SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
(AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING
MASTER OF TECHNOLOGY
THERMAL ENGINEERING (ME)
COURSE STRUCTURE (I & II YEAR)

I YEAR I SEMESTER

S NO.	COURSE CODE	SUBJECT	L	T	P	C
1.	20HS0823	Research Methodology and IPR	2	-	-	2
2.	20ME3101	Thermodynamics and Combustion	3	-	-	3
3.	20ME3102	Advanced Fluid Dynamics	3	-	-	3
PROGRAMME ELECTIVE-I						
4.	20ME3112	Nuclear Engineering	3	-	-	3
	20ME3113	Energy Conservation and Management				
	20ME3114	Energy Management in Thermal Systems				
PROGRAMME ELECTIVE-II						
5.	20ME3115	Air Conditioning System Design	3	-	-	3
	20ME3116	Jet Propulsion and Rocketry				
	20ME3117	Fuels and Combustion				
6.	20ME3103	Thermal Engineering Lab	-	-	4	2
7.	20ME3104	Computer Aided Analysis Lab	-	-	4	2
AUDIT COURSE-I						
8.	20HS0818	English for Research Paper writing	3	-	-	-
Contact Periods / Week			**17**	**-**	**8**	**18**
			Total/Week 25			

I YEAR II SEMESTER

S NO.	COURSE CODE	SUBJECT	L	T	P	C
1.	20ME3105	Advanced Heat Transfer	3	-	-	3
2.	20ME3106	Steam Engineering	3	-	-	3
PROGRAMME ELECTIVE-III						
3.	20ME3118	Refrigeration and Cryogenics	3	-	-	3
	20ME3119	Design of Heat Exchangers				
	20ME3120	Cryogenic Engineering				
PROGRAMME ELECTIVE-IV						
4.	20ME3121	Computational Fluid Dynamics	3	-	-	3
	20ME3122	Modeling of IC Engines				
	20ME3123	Instrumentation for Thermal Engineering				
5.	20ME3107	Computational Fluid Dynamics Lab	-	-	4	2
6.	20ME3108	Thermal Engineering Lab (Virtual Lab)	-	-	4	2
7	20ME3109	Mini-Project	-	-	4	2
AUDIT COURSE-II						
8	20HS0829	Constitution of India	3	-	-	-
Contact Periods / Week			**15**	**-**	**12**	**18**
			Total/Week 27			

II YEAR I SEMESTER

S. No	COURSE CODE	SUBJECT	L	T	P	C
PROGRAMME ELECTIVE-V						
1.	20ME3124	Design of Solar and Wind System	3	-	-	3
	20ME3125	Finite Element Methods in Thermal Engineering				
	20ME3126	Thermal Measurements and Process Control				
OPEN ELECTIVE						
2.	20HS0824	Business Analytics	3	-	-	3
	20CE1028	Cost Management of Engineering Projects				
	20EE2128	Waste to Energy				
	20ME3026	Industrial Safety				
	20ME3027	Advances in Operations Research				
	20ME3028	Composite Materials				
3.	20ME3110	Dissertation Phase – I	-	-	20	10
		Contact periods/week	**6**	**-**	**20**	**16**
			Total/Week 26			

II YEAR II SEMESTER

S.No	COURSE CODE	SUBJECT	L	T	P	C
1.	20ME3111	Dissertation Phase – II	-	-	32	16
		Contact periods/week	**-**	**-**	**32**	**16**
			Total/Week 32			

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem	**L**	**T**	**P**	**C**
	2	**-**	**-**	**2**

(20HS0823) RESEARCH METHODOLOGY AND IPR

COURSE OBJECTIVES

The objective of the course is to

1. *Understand some basic concepts of research and its methodologies.*
2. *Identify and discuss appropriate research topics, select appropriate research design, and implement a research project.*
3. *Understand the method or research writing and presenting research report and Proposal*
4. *Provide an understanding on the importance of Intellectual property rights*
5. *Understand the intricacies of grant of patent, patentability, licensing and revocation at national and international level.*

COURSE OUTCOMES

At the end of this course, students will be able to

1. *Explain the key concepts and issues in research and basic framework of research process.*
2. *Formulate appropriate research problem and implement suitable research design for the research problem.*
3. *Identify various sources of information for literature review and data collection.*
4. *Develop an understanding of ethics in conducting applied research and make use of components of scholarly writing in report preparation.*
5. *Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.*
6. *Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.*

UNIT – I

Research Methodology: Meaning, Objective and importance of research - Types of research - steps involved in research -Motivation in Research, Types of Research -Significance of Research - Research Methods versus Methodology - Importance of Knowing How Research is done - Research Process - Criteria of Good Research defining research problem - Errors in selecting a research problem

UNIT – II

Research Design and Data Collection: Research design - Different Research Designs - Effective literature studies -Classification of Data - Methods of Data Collection – Sampling - Sampling techniques, procedure and methods - Ethical considerations in research - Responsibility of ethics in research

UNIT – III

Research 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

TEXTBOOKS

1. Stuart Melville and Wayne Goddard, *Research Methodology: An Introduction for science & Engineering students*, Juta & Co Ltd (December 1, 1996)
2. Wayne Goddard and Stuart Melville, *Research Methodology: An Introduction*, Juta & Co Ltd (April 28, 2004)

REFERENCES

1. Ranjit Kumar, *Research Methodology: A Step by Step Guide for beginners*, 4th Edition, SAGE Publications, 2014
2. Halbert, *Resisting Intellectual Property*, Taylor & Francis Ltd, 2007
3. Asimov, *Introduction to Design*, Prentice Hall, 1962.
4. T.Ramappa, *Intellectual Property rights Under WTO*, S.Chand Publications,2008
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, *Intellectual Property in New Technological Age*, Volume1 Perspectives, Trade Secrets and Patents, Claus8 Publishing, 2017.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem

L	T	P	C
3	-	-	3

(20ME3101) THERMODYNAMICS AND COMBUSTION

COURSE OBJECTIVES

Students undergoing this course are able to

1. *Understand the first and second law of thermodynamics*
2. *Recognize the Principles of combustion*
3. *Know about combustion and thermo chemistry.*
4. *Be aware of the Combustion Equipment used in the combustion*
5. *Understand the direct energy conversion*
6. *Identify the importance of burning capability of fuel in the combustion*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Understand the concepts of transient flow analysis and real gas mixture*
2. *Describe the concepts of Chemical composition*
3. *Have a broad knowledge on chemical equilibrium*
4. *Have a broad knowledge on the concepts of Nerst heat theorem*
5. *Identify the applications of the fuel cells and magneto hydro dynamic generators.*
6. *Describe the concepts of PVC*

UNIT - I

Introduction: First law and State postulates, Second law and Entropy, Availability and Irreversibility, Transient flow analysis, Enthalpy of formation–Heating value of fuel - Adiabatic flame Temperature – Equilibrium composition of gaseous mixtures.

UNIT-II

Principles of Combustion: Chemical composition–Flue gas analysis–dew point of products –Combustion stoichiometry. Combustion of fuel, droplets and sprays – Combustion systems – Pulverized fuel furnaces – fixed, Entrained and Fluidized Bed Systems.

UNIT – III

Combustion and Thermo-Chemistry, Second law analysis of reacting mixture, Chemical equilibrium, –Flame stability–Burning velocity of fuels – Measurement of burning velocity – factors affecting the burning velocity.

UNIT - IV

Combustion Equipment: Burners - Oil Burners, Vaporizing Burners, Atomizing Burners - Design of Burners. Gas Burners - Atmospheric Gas Burners, Air Aspiration Gas Burners- Burners Classification according to Flame Structures - Factors Affecting Burners & Combustion.

UNIT - V

Direct Energy Conversion: Introduction – Fuel Cells – Thermo-electric energy – Thermo-ionic power generation -Thermodynamic devices Magneto Hydrodynamic Generators – Photo voltaic cell

TEXT BOOKS

1. Yunus A Cengel& Michael A Boles, *Thermodynamics,* An Engineering Approach, Tata McGraw Hill Co., New Delhi, 2010
2. Howell and Dedcius, *Fundamentals of Engineering Thermodynamics,* Tata McGrawHill Inc., 2009

REFERENCES

1. Van Wylen& Sonntag, *Thermodynamics*, John Wiley and Sons Inc., 2nd Edition, 2008
2. Holman, *Thermo dynamics*, McGraw Hill, 12th Edition, 2008
3. HR De Groff, *Irreversible Thermo Dynamics*, McGraw Hill, 7th Edition, 2005

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech– I Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3102)ADVANCED FLUID DYNAMICS

COURSE OBJECTIVES

Objective of this course is to

1. *Impart brief knowledge on Governing equations in Fluid dynamics.*
2. *Familiarize student with Potential and Internal flows.*
3. *Make the student learn about laminar boundary layers.*
4. *Enable the student to know about turbulent flow.*
5. *Create awareness about fluid flow experiments.*
6. *Provide understanding of Design of Experiments for fluid flow and data analysis*

COURSE OUTCOMES

Students undergoing this course can will able to

1. *Derive the Governing equations in Fluid dynamics using integral and differential approaches.*
2. *Describe Potential flows and the characteristics of Internal flows*
3. *Explain about laminar boundary layers and find solution methodology for boundary layer equations.*
4. *Summarize turbulent flow and derive governing equations of turbulent flow.*
5. *Conduct fluid flow experiments and identify the sources of errors in that*
6. *Analyse the data received in experiments*

UNIT – I

Governing Equations in Fluid Dynamics: Derivation of Continuity and Momentum equations using integral and differential approach, Dimensionless formof governing equations, Integral quantities, Exact Solutions of Navier-Stokes Equations: Fully developed flows, Parallel flow in straight channel, Counter flow, creeping flows.

UNIT – II

Potential Flow: Kelvin's theorem, Irrotational flow, Stream function-Verticity approach Application of empirical relations to various geometries for Laminar and Turbulent flows.
Internal Flows: Use of empirical correlations- Reynolds – Colburn Analogy - Application of empirical relations to various geometries for Laminar and Turbulent flows.

UNIT – III

Laminar Boundary Layers: Boundary layer equations, Flow over flat plate, Momentum integral equation for boundary layer, Approximate solution methodology for boundary layer equations

UNIT – IV

Turbulent Flow: Characteristics of turbulent flow, Laminar Turbulent Transition, Time mean motion and fluctuations, Derivation of governing equations for turbulent flow, Shear stress models, and Universal velocity distribution.

UNIT – V

Experimental Techniques: Role of experiments in fluid, layout of fluid flow experiments, sources of error in experiments, Data analysis, Design of experiments, Review of probes and transducers, Introduction to Hot wire Anemometry, Laser Doppler Velocimetry and Particle Image Velocimetry.

TEXTBOOKS

1. K.Muralidhar &G.Biswas, *Advanced Engineering Fluid Mechanics,* Alpha Science International Ltd., 2nd revised Edition, 2005.
2. Irving H. Shames, *Mechanics of Fluids*, McGraw Hill, 4th Edition, 2003.

REFERENCES

1. Philip J. Pritchard, *Fox and McDonald Introduction to Fluid Mechanics*, John Wiley and Sons Inc, 8th Edition, 2011.
2. Frank M. White, *Fluid Mechanics,* McGraw Hill, 8th Edition. 2012
3. D. Rama Durgaiah, *Fluid Mechanics and Machinery*, New Age Publications, 1st edition, 2009
4. Hermann Schlichting, *Boundary layer theory*, Mcgraw Hill Education, 7th edition, 2010.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem

L	T	P	C
3	-	-	3

(20ME3112) NUCLEAR ENGINEERING

COURSE OBJECTIVES

The student will be able to

1. *Understand the basics of nuclear fission and power from fission.*
2. *Know the phenomenon of f Neutron transport and diffusion*
3. *Comprehend the concept of Multi group, Multi region diffusion equation, concept of criticality.*
4. *Recognize the importance of Reactor kinetics, control and radiation protection*
5. *Know about heat extraction from Reactor and its safety*
6. *Identify the importance of radiation protection standards*

COURSE OUTCOMES

Upon completion of the course the student will be able to

1. *State the Power production from fission process and list out the fertile materials used for the process*
2. *Derive diffusion equation for neutron transportation and explain the importance of slow neutrons in power production*
3. *Deduce solution for multi group diffusion equations in one region and multi region reactors*
4. *Distinguish the type of reactors and identify the best suitable site for the construction of reactor*
5. *Explicate the Neutron life cycle in thermal reactor and derive an equation for point kinematics in hours*
6. *Evaluate the temperature distribution in boiling regime using heat transfer equation explain the importance of Radioactive Waste Disposal.*

UNIT – I

Basics of Nuclear Fission and Power from Fission: Introduction to Nuclear Energy- Nuclear Fission and Fusion, Difference between fission and fusion process- Radioactivity - Nuclear reactions - Cross sections - Power from fission reaction, Conversion and breeding - Fertile material

UNIT- II

Neutron Transport and Diffusion: Neutron transport equation -Diffusion theory approximation - Fick's law –Diffusion Equations- Solutions to diffusion equation for point source - Planar source, Energy loss in elastic collisions - Neutron slowing down.

UNIT – III

Multi Group, Multi Region Diffusion Equation, Concept of Criticality: Solution of multi group diffusion equations in one region and multi region reactors - Concept of criticality of thermal reactors.

Reactors- Essential Components, Power generation, Classification- Pressurized Water Reactor - Boiling Water Reactor, Sodium Graphite Reactor, Fast breeder Reactor,

Homogeneous Reactor, Gas Cooled Reactor- Nuclear Power plant site selection, Nuclear Power Plants in INDIA.

UNIT- IV

Reactor kinetics and Control: Neutron Life cycle in Thermal Reactors, Reactor Kinematics**,** Derivation of point kinetics equations in hour equation- Solutions for simple cases of reactivity additions- Fission product poison, Reactivity coefficients- Radiation Hazards and Shielding -Radioactive Waste Disposal.

UNIT – V

Heat Removal from Reactor Core: Solution of heat transfer equation in reactor core, Temperature distribution, Boiling Regimes and critical heat flux.

Reactor Safety, Radiation Protection: Reactor safety philosophy - Defense in depth - Units of radioactivity exposure - Radiation protection standards.

TEXT BOOKS

1. John R. Lamarsh, Anthony J. Barrata, *Introduction to Nuclear Engineering*, Prentice Hall, 4th Edition, 2001.
2. J. Kenneth Shultis, Richard E. Faw., *Fundamentals of Nuclear Science and Engineering*, CRC Press, 2016.

REFERENCES

1. Brent J. Lewis, E. NihanOnder, Andrew A. Prudil, *Fundamentals of Nuclear Engineering*, John Wiley & Sons, 2017.
2. Dr.G.Vaidyanathan, *Nuclear Reactor Engineering (Principles and Concepts*), Repro Knowledge cast Limited, 3rd Edition, 2017.
3. TatjanaJevremovic, *Nuclear Principles in Engineering*, Springer, Second Edition, 2009.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem

L	T	P	C
3	-	-	3

(20ME3113) ENERGY CONSERVATION AND MANAGEMENT

COURSE OBJECTIVES

The objective of this course is to make the students learn the

1. *Principles of Energy Management and its role in organizations*
2. *Design for Conservation of Energy materials.*
3. *Concept of Energy Audit in the power plants and Characterization of an Investment Project*
4. *Methods of project Evaluation for identifying the period of payback*
5. *Various alternate resources available and the importance of Cogeneration in the power sector*
6. *Importance of energy usage in various Industries and its relevant laws*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Understand the Importance of Initiation, Organizing and Managing, Energy Management Programs*
2. *Critical assessment of energy usage and Importance of energy management*
3. *Analyze the Concepts of Energy auditing of the Investment projects*
4. *Understand the Relevant international standards and laws for establishing a power plant*
5. *Explain the Need of Energy Consultant in Planning and future strategies in power sector*
6. *Identify the Significance of various alternate energy resources and its energy storage and Control systems*

UNIT – I

Introduction: Principles of Energy Management –Managerial objectives–Energy management in functional areas like Manufacturing Industry, Process Industry and Commerce– Government.

Energy Manager: Role of Energy Manager in each of this organization –Initiating, Organizing and Managing, Energy Management Programs

UNIT – II

Energy Conservation: Technologies for Energy Conservation –Design for Conservation of Energy materials – Energy flow networks – Critical assessment of energy usage – Formulation of objectives and constraints.

Energy Conservation of Alternative Options: Synthesis of alternative options and technical analysis of options – Process integration.

UNIT – III

Energy Audit: Definition and Concepts, Types of Energy audits–Basic energy concepts– Resources for Plant energy studies – Data gathering – Analytical techniques.

The Energy Market: Scope, Characterization of an Investment Project – Types of Depreciation – Time Value of money – Budget considerations, Risk Analysis.

UNIT-IV

Methods of Evaluation of Projects: Payback – Annualized costs – Investor's rate of return – Present worth – Internal Rate of Return – Pros and Cons of the common methods of analysis – Replacement analysis.

Energy Consultant: Need of Energy Consultant – Consultant selection criteria-Energy Regulatories- Institutions.

UNIT – V

Energy Conservation in Industries: Cogeneration, Combined heating and power systems and relevant international standards and laws.

Alternative Energy Sources: Solar Energy – Types of devices for solar Energy collection – Thermal storage system – Control systems- Wind energy – Availability – Wind devices – Wind Characteristics – Performance of turbines and systems.

TEXT BOOKS

1. S. S. Thipse, *Energy Conservation and Management, Illustrated*, Alpha Science International Limited, 4th Edition, 2014.
2. K.V.Sharma, P.Venkataseshaiah, *Energy Management and Conservation,* I K International Publishing House, Kindle 3rd Edition,3 September 2011.

REFERENCES

1. Amlan Chakrabarti, *Energy Engineering and Management*, Kindle Edition, 30 January 2011**.**
2. S. K. Shukla, Jeewan V. Tirkey., *Energy Conversion and Management*, publisher Narosa, 3rd Edition, 2010.
3. Craig B. Smith, Kelly E. Parmenter, *Energy Management Principles: Applications, Benefits, Savings*,Elsevier, 2015.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3114) ENERGY MANAGEMENT IN THERMAL SYSTEMS

COURSE OBJECTIVES

The objective of this course is to make the students to learn the

1. *Present energy scenario and the need for energy conservation*
2. *Instruments suitable for energy auditing*
3. *Operation of thermal utilities along with energy conservation*
4. *Various means of energy transmission and their protection*
5. *Finance options for various thermal utilities and its return calculation Techniques*
6. *Energy Conservation acts.*

COURSE OUTCOMES

On completion of the course the Students will be able to

1. *Explain an overview of energy, its importance and conservation*
2. *Perform audit the power plants by considering various important parameters*
3. *Understands the usage of energy in various thermal utilities*
4. *Identify the method of energy transmission and its protection*
5. *Know about financial analysis techniques for attaining payback periods*
6. *Recognize the importance of numerous Energy Efficiency factors for achieving breakeven point in energy sectors*

UNIT – I

Introduction: Energy Scenario – World and India, Energy Resources, Availability in India, Energy consumption pattern, Energy intensive industries – An overview, Energy conservation potential in various industries and commercial establishments.

Energy Conservation and Energy Efficiency: Needs and advantages, Energy auditing – types, methodologies, barriers, role of energy manager – Energy audit questionnaire – Energy Conservation Act 2003.

UNIT – II

Instruments for Energy Auditing: Instrument characteristics – Sensitivity, readability, accuracy, precision, hysteresis, error and calibration.

Measurement of Energy Factors: Flow, Velocity, Pressure, Temperature, Speed, Power and humidity. Analysis of stack, Water quality, Power and fuel quality

UNIT – III

Thermal Utilities: Operation and Energy Conservation of Boilers, Thermic fluid heaters, Furnaces, Waste Heat Recovery Systems and Thermal Storage.

UNIT – IV

Thermal Energy Transmission / Protection Systems: Steam traps – Refractories – Insulation -Optimum insulation thickness – Piping design.

UNIT – V

Financial Management: Investment – Need, Appraisal and criteria.

Financial Analysis Techniques – Break even analysis – Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, DSCR, Financing options, ESCO concept.

TEXTBOOKS

1. S. S. Thipse, *Energy Conservation and Management,* Alpha Science International Limited,2015 Edition, 2015
2. Amlan Chakrabarti, *Energy Engineering and Management*, PHI, Second Edition, 2018

REFERENCES

1. Craig B. Smith, Kelly E. Parmenter, *Energy Management Principles*, Elsevier publisher, Second Edition, 2015.
2. S. K. Shukla, Jeewan V. Tirkey, *Energy Conversion and Management*, Narosa publishing house, 2010 Edition, 2010.
3. K V Sharma P Venkataseshaiah, *Energy Management and Conservation,* I K International Publishing House, First Edition, 2011.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech - I Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3115) AIR-CONDITIONING SYSTEM DESIGN

COURSE OBJECTIVES

The main objective of the course is to make the students to understand the

1. *Psychometric properties and thermodynamics of human body*
2. *Cooling load Estimation for various seasons*
3. *Air–conditioning terms and methods of improving efficiency*
4. *Various Air–conditioning Components for effective cooling air distribution*
5. *Importance of Air conditioning duct design for efficient cooling air distribution*
6. *Parameters influencing various air conditioning systems*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Understand the Parameters influencing the Effective Temperature for comfort Air conditioning*
2. *Classify the Air – conditioning systems like summer, winter and year round A/C Systems*
3. *Explain the Terms used in Air-Conditioning and the importance of bypass factor in the design of A/C system*
4. *Describe the working of Humidification and dehumidification equipment used for attaining required Conditions*
5. *Illustrate the function of grills, diffusers, fans and blowers for proper air distribution*
6. *Design the Air conditioning duct design for effective air distribution with less noise*

UNIT – I

Air–Conditioning: Psychometric properties and processes - Construction of Psychometric chart.

Requirements of Comfort Air conditioning: Thermodynamics of human body- Effective temperature and Comfort chart – Parameters influencing the Effective Temperature.

UNIT – II

Cooling Load Estimation: Occupants – Equipments - Heat gain due to infiltration - Fan load - Fresh air load (Ventilation).

Air-Conditioning Systems: Summer -Winter and Year round Air-conditioning systems.

UNIT – III

Terms in Air–Conditioning Systems: All Fresh air, Re-circulated air with and without bypass, with reheat systems.

Calculation: Bypass Factor, ADP,RSHF, ESHF and GSHF for different systems.

UNIT-IV

Components: Humidification and Dehumidification equipment - Grills and diffusers – Fans and blowers.

UNIT-V

Design Conditions and Load Calculations: Air distribution, Pressure drop - Duct design - Performance & Selection - Noise control.

TEXTBOOKS

1. C.P.Arora, *Refrigeration and Air-conditioning,* Tata McGraw-Hill, SecondEdition,2000.
2. *AHRI, Refrigeration and air-conditioning,* Prentice Hall, New Delhi, Fifth Edition, 1993.

REFERENCES

1. Norman C. Harris, *Modern Air Conditioning*, McGraw-Hill, First Edition, 1974.
2. Jones W.P., *Air Conditioning Engineering*, Edward Arnold Publishers Ltd., London, Second Edition, 1984.
2. Hainer R.W., VanNostrand, *Control Systems for Heating Ventilation and Air-Conditioning*, Reinhold Co., Fourth Edition,2009.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3116) JET PROPULSION AND ROCKETRY

COURSE OBJECTIVES

The objective of this course is to make students learn about

1. *Application, performance and characteristics of Jet Propulsion.*
2. *Concept of air flow phenomenon in Nozzles*
3. *Thermo chemistry of combustion products in combustors*
4. *Environmental considerations and applications of Solid propellant.*
5. *Design of combustion chamber for Liquid propellant.*
6. *Thermodynamic flow analysis in various propulsion systems*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Analyze the Gas turbine cycle and the influence of various design parameters on the Performance of the turbine*
2. *Explain the fundamentals of jet propulsion and importance of nozzles in improving the Performance*
3. *Describe the concept of thermo chemistry of combustion products*
4. *Identify the Importance of solid propulsion systems with various solid propellants*
5. *Formulate the heat transfer analysis in the liquid propellant rocket engines*
6. *Understand the concepts of thermodynamic flow analysis of Jet Propulsion*

UNIT - I

Turbo Jet Propulsion System: Gas turbine cycle analysis–layout of turbo jet engine-Turbo machinery- compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis.

Flight Performance: Forces acting on vehicle–Basic relations of motion– multi stage vehicles

UNIT – II

Principles of Jet Propulsion and Rocketry: Fundamentals of Jet propulsion, Rocket and air breathing jet engines – Classification – Turbo jet, Turbo fan, Turbo propulsion, Rocket (Solid and Liquid propellant rockets) and Ramjet engines.

Nozzle: One dimensional convergent –divergent nozzles – Choking, mass flow through a nozzle – Nozzle exhaust velocity – Thrust, Thrust coefficient - Supersonic nozzle shape – Characteristic parameters

UNIT – III

Aero Thermo Chemistry of The Combustion Products: Properties of mixture ofgases – Gibbs – Dalton laws – Equivalent ratio, Enthalpy changes in reactions, Heat of reaction and Heat of formation – Calculation of adiabatic flame temperature and specific impulse – frozen and equilibrium flows.

UNIT-IV

Solid Propulsion System: Solid propellants–Classification, Propellant manufacturing methods - Oxidizers and binders - Effect of binder on propellant properties - Solid propellant rocket engine – Internal ballistics, Equilibrium motor operation. Transient and Pseudo equilibrium operation- Rocket motor hard ware design - Heat transfer in solid rocket motor design.

UNIT-V

Liquid Rocket Propulsion System: Liquid propellants–Classification, Ignition delay of hypergolic propellants, Physical and chemical characteristics of liquid propellant - Liquid propellant rocket engine– System layout, Pump and pressure feed systems, feed system components - Design parameters of combustion chamber, Heat transfer and cooling aspects, Injectors – Types, Injection patterns, Injector characteristics, atomization and drop size distribution - Propellant tank design.

TEXT BOOKS

1. Philip Hill & Carl Peterson, *Mechanics and Dynamics of Propulsion,* Pearson, 2nd Edition,2009.
2. George P.Sutton, *Rocket propulsion elements,* Oscar Biblarz, 8th Edition,2012.
3. Nicholas Cumpsty, *Jet propulsion,* Cambridge University Press,3rd Edition, 2003.

REFERENCES

1. B.Ganesan, *Gas Turbines,* TMH, Second Edition, *2010.*
2. Khajuria& Dubey, *Gas Turbines and Propulsive Systems,* Dhanpat Rai Publishing Co Pvt Ltd, Fourth Edition, 2013.
3. George P. Sutton& Oscar Biblarz, *Rocket propulsion,* John Wiley & Sons, 8th Edition, 2010.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3117) FUELS AND COMBUSTION

COURSE OBJECTIVES

The main objective of the course is to make the students

1. *Know about the Characterization of fuel*
2. *Recognize the importance of different types of solid & liquid fuels*
3. *Interpret the usage of the various types of Gaseous fuels in power plants*
4. *Understand the combustion process*
5. *Identify the combustion equipment used in Coal Burning*
6. *Categorize the fuels which provides less pollution*

COURSE OUTCOMES

On successful Completion of this course, the student will be able to

1. *State the characteristics of fuels and explain the importance of the fuel constituents by observing the fuel analysis.*
2. *Describe different types of solid & liquid fuels used in combustion by analyzing the properties of fuels*
3. *Implement the knowledge of different gaseous fuels in combustion process for deriving an equation for the chemical kinematics of the combustion*
4. *Interpret the combustion principles in explaining the flame propagation and flame stability.*
5. *Distinguish the types of combustion equipment used in coal burning and also explicate the importance of air pollution control.*
6. *Discuss about burning velocities of fuels and compute the velocities at various factors affecting the burning*

UNIT – I

Characterization: Fuels - Classification and Characteristics - Properties of Fuels - Fuel Analysis - Proximate and Ultimate Analysis –Moisture content- Calorific Value – Calorimetry, DuLong's Formula - Flue gas Analysis - Orsat Apparatus - Spontaneous Ignition Temperatures.

UNIT – II

Solid Fuels : Type of Coals - Properties - Calorific Value - ROM, DMMF, DAF and Bone Dry Basis - Ranking - Bulk & Apparent Density - Storage - Washability - Coking & Caking Coals – Renewable Solid Fuels - Biomass - Wood Waste - Agro Fuels - Manufactured Solid Fuels- Carbonization, Coal storage and Ash Handling systems

Liquid Fuels: Sources - Petroleum Fractions - Classification - Refining - Properties- Calorific Value, Specific Gravity, Flash & Fire Point, Octane Number, Cetane Number- Alcohols - Tar Sand Oil - Liquefaction of Solid Fuels.

UNIT – III

Gaseous Fuels: Classification - Composition & Properties - Estimation of Calorific Value - Gas Calorimeter -Wobbe Index - Natural Gas –Types - Dry & Wet, Stripped- Foul & Sweet natural gas - LPG - CNG – Methane- Producer Gas - Gasifiers - Coal Gasification - Gasification Efficiency - Biogas - Digesters - Viability - Economics.

Chemical kinetics -Rate of reaction - Reaction order - Molecularity Theories of reaction-Kinetics - General oxidation behavior of HC's

UNIT – IV

Principles of Combustion-- Chemical Composition of fuels -- dew point of Products -- Combustion stoichiometry- Excess air Calculations – Combustion – Mechanism- Types of combustion- Surface or Flameless, Submerged, Pulsating & Slow, Explosive, Spontaneous combustion, Ignition & Ignition Energy, Thermo Chemistry – Combustion Products- Low Temperature, High Temperature and Equilibrium, Enthalpy of formation.

Flame Propagation – Flame Temperature – Flame Stability, Burning Velocities of fuels-Measurement and factors affecting the burning velocities

UNIT – V

Combustion Equipment's: Coal Burning Equipment's – Types –Spreader Stokers – Vibrating Grate Stokers – Sprinkler Stokers, Traveling Grate Stokers - Burners Classification - Oil Burners, Vaporizing Burners, Atomizing Burners - Gas Burners – Atmospheric Gas Burners – Air Aspiration Gas Burners –Factors Affecting Burners & Combustion.

Environmental considerations: Air pollution - Principal pollutants-Effect on Environment, Legislative Measures &control.

TEXT BOOKS

1. Sharma and Chander Mohan, *Fuels and Combustion,* Tata Mcgraw Hill, 5th Edition, 2010
2. Blokh A.G., *Heat Transfer in Steam Boiler Furnace*, Hemisphere Publishing Corp, 4th Edition,1988

REFERENCES

1. Holman J.P., *Thermodynamics,* McGraw-Hill Inc., Fourth Edition, 1988
2. Samir Sarkar, *Fuels & Combustion, ,* Orient Longman, 3rd Edition, 2009
3. *Stephen R Tums, An Introduction to Combustion,* Mc. Graw Hill International Edition. 2010

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem

L	T	P	C
-	-	4	2

(20ME3103)THERMAL ENGINEERING LAB

COURSE OBJECTIVES

The objective of this course is to make the student to learn about the

1. *Performance of Heat Exchangers &Flame propagation analysis of Gaseous fuels.*
2. *Heat Balance sheet and emission measurement of an engine*
3. *Performance of VCR engine*
4. *Analysis on Heat Pipes and Air conditioning systems*
5. *Various temperature measurement instruments*
6. *Applications of Air compressors*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Demonstrate the Performance of Heat Exchangers & Flame propagation analysis of Gaseous fuel.*
2. *Explain the Heat Balance sheet and emissions of an Engine*
3. *Have a broad knowledge on VCR engine*
4. *Differentiate between the performance analysis of Heat Pipe and Air Conditioning unit*
5. *Identify the importance of air compressor in industries*
6. *Calibrate the Temperature measurement apparatus*

List of Experiments:

1. Performance of Heat Exchangers.
2. Emission measurement of an I.C. Engine.
3. Heat Balance sheet, Volumetric Efficiency and air fuel ratio estimation of an I.C. Engine.
4. Performance test on variable compression ratio of diesel engines.
5. COP estimation of vapour compression refrigeration test rig.
6. Performance analysis of Air conditioning unit.
7. Performance analysis of heat pipe.
8. Calibration of temperature measurement apparatus
9. Performance of Air compressor
10. Performance test on Petrol engine

Note: Any 8 Experiments are to be done

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – I Sem	**L**	**T**	**P**	**C**
	-	**-**	**4**	**2**

(20ME3104) COMPUTER AIDED ANALYSIS LAB

COURSE OBJECTIVES

The main objective of the course is to make the students to be aware of

1. *Structural Analysis of solid with and without hole*
2. *Thermal analysis of two dimension component.*
3. *Different kinds of analysis and apply the basic principles to find out the stress and other related parameters of bars, beams loaded with loading conditions.*
4. *Basic principles to carry out dynamic analysis to know the natural frequency of different kind of beams.*
5. *Various Modeling and Analysis software.*
6. *Flow analysis in various geometries under laminar and turbulent flows*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Understand the Analysis of a truss member under loading.*
2. *Explain the concepts of Tapered plate under transverse load.*
3. *Describe concepts of the flow of incompressible gas through an S-bend for laminar flow.*
4. *Design the air flow over a simple geometry (aero foil) in a wind.*
5. *Apply the basic principle of analysis to solve and demonstrate 1D and 2D heat transfer with conduction and convection boundary conditions.*
6. *Explain the applications of CFD*

I. Introduction to Analysis Software Package

II. Structural Analysis

1. Analysis of a rectangular plate with a hole.
2. Analysis of a truss member under loading.
3. Static Analysis of a Simply supported beam
4. Analysis of Tapered plate under transverse load

III. Thermal Analysis

1. Conductive Heat Transfer Analysis in Rectangular 2D Component
2. Conductive Heat Transfer Analysis in Different Geometry 2D Components

IV. Computational Fluid Dynamics

1. Determine the flow of incompressible gas through an S-bend for laminar flow.
2. Determine the flow of incompressible gas through an S-bend for turbulent flow.
3. Determine that of incompressible water flowing over a cylinder.
4. Determine air flow over a simple geometry (aero foil) in a wind tunnel (2-D).

SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech- I Sem.	**L**	**T**	**P**	**C**
	3	**-**	**-**	**-**

(20HS0818) ENGLISH FOR RESEARCH PAPER WRITING

COURSE OBJECTIVES

The main objective of the course is to make the students

1. *Understand that how to improve your writing skills and level of readability.*
2. *Learn about what to write in each section.*
3. *Understand the skills needed when writing a Title.*
4. *Ensure the good quality of paper at very first-time submission.*
5. *Have Knowledge on critical thinking in research writing*
6. *Identify the methodology of doing research logically and its representation*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Familiarize students with the key concepts of linguistics and develop awareness of the latest trends in language study*
2. *Understanding of the human communicative action through an objective study of language*
3. *Know and appreciate the location of literature within humanities*
4. *Knowledge of research methods in literary studies and advanced knowledge of literature in the English language and literary theory*
5. *Formulate an independent, limited research project under supervision, in accordance with applicable norms, ideals and conditions for literary research.*
6. *Improve common and basic scholarly requirements of logical and empirical rigor.*

.

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 Criticizing, Paraphrasing and Plagiarism- Sections of a Paper, Abstracts and Introduction.

UNIT-III

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

UNIT-IV

Key skills needed when writing 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. Adrian Wallwork, *English for Writing Research Papers*, Springer New York Dordrecht Heidelberg London, 2011.
2. Adrian Wallwork *English for Academic Correspondence and Socializing***,** Kindle Edition, 2011.

REFERENCES

1. Day R, *How to Write and Publish a Scientific Paper*, Cambridge University Press, 2006.
2. Highman N, *Handbook of Writing for the Mathematical Sciences*, SIAM, Highman's Books, 1998.
3. Goldbort R, *Writing for Science*, Yale University Press, 2006.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – II Sem.

L	T	P	C
3	-	-	3

(20ME3105) ADVANCED HEAT TRANSFER

COURSE OBJECTIVES

Students undergoing this course are able to understand the

1. *Modes of heat transfer in 1D and 2D fins*
2. *D*ifferent types *of flow process under free and forced convection*
3. *Boiling and condensation phenomena.*
4. *Heat Exchangers and its types.*
5. *Radiation heat transfer in various types surfaces*
6. *Importance of radiation shields in various industries*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Describe the various modes of heat transfer.*
2. *Differentiate between different flow process of forced and free convection*
3. *Have a broad knowledge on* Pool Boiling and Nusselt's theory
4. *Distinguish between LMTD and NTU Methods*
5. *Explain the Radiant heat exchange in grey, non-grey bodies*
6. *Understand the Steady State Heat Flow*

UNIT- I

Brief Introduction to different modes of heat transfer;
Conduction: General heat Conduction equation.
Steady State Heat Transfer: Simplified heat transfer in 1D and 2D–Fins.
Transient heat conduction: Lumped system analysis- Heisler's charts-semi-infinite Solid-use of shape factors in conduction – problem solutions.

UNIT - II

Forced Convection: Flow over a flat plate, Methods to determine heat transfer coefficient: Analogy between heat and momentum transfer -Similarity Parameters - Analytical Methods - Exact and Integral methods - Application of Empirical relations to various geometries for Laminar and Turbulent flows
Internal Flows: use of empirical correlations. Reynolds – Colburn Analogy – Application of empirical relations to various geometries for Laminar and Turbulent flows.
Free Convection: Integral analysis on laminar free convective heat transfer – Different Geometries – combined free and forced convection

UNIT - III

Boiling and Condensation: Pool Boiling–Boiling regimes-Correlations- Nusselt's theory of film condensation on a vertical plate – Assumptions and correlations of film condensation for different geometrics. Two Phase flow mass transfer, cooling, fluidized bed combustion, Heat pipes.

UNIT - IV

Heat Exchangers: Design procedure - LMTD and NTU methods–Cross flow and 1 shell 2,4,6,8 pass heat exchangers – Use of charts and empirical correlations.

UNIT - V

Radiation Heat Transfer: Radiant heat exchange in grey, Non-grey bodies, Spherical surfaces, Radiation, Shape factor, Analogy, Shields, Radiation of gases &vapours.

TEXT BOOKS

1.M. Necati Ozisik, *Heat Transfer*, TMH, 7th Edition, 2010
2.P.K.Nag, Heat *and Mass Transfer*, McGraw Hill Book Company, 3rd Edition, 2002

REFERENCES

1.J.P. Holman, Frank P. Incropera, David P. Dewitt, *Introduction to Heat Transfer*, 4th Edition, 2010
2. P.S. Ghoshdastidar, *Heat Transfer*, Oxford Press, 2nd Edition, 2008.
3. Holman.J.P, *Heat Transfer*, Tata McGraw Hill, 4th Edition,2002.
4. R.C. Sachdeva, *Fundamentals of Engineering Heat and Mass Transfer*, Wiley Eastern Ltd., India, 2006.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech-II Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3106) STEAM ENGINEERING

COURSE OBJECTIVES

The main objective of the course is to make the students

1. *Learn about fundamentals of steam generation, Boilers and its Accessories*
2. *Know the piping, insulation, refractory materials and its applications*
3. *Comprehend the assessment of steam distribution losses, Steam Leakages and its Equipment*
4. *Learn about the boiler performance and the factors affecting it*
5. *Know about Energy Conservation and Waste Minimization*
6. *Recognize various boiler standards*

COURSE OUTCOMES

Upon completion of the course the student will be able to

1. *Describe the combustion process in boilers and interpret the importance of adiabatic flame temperature in combustion.*
2. *Derive an equation for economic thickness of Insulation for maximum heat savings in the steam lining design*
3. *Distinguish the types of refractory materials and determine the best refractory for reducing waste minimization*
4. *Asses the steam distribution and leakages in steam piping and list out the steam based equipment used*
5. *Explain the performance evaluation methods of boilers and the factors affecting on it*
6. *Illustrate the phenomenon of the control and monitoring of devices used for boiler waste minimization*

UNIT – I

Introduction: Fundamentals of steam generation, Quality of steam, Use of steam table, Mollier Chart Boilers, Classification- Fire tube and Water tube boilers, Mountings and Accessories, Combustion in boilers, Adiabatic flame temperature, quantity of flue gases, Feed Water and its quality, Blow down; IBR, Boiler standards

UNIT – II

Piping & Insulation: Water Line, Steam line design and insulation; Insulation-types and application, Economic thickness of insulation, Heat savings and application criteria, Refractory-types, selection and application of refractory, Heat loss.

UNIT – III

Steam Systems: Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Steam Engineering Practices; Steam Based Equipment / Systems.

UNIT – IV

Boiler Performance Assessment: Performance Test codes and procedure, Boiler Efficiency, Flue gas Analysis, Analysis of losses in Boilers; Performance evaluation of accessories; factors affecting boiler performance- Problems.

UNIT – V

Energy Conservation and Waste Minimization: Energy conservation in Boilers; Waste minimization, Classification and its methodology; Economical viability of waste minimization

Instrumentation & Control: Process instrumentation, Control and Monitoring- Flow, pressure and temperature measurement and Types of Instruments for Process Control and Monitoring

TEXTBOOKS

1. P L Ballany, *Thermal Engineering in S I Unit*s, Khanna Publications, third Edition, 2002
2. R K Rajput, *Thermal Engineering*, Lakshimi Publications, Second Edition, 2010
3.

REFERENCES

1. Domkundwar; *A Course in Power Plant Engineering,* DhanapatRai and sons, 2010
2. P. Chatopadhyay, *Boiler Operation Engineering: Questions and Answers,* Tata McGraw Hill, Fourth Edition, 2007.
3. *Waste Minimization manual for Textile Processing, National productivity Council, Chennai*
4. *Energy Efficiency in Thermal Utilities;* Book II Bureau of Energy Efficiency, 2010.
5. *Energy Performance Assessment for Equipment & Utility Systems;* Book IV - Bureau of Energy Efficiency,2008.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech - II Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3118) REFRIGERATION AND CRYOGENICS

COURSE OBJECTIVES

The main objective of this course is to learn about

1. *The necessity of lower temperatures in the manufacturing sectors*
2. *Performance characteristics of compressors*
3. *Various alternative refrigerants with lower ODP*
4. *Various Liquefactions process of gases*
5. *Properties of metals when at low temperatures.*
6. *Applications of cryogenics in Medical and Aviation Industries*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Understand the Working principle of multistage compression systems for producing lower temperatures*
2. *Design, selection of evaporators, condensers, control systems*
3. *Different types of refrigerants to phase out CFCs .*
4. *Explain the Concept of insulation in the cryogenic systems*
5. *Describe Liquefaction process of various gases*
6. *Identify Effect of lower temperatures on the properties of the metals*

UNIT – I

Introduction: Necessity of low temperature - Vapour compression refrigeration - Multistage compression with inter-cooling, Multi-evaporator systems - Cascade systems - Manufacturing of dry ice.

UNIT – II

Types of Compressor: Performance characteristics and capacity control of reciprocating compressor, centrifugal compressors, screw compressor and scroll compressor.

UNIT – III

Design and selection of Devices in Refrigerator: evaporators – condensers - control systems – motors.

Types of Refrigerants: Refrigerants - alternative refrigerants - CFC/HCFC phase-out regulations - Refrigeration applications - food preservation - transport.

UNIT – IV

Insulation: Low temperature insulation-reflective-Evacuated powders- Rigid forms- super Insulation.

Cooling By Adiabatic Demagnetization: Gas separation and Cryogenic systems- Air separating- storage and handling of cryogenic liquids.

UNIT – V

Liquefaction of Gases: Air - Linde system- Analysis- Dual pressure cycle analysis- Liquefaction of Hydrogen and Helium-problems.

Effects on the Properties of Metals: Strength-Thermal properties-super conductivity-super fluidity -Application of Lower temperatures.

TEXTBOOKS

1. Marshall Sitting, *Cryogenic Research and Applications,* Von NostrandInc, New Jersey, 2001
2. B.A.Hands, *Cryogenics Engineering,* Academic Press, 1996

REFERENCES

1. C.P.Arora, *Refrigeration and Air-conditioning,* Tata McGraw-Hill, 2000.
2. R. B. Scott, *Cryogenics Engineering,* Von NostrandInc, New Jersey, 1999
3. K.D.Timmerhaus& TM Flynn, *Cryogenics process Engineering*, Plenum press, 1998
4. J.L.Threlkeld, *Thermal Environmental Engineering,* Prentice Hall, 1970

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – II Sem

L	T	P	C
3	-	-	3

(20ME3119) DESIGN OF HEAT EXCHANGERS

COURSE OBJECTIVES

Objective of this course is to

1. *Impart brief knowledge on Heat exchangers and its classification.*
2. *Familiarize student with design methodology of heat exchangers and fouling.*
3. *Make the student learn about double pipe heat exchangers.*
4. *Enable the student to know about the Compact heat exchangers.*
5. *Make the student to understand about Mechanical design, simulation & optimization of heat exchangers.*
6. *Provide knowledge on heat exchanger design standards, codes and materials needed.*

COURSE OUTCOMES

On completion of the course the Students will be able to

1. *Explain Heat exchangers and its classification.*
2. *Carryout heat exchanger analysis and describe fouling.*
3. *Design and Analyze double pipe heat exchangers.*
4. *Construct and analyze the Compact heat exchangers.*
5. *Understands about Mechanical design, simulation & optimization of heat exchangers.*
6. *Describe about different types of Design methodologies*

UNIT – I

Heat Exchangers – Classification of heat exchanger- plate type heat exchangers extended surface heat exchangers, Counter flow, Parallel flow, Cross flow exchanger, Turbulent Heat exchangers, Heat pipe, Regenerators.

UNIT – II

Heat exchanger Design Methodology: Heat transfer analysis, Problem formulation, e-NTU method, *P*-NTU method, Mean temperature difference method, fouling of heat exchanger, effects of fouling, categories of fouling, fundamental processes of fouling.

UNIT – III

Double Pipe Heat Exchangers: Thermal and Hydraulic design of inner tube, Thermal and hydraulic analysis of Annulus, Total pressure drop

UNIT – IV

Compact Heat Exchangers: Thermal and Hydraulic design of compact heat exchanger
Shell and Tube heat exchangers – Tinker's, kern's and Bell Delaware's methods for thermal and hydraulic design of Shell and Tube heat exchangers

UNIT – V

Mechanical Design of Heat Exchangers: Design standards and codes, Key terms in heat exchanger design, Material selection, and thickness calculation for major components such as tube sheet, Shell, Tubes, Flanges and Nozzles. Introduction to simulation and optimization of heat exchangers, Flow induced vibrations.

TEXTBOOKS

1. Ramesh K. Shah and Dusan P. Sekulic, *Fundamentals of Heat Exchanger Design*, John Wiley & sons Inc., 2003.
2. D.C. Kern, *Process Heat Transfer*, McGraw Hill, 2009.

REFERENCES

1. SadikKakac and Hongton Liu, *Heat Exchangers: Selection, Rating and Thermal Design*,CRC Press, 2012.
2. A .P. Frass and M.N. Ozisik, *Heat Exchanger Design*, McGraw Hill, 1984
3. T. Kuppan, *Hand Book of Heat Exchanger Design*, New York, 1999.
4. G. Walker, *Industrial Heat Exchangers-A Basic Guide*, McGraw Hill, 1982.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – II Sem.

L	T	P	C
3	-	-	3

(20ME3120) CRYOGENIC ENGINEERING

COURSE OBJECTIVES

The objective of this course is to

1. *Provide introductory knowledge of Cryogenic Engineering Materials and Applications*
2. *Impart acquaintance in liquefaction of cryogenics*
3. *Have familiarization of Cryogenic gases separation and purification methods*
4. *Understand Cryogenic refrigeration principles and Refrigerators*
5. *Present the design aspects of cryogenic storage and instrumentation used*
6. *Identify the important applications of cryogenics in various medical and aviation Industries*

COURSE OUTCOMES

Upon completion of this course, the student will be able to

1. *List out the material properties of cryogenic materials and explain the applications of them in cryogenic Industry*
2. *State the basic principles of liquefaction of cryogenic fluid systems and implement this knowledge in the production of lower temperatures.*
3. *Distinguish various methods of separation of cryogenic gases and apply the same in the purification of cryogenic gases*
4. *Analyze the numerous types of refrigeration principles and differentiate the cryogenic refrigerators*
5. *Interpret several cryogenic fluid storage systems and identify the best methods of handling cryogenic fluids with insulations and instrumentation*
6. *Evaluate the design aspects of Cryogenic Storage systems and compare the heat transfer at various Insulation levels.*

UNIT – I

Introduction: Insight on Cryogenics –Low temperature properties of Engineering Materials – Mechanical, Thermal, Electric and Magnetic Properties- Cryogenic Fluids- Superconductivity - Cryo-metallurgy

Applications of Cryogenics: Applications in Space, Food Processing, Electrical Power, Biology, Medicine, Electronics and Machining Tools Industry

UNIT – II

Liquefaction Cycles: Liquefaction of Ideal Cycles – Carnot, Inversion Curve, Joule Thomson Expansion, Adiabatic Expansion - Linde Hampson Cycle, Claude Cycle& Cascade Systems, Striling Cycle, Eollins cycle, Simpson cycle - Ortho-Para hydrogen conversion

Production of Lower Temperatures: Critical Components in Liquefaction Systems, General Liquefaction systems for Hydrogen, Helium and Neon.

UNIT – III

Cryogenic Gas Separation and Purification: Thermodynamically ideal separation system, Properties of Mixtures, Binary Mixtures, Principle of air separation- Components of sir separation systems - Hydrogen, Argon and Helium air separation systems.

Gas Purification Methods: Components of Purification systems= Hydrogen, Helium, Nitrogen and Biogas purification Methods

UNIT – IV

Cryogenic Refrigeration Systems: Ideal Refrigeration systems- Refrigeration using liquids and gases as refrigerant- Refrigerators using solids as working medium.

Cryogenic Refrigerators: Cryostat, Cryocoolers, Sterling Cycle Refrigerators, Pulse Tube Refrigerators, Magnetic Refrigerators –Vortex Tube Refrigeration, Cryogenic Engine for space vehicles

UNIT – V

Cryogenic Fluid Storage Systems: Cryogenic Storage vessels and Transportation, Thermal insulation and their performance at cryogenic temperatures, Super Insulations, Vacuum insulation, Powder insulation, selection and comparison of Insulations, Cryogenic Dewar, Cryogenic fluid transfer systems.

Cryogenic Instrumentation: Pressure, flow rate, liquid level and temperature measurements. Types of heat exchangers used in cryogenic systems(only description with figure) Cryo pumping Applications, Safety in Cryogenics

TEXT BOOKS

1. Klaus D. Timmerhaus, Richard P. Reed, *Cryogenic Engineering*, Springer publication, 1st Edition, 2007
2. Mamata Mukhopadhya, *Fundamentals of Cryogenic Engineering*, PHI publication, Kindle Edition, 2010

REFERENCES

1. J. G. Weisend, *The Handbook of Cryogenic Engineering*, Taylor & Fransis publication1stEdition, 1998
2. Radall F Barron, *Cryogenic Heat transfer*, Taylor & Fransis publication, 2nd Edition,1998
3. R.B.Scott, *Cryogenic Engineering*, Van Nostrand Co, 1959

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech-II Sem	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3121) COMPUTATIONAL FLUID DYNAMICS

COURSE OBJECTIVES

The main objective of the course is to make the students to understand

1. *Basics of CFD with experimental and Hyperbolic Equations*
2. *Governing equations of Navier-Stokes Equation*
3. *Geometry modeling and Grid Generation*
4. *CFDHT Methodology for diffusion equation*
5. *Solution of N-S Equations for Incompressible Flows*
6. *Algorithms for various grid systems of incompressible flow*

COURSE OUTCOMES

Students undergoing this course will be able to

1. *Analyze the Experimental and hyperbolic equations of CFD*
2. *Explain the Concept of FDM, FVM Methodology for solving the problems*
3. *Describe the Flow domains, mesh and their importance.*
4. *Derive Diffusion Equation, Convection Equation.*
5. *Differentiate Staggered & Non Staggered Grid Systems.*
6. *Formulate Partial Differential Equations for CFD*

UNIT – I

Introduction to CFD: CFD– Experimental and Hyperbolic Equations– Computational approach to Fluid Dynamics & its comparison analytical methods
Basics of PDE: Elliptic, Parabolic.

UNIT – II

Governing Equations: Navier-Stokes Equation & Simplified forms – Solution Methodology – FDM & FVM with special emphasis on FVM, Stability and Convergence& Accuracy.
Finite Volume Method: Domain discretization – Types of mesh – Quality of mesh, simple, Pressure velocity coupling, Checkerboard pressure field & staggered grid approach

UNIT – III

Geometry Modeling and Grid Generation: Practical aspects of computational modeling of flow domains – Grid Generation – Types of mesh – Selection criteria, Mesh quality, Key parameters & their importance

UNIT – IV

Methodology of CFDHT: Objectives & importance of CFDHT – CFDHT for Diffusion Equation, Convection Equation & Convection-Diffusion Equation

UNIT – V

Solution of N-S Equations for Incompressible Flows: Semi-Explicit & Semi-Implicit – Algorithms for Staggered Grid System & Non Staggered Grid System of N-S Equations for Incompressible Flows

TEXTBOOKS

1. Atul Sharma, *Introduction to Computational Fluid Dynamics: Development, Application and Analysis,* John Wiley & Sons,1st Edition, 2017.
2. T. J. Chung, *Computational Fluid Dynamics, Cambridge University Press,* 2nd Edition, 2017.

REFERENCES

1. Oleg Zikanov, *Essential Computational Fluid Dynamics,* John Wiley & Sons, 2nd Edition, 2019.
2. John F Wendt, *Computational Fluid Dynamics,* Springer Science & Business Media, 3rd Edition, 2008.
3. Frederic Magoules, *Computational Fluid Dynamics,* CRC Press, 1st Edition, 2011.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech-II Sem

L	T	P	C
3	-	-	3

(20ME3122) MODELLING OF I.C ENGINES

COURSE OBJECTIVES

The objective of the course is to make students understand

1. *Governing equations for the combustion processes*
2. *Thermodynamic Combustion Models of CI Engines.*
3. *Fuel spray behavior, structure in the combustion chamber*
4. *Modeling of charging system*
5. *Simulation of Otto cycle and the importance of friction in combustion chamber*
6. *Heat transfer phenomenon through valves and engine components*

COURSE OUTCOMES

Students undergoing this course will be able to

1. *Learn the Approaches of modeling, model building and integration methods*
2. *Formulate the Thermodynamic models of CI engines.*
3. *Explain the Concept of fuel spray behavior, turbulent interactions.*
4. *Illustrate the Mathematical models of SI Engines*
5. *Design the Modeling of charging systems.*
6. *Describe Wall Heat transfer Correlations*

UNIT – I

Fundamentals: Governing equations - Equilibrium charts of combustion chemistry, chemical reaction rates, and approaches of modeling, model building and integration methods.

Gas Exchange: Through valves, Engine and porting geometry - Exhaust gas recirculation - Valve lift curves.

UNIT – II

Thermodynamic Combustion Models of CI Engines: Single zone models, Premixed and diffusive combustion models - Combustion heat release using wiebe function

Wall Heat Transfer Correlations: Ignition delay, Internal energy estimations - Two zone model - Application of heat release analysis.

UNIT – III

Fuel Spray Behavior: Fuel injection - Spray structure - Fuel atomization - Droplet turbulence interactions - Droplet impingement on walls.

UNIT – IV

Modeling of Charging System: Constant pressure and pulse turbo charging - Compressor and turbine maps - Charge air cooler.

UNIT – V

Mathematical Models of SI Engines: Simulation of Otto cycle, Progressive combustion, Auto ignition modeling - Single zone models, Mass burning rate estimation, SI Engine with stratified charge.

Friction - In pumping, Piston assembly, Bearings and Valve train - Friction estimation for warm and warm up engines.

TEXTBOOKS

1. Haywood, *Internal Combustion Engines*, McGraw Hill, 2nd Edition, 2001.
2. Ramos J, *Internal Combustion Engine Modeling*, Hemisphere Publishing Company, 2009

REFERENCES

1. V. Ganesan, *Internal Combustion Engines, Tata McGraw Hill, New Delhi, 1996*
2. P.A. Lakshmi Narayanan and Y. V. Aghav, *Modeling Diesel Combustion*, Springer, 2010
3. Bernard Challen and Rodica Baranescu, *Diesel Engine Reference Book*, Butterworth-Heinemann, 1999.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – II Sem.	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(20ME3123) INSTRUMENTATION FOR THERMAL ENGINEERING

COURSE OBJECTIVES

The objective of this course is to provide the knowledge on

1. *Various measuring instruments for thermal engineering*
2. *Microprocessor and element of microcomputer*
3. *Advance measurement techniques*
4. *The various measurement methods*
5. *Measurement analyzers of gases.*
6. *Experimental error analysis of various instruments under static and dynamic conditions*

COURSE OUTCOMES

Students undergoing this course will be able to

1. *Get the knowledge on characteristics of instruments and measuring Instruments*
2. *Acquire knowledge on microprocessor and element of micro computer*
3. *Knowledge on Measurement of Physical Quantities instruments*
4. *Measure the advance technique instruments*
5. *Acquire knowledge on Measurement analyzers*
6. *Describe about different types of Measurement Analyzers*

UNIT – I

Measurement Characteristics : Instrument Classification- Characteristics of Instruments – Static and dynamic- experimental error analysis, Systematic and random errors- Statistical analysis- Uncertainty- Experimental planning and selection of measuring instruments- Reliability of instruments

UNIT – II

Microprocessors and Computers in Measurement: Data logging and acquisition – use of sensors for error reduction- elements of microcomputer interfacing- intelligent instruments in use.

UNIT – III

Measurement of Physical Quantities: Measurement of thermo-physical properties- instruments for measuring temperature, pressure and flow- use of sensors for physical variables

UNIT – IV

Advance Measurement Techniques: Shadowgraph – Schlieren – Interferometer - Laser Doppler Anemometer - Hot wire Anemometer- heat flux sensors- Telemetry in measurement

UNIT – V

Measurement Analysis: Chemical, thermal, magnetic and optical gas analyzers - measurement of smoke, Dust and moisture- gas chromatography- spectrometry- measurement of pH- Review of basic measurement techniques.

TEXT BOOKS

1. Barnery, *Intelligent Instrumentation*, Prentice Hall of India, 2nd Edition,1988
2. Bolton.W, *Industrial Control & Instrumentation*, Universities Press, 4thEdition, 2001

REFERENCES

1. *Doblin E.O, Measurement System Application and Design,* McGraw Hill,1stEdition.1999
2. Holman ,J.P., *Experimental methods for engineers*, McGraw-Hill, 2012
3. John G Webster, *The measurement, Instrumentation and sensors Handbook,* CRC and IEE Press, 1999
4. Morris A.S, *Principles of Measurements and Instrumentation,* Prentice Hall of India, 1998.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – II Sem

L	T	P	C
-	-	4	2

(20ME3107) COMPUTATIONAL FLUID DYNAMICS LAB

COURSE OBJECTIVES

Objective of the course is to make students learn about the

1. *Basic governing equations of CFD*
2. *Solutions for governing equations in Finite volume method.*
3. *Solution of N-S Equations for Incompressible Flows.*
4. *Essential numerical background for solving the partial differential Equations governing the fluid flow.*
5. *Skills of using a commercial software package.*
6. *Applications of fluid flow various Automotive applications*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Explain the Experimental and hyperbolic equations.*
2. *Describe the Geometry modeling and Grid Generation.*
3. *Describe the Methodology of computational fluid dynamics.*
4. *Illustrate both flow physics and mathematical properties of governing N-S Equations and define proper boundary conditions for solution.*
5. *Usage of CFD software to model relevant engineering flow problems and analyze the CFD results.*
6. *Formulate the Simulation in Fin by Natural Convection process*

List of Experiments:

1. Simulation of Plane Poiseuille flow through long Parallel and Stationary Plates and Plotting Velocity Contours and Velocity Variation along the horizontal central line. Take the distance between the plates as 4 cm. Properties of fluid are v=0.000217 m^2/s p=800 kg/m^2
2. Simulation of Couette flow when the upper plates are moving with a velocity of 40 m/s. Take the distance between the plates as 4 cm properties of fluid are v=0.000217 m^2/s, p=800 kg/m^3. Make simulations for a pressure gradient of 0-30000 $N/m^2/m$ and 20000 N m^2/m and report the variation of velocity contours for each case
3. Simulation of a channel flow (Tube flow) for a tube of diameter. 5 cm and take the fluid. As water at 30^0C at the entry of the tube of length 0.7m. A heat flux of 3000 W/m^2 is imposed along a wall. Obtain the contours of velocity and temperature along the length of the tube and also obtain the center line temperature and velocity of fluid.
4. Simulation of a channel flow (Tube flow) for a tube of diameter 5 cm and take the fluid as water at 30^0C at the entry of the tube length 0.7m. A Constant wall temperature of 300^0C is imposed along the wall. Obtain the contours of Velocity and temperature along the length of the tube and also obtain the center line temperature and velocity of fluid.
5. Unsteady simulation of compressible flow of air through 2D a convergent – Divergent nozzle, with inlet and outlet of 0.2m size and both are joined by a throat section wherethe flow area is reduced by 10% and is of sinusoidal shape. Air enters

the nozzle at a pressure of 0.9 bar and leaves at 0.73 bar. Obtain the contours of velocity, pressure and Mach number.

6. Simulation of flow over a circular cylinder of size 5 cm for different Reynold's number values of air and plotting the contours of velocity and vorticity
7. Simulation of temperature counters for a square plate of size 0.2m subjected to differenttypes of boundary conditions.
8. Simulation of temperature counters for a pin fin in natural and forced convective conditions.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech – II Sem.

L	T	P	C
-	-	4	2

(20ME3108) THERMAL ENGINEERING LAB (VIRTUAL LAB)

COURSE OBJECTIVES

Objective of this course is to

1. *Impart brief knowledge on rise of Taylor bubble and gas-liquid two phase flow through vertical conduit.*
2. *Familiarize student with evaporation loss from cryogenic vessel and characteristics of air lift pump.*
3. *Make the student learn about conductivity probes and signals & Natural circulation loop in two phase flow.*
4. *Enable the student to know about bubble formation and condensation.*
5. *Make the student understand about various performance parameters of I.C Engine.*
6. *Utilize the virtual lab software to perform various experiments at different operating conditions*

COURSE OUTCOMES

On completion of the course the students will be able to

1. *Gains brief knowledge on rise of Taylor bubble and gas-liquid two phase flow through vertical conduit..*
2. *Attain the familiarized with evaporation loss from cryogenic vessel and characteristics of air lift pump.*
3. *Learns about conductivity probes and signals &Natural circulation loop in two phase flow.*
4. *Knows about bubble formation and condensation.*
5. *Understands about various performance parameters of I.C Engine.*
6. *Understand about Steam Condensation*

ADVANCED THERMAL ENGINEERING LAB

1. Rise of Taylor Bubble through Vertical Circular Conduits.
2. Gas-Liquid Two-Phase Flow through a Vertical Tube.
3. Evaporation Loss from a Cryogenic Vessel
4. Characteristics of an Air Lift Pump
5. Conductivity Probes and Signals in Two-Phase Flow.
6. Bubble Generation, Growth and Departure from a Submerged Orifice.
7. Virtual Lab on Steam Condensation in Micro channels
8. Natural circulation loop in two phase flow.

REMOTE TRIGGERED VIRTUAL LAB ON AUTOMOTIVE SYSTEMS

1. PV Diagram of a SI Engine
2. Torque Crank Angle Curve of a SI Engine
3. Load Test on a SI Engine
4. Mechanical Efficiency of a SI Engine
5. Determination of Cylinder Mean Effective Pressure.
6. Engine Health Monitoring by Vibration Analysis
7. Variation of Exhaust Noise with Engine Speed
8. Torsional Vibrations of an Engine

SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

I M.Tech- II Sem

L	T	P	C
2	-	-	-

(20HS0829) CONSTITUTION OF INDIA

COURSE OBJECTIVES

1. *Know the premises informing the twin themes of liberty and freedom from a civil rights perspective.*
2. *Address the growth of Indian opinion regarding modern Indian intellectuals Constitutional role*
3. *Tackle the entitlement to civil and economic rights as well as the emergence of Nationhood in the early years of Indian nationalism.*
4. *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*
5. *Acquire knowledge for various competitive examinations*

COURSE OUTCOMES

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

1. *Explain the key concepts of political economy*
2. *Analyse the significant developments in the political ideologies*
3. *Describe the salient features of the constitution of India interpret, integrate and critically*
4. *Analyse the political economy of Indian international relations and gain knowledge in Judiciary system*
5. *Apply their knowledge and skills acquired to write various competitive Examinations*
6. *Explain the functions of Election commission*

UNIT-I

Constitution: Definition, Introduction, Meaning of the term,- Indian Constitution: Sources and Features

UNIT-II

Historical Perspective of Indian Constitution: The Government Act of 1919and1935 - A Dual Form of Government – The Constitutional Reforms of Simon commission –Formation of Drafting Committee – The Role of Constitution Assembly.

Salient Features and Characteristics of the Constitution of India: Structure of the Indian Union: Federalism, Centre- State relationship

UNIT-III

Scheme of the Fundamental Rights: Concept of Fundamental Rights in India, Justifiability of Fundamental Rights - Reach of Fundamental Rights -The scheme of the Fundamental Duties and its Legal Status: Fundamental Duties in India – Article 51A - Introduction to Fundamental Duties in India – Importance of Fundamental Duties. The Directive Principles

of State Policy - Its importance and implementation - The Potential of Directive Principles of State Policy for the Judicial Enforcement of Socio-Economic Rights

UNIT-IV

Parliamentary Form of Government in India: Origin, growth and development of the parliamentary system in India – Chief Characteristics of Indian Parliament – Constitutional Powers and Functions of Indian Parliamentary system.

The President of India: Qualifications of President - Election of President, Tuner of President - Status, Powers and Functions of President. The Historical Perspectives of the Constitutional Amendments in India: Types of Amendments & Constitutional Amendment Process in India

Indian Polity-Judiciary System: Introduction to Indian Judiciary System - Independent Indian Judiciary - Indian Judiciary Structure - Powers and Functions of Indian Judiciary

UNIT-V

Local Self Government – Constitutional Scheme inIndia - District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO **ZilaPachayati**: Position and role, Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Election Commission: Role and Functions of 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. *Government of India Ministry of Law and Justice (Legislative Department),* The Constitution of India, 1950 (Bare Act) Government Publication, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar *framing of Indian Constitution,* 1st Edition, GovernmentPublication 2015.

REFERENCES

1. M. P.Jain, *Indian Constitution Law, Lexis Nexis*7th Edition, 2014.
2. D.D. Basu, *Introduction to the Constitution of India,* Lexis Nexis, 2015
3. P.M.Bakshi, *Constitution of India Universal Law Publishing, 15*th Edition,2018

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech-I Sem

L	T	P	C
3	-	-	3

(20ME3124) DESIGN OF SOLAR AND WIND SYSTEMS

COURSE OBJECTIVES

The objective of the course is to make the students know the

1. *Alternative energy sources*
2. *Solar energy and Nuclear energy*
3. *Wind energy characteristics and Geothermal Energy*
4. *Availability of Hydrogen energy and Hydrogen production, storage methods*
5. *Direct energy conversion methods*
6. *Important parameters influencing the designing of solar and wind systems*

COURSE OUTCOMES

On successful completion of the course the student will be able to

1. *Explain the Solar radiation estimation and measurement, solar energy collectors*
2. *Describe the Concept of Nuclear reactor, nuclear waste disposal*
3. *Classify the Methods of wind energy conversion systems and Geothermal Energy*
4. *Express the Production, storage methods of Hydrogen*
5. *Describe the Direct energy conversion methods.*
6. *Importance of Nuclear Waste Disposal from power plants*

UNIT - I

Introduction to conventional sources of energy, Alternative energy sources,
Solar Energy: solar radiation-capturing solar radiation-Types of collectors- concentric solar power-Applications. Solar radiation – Estimation, measurement, Solar energy utilization.

UNIT - II

Nuclear Energy: Potential of Nuclear energy, International Nuclear policies and regulations. Nuclear energy technologies – Fuel enrichment, Different types of Nuclear reactors, Nuclear waste disposal and nuclear fusion.

UNIT - III

Wind Energy: wind energy characteristics – Site location factors – Wind energy conversion systems –Betz model –applications
Geothermal Energy : Availability of Geothermal Energy-Size and distribution , Various types of systems to use geothermal energy , Direct heat applications , Power generation using geothermal heat, Sustainability of geothermal sources, Status of geothermal technology , Economics of geothermal energy.

UNIT - IV

Hydrogen Energy: Hydrogen as a renewable energy source, Hydrogen Fuel for vehicles.
Hydrogen Production: Direct electrolysis of water, thermal decomposition of water, biological and bio chemical methods of hydrogen production. Storage of Hydrogen: Gaseous, cryogenic and metal hydride

UNIT - V

Direct Energy Conversion: Introduction – Fuel cells – Thermo – electric energy – Magneto Hydrodynamic Generators – Photo voltaic cell.

TEXT BOOKS

1. N.K.Bansal and M.K Kleeman, *Renewable Sources of Energy and Conversion Systems*, 3rd Edition,2007.
2. Duffie, *Principles of Thermal Process*, Beckman, 2nd Edition, 2010.

REFERENCES

1. Kreith and Kreider, *Solar Energy Handbook*, McGrawHill, 1st Edition, 2006.
2. John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2nd Edition,2006
3. D.A.Maths, *Hydrogen Technology for Energy,* Noyes Data Corp, 4th Edition, 2002.
4. Linden, *Batteries and Fuel cell hand book*, MC. Graw Gill, 1st Edition, 2010.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech-I Sem

L	T	P	C
3	-	-	3

(20ME3125) FINITE ELEMENT METHODS IN THERMAL ENGINEERING

COURSEOBJECTIVES

Students undergoing this course are able to understand

1. *Basics of Finite Element Methods and its Governing equations*
2. *Governing equations for 1D structural problems*
3. *Boundary conditions & shape functions*
4. *Scalar field problems in steady state heat conduction*
5. *Computer implementation in solving the governing equations*
6. *Finite Element method application packages*

COURSE OUTCOMES

On successful completion of the course the Students will be able to

1. *Formulate the experimental and basic equations.*
2. *Describe the problems on bar, analysis of beams and frames.*
3. *Discuss the boundary layer condition and Numerical integration.*
4. *Explain the Generalist heat conduction equation.*
5. *Illustrate the processes mesh generation, boundary conditions.*
6. *Analyze the Analysis of Frames & Beams*

UNIT – I

Introduction to FEM: Basic concepts, Application of FEM- General description, Advantages of FEM, comparison of FEM with other methods - Finite difference method, Variational method, Galerkin Method, Basic element shapes, Interpolation function- Virtual Energy principle, Treatment of boundary conditions, Solution of system of equations, basic equations of elasticity, strain displacement relations.

UNIT – II

1-D Structural Problems: Axial bar element, stiffness matrix, load vector, temperature effects, quadratic shape function and analysis of trusses – Plane truss and space truss elements.

Analysis of Beams, Frames– Hermite shape functions, stiffness matrix, load vector problems, analysis.

UNIT – III

2-D Problems –CST, force terms, stiffness matrix and load vector, boundary conditions, Iso-parametric element, Quadric element, shape functions, Numerical Integration, 3-Dproblems – Tetrahedron element, Jacobian matrix, stiffness matrix.

UNIT – IV

Scalar Field Problems –Generalized Heat Conduction Equation–Variation Principle– Boundary Conditions – Internal heat generation, heat flux and convection - 1-DSteady state Heat conduction – Thermal load vector - 1-D fin element – Quadratic fin elements I D unsteady state heat conduction – Thermal load vector - 2-D steady state heat conduction –

Concepts of 3D heat conduction- Finite Element Formulation of Torsion, Potential flow, seepage and fluid flow in ducts.

UNIT – V

Computer Implementation: Pre-processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – solutions and post processing- overview and application packages

TEXTBOOKS

1. Tirupathi R. Chandrupatla and Ashok D.Belegundu,*Introduction to finite elements in engineering* , Pearson publication,2012
2. S.S. Rao, *An Introduction to Finite Element Methods*, Pegamon, New York

REFERENCES

1. O.C. Aienkowitz,*The Finite element method in Engineering science*, , Mc. Graw Hill.
2. Lewis R.W, Morgan.K, ThomasH.R. and Seetharaman K.N,*The finite element method in Heat transfer analysis-*, John Wiley, 1994.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech-I Sem

L	T	P	C
3	-	-	3

(20ME3126) THERMAL MEASUREMENTS AND PROCESS CONTROLS

COURSEOBJECTIVES

Students undergoing this course are able to understand

1. *General concepts of Thermal Measurement and Process Controls*
2. *Measurement of pressure and calibration methods*
3. *The compressible fluid Flow measurement*
4. *The working principles of various temperatures Measuring Instruments*
5. *Measurement of Fluid Level and velocity measurements*
6. *The working of various process controls*

COURSE OUTCOMES

Upon completion of the course the Students will be able to

1. *Understand the basic Instruments and general concepts.*
2. *Describe the working of different Pressure Measurement Instruments.*
3. *Illustrate different working of Flow measurement*
4. *Discuss about the Generalist Temperature Measurement Instruments.*
5. *Differentiate the difference of Velocity and density Measurement.*
6. *Describe the working of water level measuring Instruments*

UNIT – I

General Concepts: Fundamental elements of a measuring instrument - Static and dynamic characteristics – Errors in instruments – Different methods of measurement and their analysis – Sensing elements and transducers.

UNIT – II

Measurement of Pressure: Principles of pressure measurement, static and dynamic pressure, vacuum and high pressure measuring – Measurement of low pressure, manometers-Calibration methods.

UNIT – III

Measurement of Flow: Obstruction meters, variable area meters. Pressure probes andtheir classification and applications .compressible fluid flow measurement, Thermal anemometers, calibration of flow measuring instruments.

UNIT – IV

Temperature Measurement: Different principles of Temperature Measurement, use of bimetallic thermometers – Mercury thermometers, Vapor Pressure thermometers-Thermo positive elements, thermocouples in series and parallel, measurement of heat flux- calibration of temperature measuring instruments- Measurement of thermal conductivity of solids, liquids and gases.

UNIT – V

Level Measurement: Direct and indirect methods, manometric methods, float levelmeters, electrical conductivity, Capacitive, Ultrasonic, and Nucleonic Methods.

Measurement of Density: Hydrometer, continuous weight method, Gamma rays, Gas impulse wheel.

Velocity Measurement; Coefficient of viscosity, Ostesld method, Free fall of piston under gravity, Torque method.

TEXTBOOKS

1. E.O. Doeblin, *Measurement System, Application and Design,* McGraw Hill Publications. 2nd Edition, 2009
2. B.C.Nakara, KK Chaudhry, *Instrumentation &Measurement and analysis,* TMH Publications, 5th Edition, 2012

REFERENCES

1. R.K. Jain , *Mechanical and Industrial Measurements* , Khanna Publishers, 10th Edition, 2012
2. Buck & Beckwith , *Mechanical Measurements*, Pearson, 4th Edition, 1995
3. Bela.G.Liptak, *Process Measurement and analysis*, CRC Press publisher. 1998

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech-I Semester

L	T	P	C
3	-	-	3

(20HS0824) BUSINESS ANALYTICS

COURSE OBJECTIVES

Students undergoing this course are able to

1. *Understand the concepts and methods of business analytics.*
2. *To Gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.*
3. *Identify the management related issues and processes to resolve*
4. *Understand the significance of forecasting models helpful in decision making*
5. *To become familiar with processes needed to develop, report and analyze business data*

COURSE OUTCOMES

On successful completion of course student will be able to

1. *Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.*
2. *Design alternatives to solve business problems utilizing quantitative analysis, critical thinking and sound ethical decision making.*
3. *Summarize, process and transform data for obtaining meaningful conclusions*
4. *Interpret data using latest data analytics tools to address organizational problems*
5. *Organize and critically apply the concepts and methods of business analytics*
6. *Assess decision problems and build models for creating solutions using business analytical tools.*

UNIT-I

Business Analytics: Overview of Business analytics - Scope of Business analytics - Business Analytics Process - Relationship of Business Analytics Process and organization - competitive advantages of Business Analytics - Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.

UNIT-II

Trendiness and Regression Analysis: Modeling Relationships and Trends in Data - simple Linear Regression - Important Resources - Business Analytics Personnel - Data and models for Business analytics - problem solving - Visualizing and Exploring Data, Business Analytics Technology

UNIT III

Organization Structures of Business Analytics: Team management - Management Issues - Designing Information Policy – Outsourcing - Ensuring Data Quality - Measuring contribution of Business analytics - Managing Changes - Descriptive Analytics - predictive analytics - predicative Modeling - Predictive analytics analysis - Data Mining - Data Mining

Methodologies - Prescriptive analytics and its step in the business analytics Process - Prescriptive Modeling - nonlinear Optimization.

UNIT IV

Forecasting Techniques: Qualitative and Judgmental Forecasting - Statistical Forecasting Models - Forecasting Models for Stationary Time Series - Forecasting Models for Time Series with a Linear Trend - Forecasting Time Series with Seasonality - Regression Forecasting with Casual Variables - Selecting Appropriate Forecasting Models - Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform - New-Product Development Model - Newsvendor Model - Overbooking Model - Cash Budget Model.

UNIT V

Decision Analysis: Formulating Decision Problems - Decision Strategies with the Outcome Probabilities - Decision Trees - The Value of Information - Utility and Decision Making - Recent Trends in Embedded and collaborative business intelligence - Visual data recovery - Data Storytelling and Data journalism.

TEXT BOOKS

1. S. Christian Albright & Wayne Winston, *Business Analytics: Data analysis & Decision making,* 6th Edition, Cengage Learning, 2019
2. James Evans, *Business Analytics,* 2nd Edition, Pearson Education, 2013.

REFERENCES

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, *Business analytics Principles, Concepts, and Applications,* 1st Edition, Pearson FT Press, 2014.
2. SeemaAcharya& RN Prasad, *Fundamentals of Business Analytics,* 2nd Edition, WILEY, 2008
3. GalitShmueli, Peter C. Bruce, Nitin R. Patel, *Data mining for business analytics: Concepts, Techniques and Applications in Microsoft Office Excel with XLMiner, WILEY, 2008.*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech - I Sem

L	T	P	C
3	-	-	3

(20CE1028) COST MANAGEMENT OF ENGINEERING PROJECTS

COURSE OBJECTIVES

To Understand

1. *Establish systems to help streamline the transactions between corporate support departments and the operating units*
2. *Devise transfer pricing systems to coordinate the buyer-supplier interactions between decentralized organizational operating units*
3. *Use pseudo profit centers to create profit maximizing behaviour in what were formerly cost centers*

COURSE OUTCOMES

At the end of the course, the students are able to

1. *Summarize the concept of strategic cost management, strategic cost analysis – target costing, life cycle costing and Kaizen costing and the cost drive concept.*
2. *Describe the decision-making; relevant cost, differential cost, incremental cost and opportunity cost, objectives of a costing system.*
3. *Summarize the meaning and different types of project management and project Execution, detailed engineering activities.*
4. *Understand the project contracts*
5. *Describe the cost behavior and profit planning types and contents, Bar charts and Network diagram.*
6. *Analyze by using quantitative techniques for cost management like PERT/CPM*

UNIT-I

Introduction and Overview of the Strategic Cost Management Process

UNIT- II

Cost Concepts: Cost concepts in decision-making - Relevant cost - Differential cost - Incremental cost and Opportunity cost - Objectives of a Costing System - Inventory valuation - Creation of a Database for operational control - Provision of data for Decision Making

UNIT-III

Project Management: Project: meaning - Different types - why to manage - cost overruns centers - various stages of project execution: conception to commissioning - Project execution as conglomeration of technical and nontechnical activities - Detailed Engineering activities - Pre project execution main clearances and documents - Project team: Role of each member - Importance Project site: Data required with significance - Project contracts - Types and contents - Project execution Project cost control - Bar charts and Network diagram - Project commissioning: mechanical and process

UNIT- IV

Cost Behavior and Profit Planning: Cost Behavior and Profit Planning Marginal Costing - Distinction between Marginal Costing and Absorption Costing - Break-even Analysis - Cost-Volume-Profit Analysis - Various decision-making problems - Standard Costing and Variance Analysis - Pricing strategies: Pareto Analysis - Target costing - Life Cycle Costing - Costing of service sector - Just-in-time approach - Material Requirement – Planning - Enterprise Resource Planning -Total Quality Management and Theory of constraints - Activity-Based Cost Management - Bench Marking - Balanced Score Card and Value-Chain Analysis - Budgetary Control - Flexible Budgets - Performance budgets - Zero-based budgets- Measurement of Divisional profitability pricing decisions including transfer pricing

UNIT-V

Quantitative Techniques: Quantitative techniques for cost management - Linear Programming, PERT/CPM - Transportation Problems - Assignment problems – Simulation - Learning Curve Theory

TEXT BOOKS

1. Robert S Kaplan Anthony A. Alkinson, *Management & Cost Accounting*
2. N.D. Vohra, *Quantitative Techniques in Management*, Tata McGraw Hill Book Co. Ltd

REFERENCES

1. *Cost Accounting A Managerial Emphasis*, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, *Advanced Management Accounting*
3. Ashish K. Bhattacharya, *Principles & Practices of Cost Accounting*, A. H. Wheeler publisher

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech - I Sem

L	T	P	C
3	-	-	3

(20EE2128) WASTE TO ENERGY

COURSE OBJECTIVES

The objectives of this course is

1. *To learn different types of waste materials available for energy conversion*
2. *To understand Pyrolytic oil and gases*
3. *To introduce gasification methods for biomass*
4. *To learn concepts of biomass resources, combustion types and biogas plant technology*
5. *To make the student to visualize the analysis of biogas plant*
6. *To learn various properties of biogas*

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. *Analyse agro based, forest residue and industrial waste conversion processes.*
2. *Describe the Manufacture of Pyrolytic oils and gases*
3. *Discuss about the methods of Manufacture of charcoal and its applications*
4. *Understand various types of gasifiers operation*
5. *Understand inclined and fluidized bed combustors operation*
6. *Understand types of biogas plants and biomass energy programme in India*

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

Bio-mass 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 Combustion: 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.

TEXT BOOKS

1. Desai, Ashok V ,*Non-Conventional Energy*, Wiley Eastern Ltd., 1990.
2. Khandelwal, K. C. and Mahdi ,*Biogas Technology - A Practical Hand Book* -, Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

REFERENCES

1. ChallalD.S ,*Food, Feed and Fuel from Biomass , I*BH Publishing Co Pvt Ltd.,1991.
2. *GD Roy, Non-conventional Energy Sources*- Khanna Publishers, 6th Edition, 2002
3. Khahid Rehman Hekeem, Mohammad Jawald., Umar Rashid,*Biomass & Bioenergy,* Springer International Publishing Ltd. 2001

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

	L	T	P	C
II M.Tech - I Semester	**3**	**-**	**-**	**3**

(20ME3026) INDUSTRIAL SAFETY

COURSE OBJECTIVES

The objective of this course is to

1. *Learn about Mechanical and electrical hazards.*
2. *Understand the Fundamentals of Maintenance Engineering.*
3. *Identify the importance of Wear, Corrosion and their prevention.*
4. *Explain the Fault Tracing concept of various instruments used*
5. *Know the terms Periodic and preventive maintenance*

COURSE OUTCOMES

On successful completion of this course the student will be able to

1. *Explain the Points of factories act 1948 for health and safety.*
2. *Define the term Cost & its relation with replacement economy.*
3. *Recognize the Concept of Wear, Corrosion and its Prevention methods*
4. *Understand the Concept of sequence of fault finding activities and the importance of decision tree*
5. *Elaborate the importance of scheduled preventive maintenance of mechanical and electrical equipment.*
6. *Distinguish between Periodic and Preventive maintenance of equipments*

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 firefighting, 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, Screw down grease cup, Pressure grease gun, Splash lubrication, Gravity lubrication, Wick feed lubrication, Side feed lubrication, Ring lubrication, Principle and factors affecting the corrosion-Types and 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, Types of faults in machine tools and their general causes.

UNIT-V

Periodic 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

Preventive Maintenance: Definition, need, steps and advantages, Program and schedule of preventive maintenance of mechanical and electrical equipment, Repair cycle concept and its importance.

TEXT BOOKS

1. Higgins & Morrow, *Maintenance Engineering Handbook*,Da Information Services, 1995
2. *H. P.* Garg, *Maintenance Engineering, S. Chand and Company,* 2nd Edition, 2010

REFERENCES

1. Audels, *Pump-hydraulic Compressors, Mcgrew Hill Publication.*4th Edition,1993
2. Winterkorn, *Foundation Engineering Handbook*, Chapman & Hall London., 2005

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech - I Sem

L	T	P	C
3	-	-	3

(20ME3027) ADVANCES IN OPERATIONS RESEARCH

COURSE OBJECTIVES

The objective of this course is to

1. *Enumerate the fundamentals of Linear Programming*
2. *Learn classical optimization techniques*
3. *Develop the best strategy of Game and identifying the Queuing theory.*
4. *Understand about sequence and optimum Duration of the Project*
5. *Develop the importance of Replacement models and Inventory control*
6. *Identify the critical path of the project for optimum project duration.*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Create mathematical models of the real time situations.*
2. *Implement Transportation and Assignment problems to solve in real time industry*
3. *Choose the best strategy of Game and capable of identifying the suitable queuing Theory*
4. *Enumerate fundamental techniques and apply it to solve various optimization areas*
5. *Investigate, study, Apply knowledge in Replacement models and Inventory Control Models*
6. *Understand the Inventory control Models*

UNIT-I

Introduction to OR and Linear Programming: OR definition–Types of Operations Research models; Linear Programming- Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Degeneracy - Problems

UNIT-II

Transportation Problem: Formulation; Initial Basic Feasible Solution-North-West Corner Rule, Least Cost Method, Vogel's Approximation Method Modified Distribution (MODI) Method, Unbalanced Transportation-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 and Mixed Strategies – 2 X 2 Games – Dominance Principle.

Queuing Theory: Introduction to queuing system–Service Channel, Arrival Pattern, Size of Population, Service Pattern, Queue Discipline, Customer Behavior, Probability Distribution-Birth & Death Process, Simple Problems on Single Service channel only.

UNIT-IV

Sequencing: Terminology - Johnson's Algorithm for n-jobs x 2 Machines and n-jobs x 3 machines models - Problems

PERT & CPM: Introduction, Difference between PERT and CPM, Terminology- Activities, Events, Predecessor, 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; PERT- Probabilistic Model, Critical Path, Optimal Project Duration, Least Possible Project Duration- Problems.

UNIT-V

Replacement: Failure Mechanism of Items**,** Types of Replacements- Individual Replacement policy, Group Replacement policy, Replacement of items fail suddenly – problems

Inventory: Necessity for maintaining inventory, inventory costs, classification of fixed order quantity inventory models, selective inventory management techniques.

TEXT BOOKS

1. S D. SHARMA *Operations Research* KNRN Publications. 17th edition 2015
2. Hamdy A Taha , *Operations Research Pearson Publications,* 9th Edition 2015

REFERENCES

1. Manohar Mahajan *Operations Research, DhanpatRai&Co,* 3rd Edition, 2016
2. Er. Premkumar Guptha & Dr.D.S.Hira *Operations Research*, S Chand publications, 4th Edition, 2012.
3. R Panneerselvam *Operations Research, PHI*, 2nd Edition, 2012.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech - I Sem

L	T	P	C
3	-	-	3

(20ME3028) COMPOSITE MATERIALS

COURSE OBJECTIVES

The objective of the course is to

1. *Understand the mechanical behavior of composite materials*
2. *Get an overview of the methods of manufacturing composite materials.*
3. *Know the fundamentals of composite materials.*
4. *Understand the fabrication and process of composites.*
5. *Recognize the applications of composite materials.*
6. *Understand the mechanics of composites in the manufacturing process*

COURSE OUTCOMES

On successful Completion of this course the student will be able to

1. *Explain the Fundamental concept of composite materials.*
2. *Classify different types of composite materials.*
3. *Describe the Fabrication and processing of composite materials.*
4. *Illustrate the Methods of preparation of Metal matrix Composites and polymer matrix composites*
5. *Discuss about the Mechanical behavior of composite materials.*
6. *Explain the 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, Pre-pregs, 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*, Chapman and Hall, London, England, 1st Edition, 1994.
2. Chawla K. K.,*Composite materials,* Springer – Verlag, 2nd Edition, 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, 2nd Edition, 1989.
3. Sharma, S.C., *Composite materials*, Narosa Publications, 4th Edition, 2000.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech - I Sem

L	T	P	C
-	-	20	10

(20ME3010) DISSERTATION PHASE-I

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II M.Tech - II Sem

L	T	P	C
-	-	32	16

(20ME3011) DISSERTATION PHASE-II