions of management, formal and informal organization, staffing,*
- *creativity and innovation, process of communication.*

Course Outcomes:

- *Design, device, and query relational databases for operative data.*
- *Design, implement, populate and query data warehouses for informational data.*
- *To integrate very large data sets to make business decisions.*
- *Evaluate the use of data from acquisition through cleansing, warehousing, analytics, and visualization to the ultimate business decision.*

Unit I

Introduction to Descriptive analytics, Descriptive Statistics, Probability Distributions, Inferential Statistics through hypothesis tests, Permutation & Randomization Test

Unit II

Regression, ANOVA (Analysis of Variance), Machine Learning Introduction and ConceptsDifferentiating, algorithmic and model based frameworks, Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression, K Nearest Neighbors', Regression &Classification

Unit III

Supervised Learning with Regression and Classification techniques- Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear DiscriminantAnalysis, Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines, Ensemble Methods: Random Forest, Neural Networks, Deep learning

Unit IV

Unsupervised Learning and Challenges for Big Data Analytics- Clustering, Associative Rule Mining, Challenges for big data analytics

Unit V

Prescriptive analytics Creating data for analytics through designed experiments, creating data for analytics through Active learning, creating data for analytics through Reinforcement learning, Graph Visualization, Data Summaries, Model Checking & Comparison

References:

1. Hastie, Trevor, et al. The elements of statistical learning.Vol.2.No. 1. New York: springer, 2009.

2. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010

3. Bekkerman et al. Scaling up Machine Learning

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II M.Tech - I Semester (CAD&M)

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OPEN ELECTIVE
(18ME3121) Industrial Safety

Course Learning Objectives:

- *To learn about mechanical and electrical hazards.*
- *To learn about P mechanical and electrical hazards.*
- *To learn about Wear and Corrosion and their prevention.*
- *To learn about Periodic and preventive maintenance.*

Course Outcomes:

Students undergoing this course are able to

- *Understand the points of factories act 1948 for health and safety.*
- *Understand the cost & its relation with replacement economy.*
- *Understand the concepts of sequence of fault finding activities*
- *Understand the Program and schedule of preventive maintenance of mechanical and electrical equipment.*

UNIT-I:

Industrial Safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.

UNIT-II:

Fundamentals Of Maintenance Engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III:

Wear And Corrosion And Their Prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV:

Fault Tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V:

Periodic And Preventive Maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books:

1. *Maintenance Engineering Handbook*, Higgins & Morrow, Da Information Services.
2. *Maintenance Engineering*, H. P. Garg, S. Chand and Company.

Reference Books:

1. *Pump-hydraulic Compressors*, Audels, Mcgrew Hill Publication.
2. *Foundation Engineering Handbook*, Winterkorn, Hans, Chapman & Hall London.

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II M.Tech - I Sem (CAD&M)

OPEN ELECTIVE **L T C**
(18ME3021) Advances in Operations Research **3 0 3**

Course Educational Objectives:

- *To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems*

Course Outcomes:

Students undergoing this course are able to

- *Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems*

UNIT-I

Introduction to OR and Linear Programming-OR definition– Classification of Models –Types of Operations Research models; Linear Programming- Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Duality, Dual Simplex Method Degeneracy.

UNIT-II

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution-North-West Corner Rule, Least Cost Method, Vogel's Approximation Method Modified Distribution (MODI) Method, Unbalanced Transportation Problem, Degenerate Problem. Assignment Problem – Formulation, Optimal Solution -Traveling Salesman problem.

UNIT-III

Game Theory - Introduction – Minimax (Maximin) Criterion and Optimal Strategy, Saddle Point, Solution of Games with Pure Strategy –Games with Mixed Strategies – 2 X 2 Games – Dominance Principle– Solution by Graphical Method of m X 2 & 2 X n games.

Queuing Theory- Introduction –Terminology, Service Channel, Arrival Pattern, Population, Departure Pattern(Service Pattern), Queue Discipline, Birth & Death Process, Balking, Reneging, Jockeying; Single Channel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non-finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with finite queue length and nonfinite queue length.

UNIT-IV

Sequencing -Assumptions-n-jobs x 2 Machines model, n-jobs x 3 machines models. PERT & CPM: Introduction to Project Management, Activities, Events, Predecessor Relationships, AOA Diagram, Early Start, Early Finish, Late Start & Late Finish Times, Earliest Occurrence and Latest Occurrence of the Event, Total Float, Free Float, Independent Float CPM- Deterministic Model-Critical Path, Crashing, Optimal Project Duration, Least Possible Project Duration ,PERT-Probabilistic Model- Various types of Activity Time Estimates, Standard Deviation and Variance of the Activities and Projects, and Probability of Completing the Project within scheduled time.

UNIT-V

Dynamic Programming - Introduction – Bellman's Principle of Optimality – Applications of Dynamic Programming- Capital Budgeting Problem – Shortest Path Problem. Introduction to maintenance– Types of Maintenance, Types of Replacement Problem, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.

Text Books:

1. *Operations Research* by R Panneerselvam, PHI, 2nd edition, 2012.
2. *Operations Research* by Manohar Mahajan DhanpatRai & Co, 2013

References:

1. *Operations Research* by Er. Premkumar Guptha & Dr.D.S. Hira

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II M.Tech - I Sem (CAD&M)

OPEN ELECTIVE **L T C**
(18CE1028) Cost Management of Engineering Projects **3 0 3**

Course Objectives:

- *To Implement CPM and PERT concepts in construction*
- *To provide techniques to develop personal skills of practical use in the Management and implementation of Civil Engineering projects*
- *To know the Management techniques, the development of personal, interpersonal and Project Management skills*
- *To provide a fundamental of understanding of the social, economic, resource management within which the Construction Project takes place.*

Course Outcomes:

After completion of this course, the student shall be able to

- *Implement generic and special Construction Project Management skills to a higher level*
- *Understand the special management skills required in multidisciplinary and global Construction Industry*
- *Integrate and apply theoretical concepts, ideas, tools and techniques to Construction practice.*
- *Can plan, execute, monitor and control construction projects using Construction Project Management Tools such as CPM & PERT*

UNIT-I

FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY: Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations.

PREPARATORY WORK AND IMPLEMENTATION: Site layout – Infrastructure Development – Construction Methods – Construction Materials – Deployment of Construction Equipment – Prefabrication in Construction – False work and Temporary Works

UNIT- II

EARTH WORK: Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging. Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting

UNIT-III

PROJECT MANAGEMENT AND BAR CHARTS AND MILESTONE CHARTS:

Introduction – Project planning – Scheduling – Controlling – Role of decision in project

management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems – Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts – Development of PERT network problems.

UNIT- IV

ELEMENTS OF NETWORK AND DEVELOPMENT OF NETWORK: Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems – Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure –Hierarchies – Illustrative examples – Problems.

UNIT-V

PERT: Uncertainties: Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time Problems - Earliest expected time – Formulation for T_E - Latest allowable occurrence time – Formulation for T_L - Combined tabular computations for T_E and T_L problems.

CPM: Slack – Critical path – Illustrative examples – Probability of meeting scheduled date Problems – CPM: process – CPM: Networks – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for T_E and T_L - Start and finish times of activity – Float – Critical activities and critical path – Illustrative examples Problems.

Text Books:

1. Construction Technology by Subir K. Sarkar and Subhajit Saraswati, Oxford Higher Education- Publishing, Univ.Press, Delhi.
2. Project Planning and Control with PERT and CPM by Dr.B.C. Punmia, K.K. Khandelwal, Lakshmi Publications New Delhi.

Reference Books:

1. Optimal design of water distribution networks by P.R. Bhave, Narosa Publishing house 2003.
2. Total Project management, the Indian context by: P.K.JOY, Mac Millan Publishers India Limited.
3. Construction project management by Jha, Pearson publications, New Delhi.

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II M.Tech - I Sem (CAD&M)

OPEN ELECTIVE

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(18ME3022) Composite Materials

Course Educational Objectives:

- *To understand the mechanical behavior of composite materials*
- *To get an overview of the methods of manufacturing composite materials.*

Course Outcomes:

- *Upon completion of this course, the students will have an overview of the mechanical behavior and application of composite materials.*

UNIT-I:

Introduction To Composites

Fundamentals of composites – need– enhancement of properties – classifications —Introduction to Reinforcement composites–types. Applications. Fiber production techniques for glass, carbon and ceramic fibers –Resin materials-Types.

UNIT-II:

Polymer Matrix Composites

Fabrication of PMC's :- Fabrication of Fibers, Plastic Fiber Forms, Prepregs, Molding Compounds-Processes, Lay-Ups, Filament Winding, Pultrusion, and Recycling. ; Matrix – Reinforcement Interface, Wettability.

UNIT-III:

MMC&CMC

Fabrication of MMC'S: Liquid Infiltration- Casting, Solid State Processes-Diffusion Bonding &In Situ Technique.

Fabrication of CMC's: Hot-Pressing, Infiltration, In Situ Chemical reaction Techniques.CVD& CVI, Sol-gel.

UNIT-IV:

Mechanics of Composites:

Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai-Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates

UNIT-V :

Applications Of Composites

Applications of advanced composite materials. Environmental effects in Composites, Green composites, Synthesis and Properties of Nano composites. Surface Composites & Surface metal matrix composites: Need, Synthesis, Properties and applications.

Text Books:

1. Mathews F. L. and Rawlings R. D., "Composite Materials: Engineering and Science", 1st Edition, Chapman and Hall, London, England, 1994.
2. Chawla K. K., "Composite materials", Second Edition, Springer – Verlag, 1998.

References:

1. Clyne, T. W. and Withers, P. J., "Introduction to Metal Matrix Composites", Cambridge University Press, 1993.
2. Strong, A.B., "Fundamentals of Composite Manufacturing", SME, 1989.
3. Sharma, S.C., "Composite materials", Narosa Publications, 2000.

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II M.Tech - I Sem (CAD&M)

OPEN ELECTIVE **L T C**
(18EE2128) Waste to Energy **3 0 3**

Course Educational Objectives:

- *To understand the importance of gaining energy from the waste*
- *To Understand and analyze the pattern of renewable energy resources Suggest methodologies / technologies for its utilization Economics of the utilization and environmental aspects.*
- *To undusted the need and production of for bio gas.*

Course Outcomes:

- *Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.*

UNIT-I

INTRODUCTION TO ENERGY FROM WASTE:

Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

UNIT-II

BIOMASS PYROLYSIS:

Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods -Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III

BIOMASS GASIFICATION:

Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV

BIOMASS COMBUTION:

Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V

PROPERTIES OF BIOGAS (CALORIFIC VALUE AND COMPOSITION)

Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion

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II M.Tech-I Sem (TE)

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(18ME3009)Dissertation Phase-I

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II M.Tech-II Sem (TE)

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0	32	16

(18ME3010)Dissertation Phase-II

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