MIT | Academy of Engineering

MIT ACADEMY OF ENGINEERING, ALANDI

An Autonomous Institute Affiliated to

Savitribai Phule Pune University

Curriculum

For

Master of Technology in Mechanical Engineering (Heat Power)

2020-2022

(With Effect from Academic Year: 2020-2021)

BoS Chairman Dean, School of Mechanical & Civil Engineering	Member Secretary Academic Council Dean Academics	Chairman Academic Council Director MITAOE

MIT Academy of Engineering, Alandi, Pune

An Autonomous Institute affiliated to Savitribai Phule Pune University

CURRICULUM FRAMEWORK (2020 PATTERN)

MECHANICAL ENGINEERING (HEAT POWER)

The Master of Technology Program shall be based on the following type of courses.

COURSE DISTRIBUTION: TRIMESTER WISE								
S.N.	TYPE OF COURSE	NO. OF COURSES/TRIMESTER						TOTAL
		1	2	3	4	5	6	
1.	Program Core (PC)	2	1	1				**04**
2.	Discipline Core (DC)	1	2	2				**05**
3.	Department Elective (DE)				2			**02**
4.	Skill Development and Project (SDP)			1	1	1	1	**04**
TOTAL		**3**	**3**	**4**	**3**	**1**	**1**	**15**

CREDIT DISTRIBUTION: TRIMESTER WISE									
1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit 1 Tutorial Hour = 1 Credit									
S.N.	TYPE OF COURSE	NO. OF CREDITS/TRIMESTER						TOTAL	%
		1	2	3	4	5	6		
1.	Program Core (PC)	8	2	2				**12**	**18.75**
2.	Discipline Core (DC)	4	8	8				**20**	**31.25**
3.	Department Elective (DE)				6			**06**	**9.37**
4.	Skill Development and Project (SDP)			2	4	10	10	**26**	**40.62**
TOTAL		**12**	**10**	**12**	**10**	**10**	**10**	**64**	**100**

	CREDITS				
	1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit				
Sl. No.	**YEAR**	**TRIMESTER**			**TOTAL**
		1	**2**	**3**	
1.	First Year	12	10	12	**34**
2.	Second Year	10	10	10	**30**
TOTAL					**64**

	CONTACT HOURS				
Sl. No.	**YEAR**	**TRIMESTER**			**TOTAL**
		1	**2**	**3**	
1.	First Year	13	12	16	41
2.	Second Year	14	20	20	54
TOTAL					**95**

ABBREVATIONS		
1.	ECE	End Course Exam
2.	IA	Internal Assessment
3.	T/P	Term Work / Practical
4.	DM	Demonstration
5.	L	Lecture
6.	P	Practical
7.	T	Tutorial
8.	Lab	Laboratory

MIT | Academy of Engineering An Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2020-2022)		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	W.E.F	:	2020-2021
FIRST YEAR MASTER OF TECHNOLOGY IN MECHANICAL ENGINEERING	RELEASE DATE	:	01/07/2020
	REVISION NO.	:	1.0

TRIMESTER: I

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS					CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY		PRACT		TOTAL	
			L	P	T	ECE	IA	T/P	DM		
PC1	AS502	Computing and Mathematics	2	-	2	60	40	50	-	150	4
PC2	CS531	Management System	2	-	2	60	40	50	-	150	4
DC1	ME532	Modern Technologies	3	2	-	60	40	50	-	150	4
TOTAL			**07**	**02**	**04**	**180**	**120**	**150**	**-**	**450**	**12**

TRIMESTER: II

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS					CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY		PRACT		TOTAL	
			L	P	T	ECE	IA	T/P	DM		
PC3	EX531	Research Methodology	2	-	-	50	25	-	-	75	2
DC2	ME541	Advanced Thermodynamics and Combustion Technology	3	2	-	60	40	-	50	150	4
DC3	ME542	Advanced Heat Transfer	3	2	-	60	40	-	50	150	4
TOTAL			**08**	**04**	**-**	**170**	**105**	**-**	**100**	**375**	**10**

TRIMESTER: III											
COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS					CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY		PRACT		TOTAL	
			L	P	T	ECE	IA	T/P	DM		
PC4	EX533	Technical Writing	2	-	-	-	25	-	50	75	2
DC4	ME543	Advanced Fluid Mechanics	3	2	-	60	40	-	50	150	4
DC5	ME544	Design of Heat Transfer Equipment's	3	2	-	60	40	-	50	150	4
SDP1	ME545	Project Work - I	-	4	-	-	-	-	50	50	2
TOTAL			**08**	**08**	**-**	**120**	**105**	**-**	**200**	**425**	**12**

MIT | Academy of Engineering Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2020-2022)		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	W.E.F	:	2021-2022
SECOND YEAR MASTER OF TECHNOLOGY IN MECHANICAL ENGINEERING	RELEASE DATE	:	01/07/2020
	REVISION NO.	:	1.0

TRIMESTER: IV

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS					CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY		PRACT		TOTAL	
			L	P	T	ECE	IA	T/P	DM		
DE1	ME66#	Elective course – I	3	-	-	60	40	-	-	100	3
DE2	ME67#	Elective course – II	3	-	-	60	40	-	-	100	3
SDP2	ME651	Project Work - II	-	08	-	-	-	50	50	100	4
TOTAL			**06**	**08**	**-**	**120**	**80**	**50**	**50**	**300**	**10**

TRIMESTER: V

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS					CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY		PRACT		TOTAL	
			L	P	T	ECE	IA	T/P	DM		
SDP3	ME652	Project Work - III	-	20	-	-	-	150	50	200	10
TOTAL			**-**	**20**	**-**	**-**	**-**	**150**	**50**	**200**	**10**

TRIMESTER: VI

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS					CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY		PRACT		TOTAL	
			L	P	T	ECE	IA	T/P	DM		
SDP4	ME653	Project Work - IV	-	20	-	-	-	200	100	300	10
TOTAL			**-**	**20**	**-**	**-**	**-**	**200**	**100**	**300**	**10**

Annexure

Department Elective Course I: 1 Course		
Sl. No.	**Course Code**	**Course**
1	ME661	Advances in IC Engines
2	ME662	Energy Conservation and Management
3	ME663	Computational Fluid Dynamics
4	ME664	Compressible Fluid flow and Gas Dynamics

Department Elective Course II: 1 Course		
Sl. No.	**Course Code**	**Course**
1	ME671	Advanced Air Conditioning and Refrigeration Technology
2	ME672	Industrial Hydraulics and Pneumatics
3	ME673	Cryogenics and Vacuum Technology
4	ME674	Steam Engineering

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECH/COMP/ETX ENGG	**COURSE NAME**	Computing and Higher Mathematics
	COURSE CODE	AS 502
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	TUTORIAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
2	2	NIL	60	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

AS501.CEO.1: To learn different numerical methods to solve differential equations and obtain the solution.

AS501.CEO.2: To understand different sampling techniques, analyze the data and process it to obtain a quality product.

AS501.CEO.3: To learn mathematical methodologies, techniques and mathematical tools to obtain an optimal solution of the problems theoretically and also by ANOVA.

COURSE OUTCOMES :

The students after completion of the course will be able to,

AS501.CO.1: Identify the accurate solution method (minimizing the error) to solve the differential equation with given conditions and obtains the particular solution of the problem.

AS501.CO.2: Collect, categorize, analyze, processing mathematically the data, thereby to obtain a quality proven product.

AS501.CO.3: Understand the physical situation, identify the accurate mathematical model and solve the problem mathematically or with the use of Statistical tools available and finally interpret it in the original context.

CONTENTS:

Computational Methods for Ordinary Differential Equations: Euler's Method, Heun's Method, Mid- point Method, Runge-Kutta Method and Multi step Methods-Explicit Adams-Bash forth technique and Implicit Adams-Moulton techniques, Adaptive RK Method, Embedded RK Method, Higher Order Ordinary differential equation- Shooting Method.

Operations Research: Simplex method: Feasible solution to system of equations, reduction of feasible to basic feasible solution, solution of LPP: computational procedure, Penalty (Big M) method. Transportation problem: North-West corner method, Least-cost method, Vogel's approximation method, Assignment Models: Hungerian Method.

Statistics and ANOVA: Central Tendency of data, Variance, Standard Deviation, Coefficient of Variance, Moments, Correlation, Coefficient of Correlation, Least Squares, Linear Regression, Inference in Linear Regression, Multiple Linear Regression, ANOVA for Regression

TUTORIAL NO.1		**2 HOURS**
Introduction to first order first degree Differential equation and its actual solution.		
TUTORIAL NO.02		**2 HOURS**
Euler's Method, Heun's Method, Mid- point Method, Runge-Kutta Method.		
TUTORIAL NO.03		**2 HOURS**
Adams-Bash forth technique and Implicit Adams-Moulton techniques.		
TUTORIAL NO.04		**2 HOURS**
Adaptive RK Method, Embedded RK Method, Shooting Method.		
TUTORIAL NO.05		**2 HOURS**
Solution of system of equations using simplex method (Feasible soln).		
TUTORIAL NO.06		**2 HOURS**
Solution of system of equations using simplex method (Feasible to basic feasible soln).		
TUTORIAL NO.07		**2 HOURS**
Transportation problem: North-West corner method, Least-cost method.		
TUTORIAL NO.08		**2 HOURS**
Transportation problem: Vogel's approximation, Assignment problem: Hungerian method.		
TUTORIAL NO.09		**2 HOURS**
Central Tendency of data, Variance, Standard Deviation.		
TUTORIAL NO.10		**2 HOURS**
Moments, Correlation, Coefficient of Correlation.		
TUTORIAL NO.11		**2 HOURS**
Regression lines.		
TUTORIAL NO.12		**2 HOURS**
ANOVA for Regression.		

TEXT BOOK

1. Dr. B.V. Ramana, Higher Engineering Mathematics, 5 th edition, Tata McGraw Hill, 2017, ISBN: 978-0-07-063419-0
2. Peter W. Vik, Regression, ANOVA, and the General Linear Model: A Statistics Primer, First Edition, ISBN-13: 978-1412997355.

REFERENCE BOOK

1. B.S. Grewal, Higher Engineering Mathematics, 44 th edition, Khanna Publications, 2018, ISBN: 978-81-933284-9-1.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th edition, Wiley Eastern Ltd., 2015, ISBN: 13: 9788126554232
3. Amos Gilat, "MATLAB: An Introduction with Applications", 4th edition, Wiley Publication, 2003, ISBN-13: 9788126537204, 8126537205.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECH/COMP/ETX ENGG	**COURSE NAME**	Management Systems
	COURSE CODE	CS531
	COURSE CREDITS	04
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	TUTORIAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
2	2	NIL	60	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CS531.CEO.1: To expose the students to fundamental concepts of management and its processes in organizations.

CS531.CEO.2: To create scientific attitude towards solving a management problem and impart knowledge about tools available for carrying out research.

CS531.CEO.3: To inculcate a spirit of entrepreneurship by promoting inquisitiveness for technological innovations, their conversion into business ideas and evolving strategy for induction of new products in new markets for growth of their entrepreneurial projects.

CS531.CEO.4: To effectively use the latest technology to support ever growing business.

COURSE OUTCOMES :

The students after completion of the course will be able to,

CS531.CO.1: Describe and explain the Significance of Businesses in Society, their Management and linking these up with other relevant systems.

CS531.CO.2: Critically analyze the organizational structure, systems, competencies and identify the areas of improvement.

CS531.CO.3: The ability and confidence to tackle common environmental and financial problems of business.

CS531.CO.4: Build an awareness of ethical and social responsibilities to multi-cultural, team-oriented, rapidly changing environments.

CONTENTS:

Basics of Management: Nature and scope of management; Evolution of Management thought; -Scientific, Behavioral, Systems and Contingency Approaches, Social responsibility of an organization. Analysis for Managerial Decision Making, Corporate Image Building.

Organizational Behavior: Concepts of OB, Designing and Delegation of Authority, Decision Making Process, Management of Creativity and Relationships, Human Resource Management, Skillful use of Emotional Intelligence in conflict management. Techniques for Self Management and Stress Management for improving personal efficiency.

Economics and Financial Management: Demand and Business Forecasting, Economics of Information and Network Industries, Entrepreneurship and New Ventures, Finance function – Scope and Significance, Capital Budgeting- Nature and Significance.

Project Management: Essentials of Project Management with use of Critical Path Method (CPM) and Programme Evaluation and Review Techniques (PERT), Functioning and growth of a Business Unit with understanding of Break-Even Analysis.

Information System: Business and Data Communications Networks, Technology Management with the help of Cyber Security, Data Mining, Enterprise Resource Planning, Industry 4.0 concepts, Business startups and growth in current Indian Environment.

TUTORIAL NO.1	Corporate management case presentation	4 HOURS
A corporate management case to be selected by students on their own choice, writing a Synopsis (2.5 Marks) and its Presentation before the class in 5 Minutes including answers to questions by class (2.5 Marks)		
TUTORIAL NO.02	**Entrepreneurial Business Plan presentation**	**6 HOURS**
Preparation and submission of an innovative and entrepreneurial Business Plan of student's own choice, submitting a Power Point Presentation to be evaluated by Faculty (2.5 Marks), and its presenting/ defending it before the class, to be evaluated by two peers on a Format to be given by Faculty (2.5 Marks).		
TUTORIAL NO.03	**Industry 4.0**	**6 HOURS**
Understand the concept of Industry 4.0 and prepare a report using any of the technology to prove that use of this technology will improve the performance of the organization.		

TEXT BOOK

1. Harold Koontz, Heinz Weihrich and Mark V Cannice, Management – A Global and Entrepreneurial Perspective, Tata McGraw Hill Publications, 12th Edition, 2008.
2. Vachaspati Mishra, Management and Entrepreneurship in Indian Environment – A Perspective through Joining the Dots, Himalaya Publishing House, First Edition, 2016

REFERENCE BOOK

1. Dr A Sivathanu Pillai; Technology Leadership – A Revolution in the Making; Tata McGraw Hill Publishing Company Ltd, New Delhi, 2005
2. James A Alexander and Mark W Hordes; S-Business: Reinventing the Services Organisations, Select Books Inc Biztantra, 2006
3. Vohra ND, Quantitative Techniques in Management; Tata McGraw Hill Publishing Company Limited, Third Edition 2007
4. Nakkiran S and Karthikeyan M; Training Techniques for Management Development; Deep and Deep Publications Pvt Ltd; 2007

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Modern Technologies
	COURSE CODE	ME532
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	2	NIL	60	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME532.CEO.1: To understand the various modes of transport phenomena and HVAC.

ME532.CEO.2: To acquire the knowledge of mathematical modeling and data interpretation techniques.

ME532.CEO.3: To study the basic principles of modern/advanced technologies.

ME532.CEO.4: To understand different statistical tools and analysis software.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME532.CO.1: Understand the knowledge of advanced technologies related to Transport phenomena and HVAC.

ME532.CO.2: Apply data interpretation techniques to different mechanical engineering based problems.

ME532.CO.3: Study different advance technologies used in automobile industry.

ME532.CO.4: Simulate (2-D geometry) model for different heat transfer equipment's.

THEORY COURSE CONTENT		
UNIT 1	**Transport Phenomena**	**6 HOURS**
Electro-hydrodynamics, Flow dynamics and heat transfer techniques in partially porous micro channel, Cross flow friction turbo machines		
UNIT 2	**HVAC**	**6 HOURS**
Green building, Radiation cooling, Air conditioning, Modern air filters, Measuring of isothermal water vapor adsorption/desorption rate using QCM method.		
UNIT 3	**Advance Technologies**	**6 HOURS**
Regenerative heat exchanger, Internal combustion engine with 2 stroke/ 4 stroke switching during its operation, Supercharger (air compressor) for motorcycle, bikes and automobile engines, Miniature internal combustion engine generator, Advanced Sensor technology, Universal fuel-economizing engines, controlling of thermal power plants and its instrumentation, Sprayer device using Coanda effect, Artificial photosynthesis, Photovoltaic cells technology, Sources of Energy storage, fuel efficient engine through closed loop control system. Advances in Electronic Cooling Equipment's.		
UNIT 4	**Modern Statistical Tools**	**6 HOURS**
Modern statistical tools like MATLAB, SPSS, etc., Optimization tools and techniques, Design of experiments, Mathematical Modeling, Data interpretation technologies like TAGUCHI, ANOVA, GRA, etc. Electronic Control Unit (ECU), Introduction to COMSOL.		
UNIT 5	**Advances in Automotive Electronics**	**6 HOURS**
Night vision systems, Driver alertness monitoring, Event data recorders (automotive black boxes), Accident recorders, Adaptive cruise control systems, Autonomous emergency breaking systems, Electronic throttle control, On-Board diagnostics systems, Blind spot detection, Navigation systems, Communication systems, Engine control		

PRACTICAL		
PRACTICAL NO.01	**Cross flow friction**	**2 HOURS**
Case study on Cross flow friction		
PRACTICAL NO.02	**QCM Method**	**2 HOURS**
Measurement of isothermal water vapor adsorption/desorption rate using QCM method.		
PRACTICAL NO.03	**Data Interpretation technology**	**4 HOURS**
Case study on data interpretation technologies with mathematical modeling.		
PRACTICAL NO.04	**Heat Transfer Coefficient by CFD Analysis**	**4 HOURS**
Determination of Heat Transfer Coefficient by CFD Analysis for Natural and Forced Convection		
PRACTICAL NO.05	**Critical Heat Flux**	**2 HOURS**
Determination of Critical Heat Flux		
PRACTICAL NO.06	**Simulation by using COMSOL Multiphysics.**	**2 HOURS**
Simulation of theoretical (2-D geometry) model for shell and tube heat exchanger		
PRACTICAL NO.07	**Velocity Profile in Pipe**	**4 HOURS**
Visualization of velocity profile (for laminar flow) in a pipe using CFD Technique.		
PRACTICAL NO.08	**Thermal Analysis of refrigeration system**	**2 HOURS**
Thermal analysis of refrigeration cycle using suitable software		

TEXT BOOK

1. Anthony F. Collings , Christa Critchley,"Artificial Photosynthesis: From Basic Biology to Industrial Application." 2014, ISBN: 978-3-527-31090-6.
2. Nasimul Alam Syed, Sanjib Islam, Saroj Kumar Patel, "Advanced Guide to MATLAB: Practical Examples in Science and Engineering" I K International Publishing House Pvt. Ltd., 2015, ISBN: 978-9384588359.
3. William B. Ribbens, Ph.D., Norman P. Mansour, Gerald Luecke, Charles W. Battle, Edward C. Jones and Leslie E. Mansir, "Understanding Automotive Electronics", ISBN: 978-0-7506-7599-4.
4. Bosch Automotive Electrics and Automotive Electronics: Systems and edited by Robert Bosch GmbH, Springer science and digital media, ISBN-13: 978-3658017835, 2013.

REFERENCE BOOK

1. Nihal Kulratna, "Energy storage devices for electronics system", ISBN: 978-0-12-407947-2, 2015.
2. Ralph Remsburg, Advanced thermal design for electronics equipment, International Thomson Publishing Thomson Science, (ISBN: 978-1-4613-4633-3).
3. Asier Perallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio Garca Zuazola, John Wiley and sons, "Intelligent Transport Systems: Technologies and Applications", ISBN: 978-1-118-89478-1, 2015.
4. GalipUlsoy, Huei Peng, Melih Çakmakci, "Automotive Control Systems", Cambridge 2012.
5. Jayavardhana Gubbi, Rajkumar Buyya "Internet of Things (IoT): A Vision, architectural elements and future directions", Elsevier Journal on Future Generation Computer Systems, 29, pages 1645-1660, 2013.
6. Ali Bahrami, Shahram Mohammadnejad, Saeede Soleimaninezhad "Photovoltaic cells technology: principles and recent developments", Springer US, Online ISSN: 1572-817X, 2012.
7. Martin Kaiser, "Electronic control unit (ECU)", Springer US, Online ISBN 978-3-658-03964-6, pages 254-259, 2015.
8. Pritpal Singh, Tanjot Sethi , Bunil Kumar Balabantaray, Bibhuti Bhushan Biswal, "Advanced vehicle security system", IEEE, International Conference on "Innovations in Information, Embedded and Communication Systems (ICIIECS)", pages 1-6, 2015.
9. Hermann Kopetz , Stephan Poledna, "Autonomous Emergency Braking: A System-of-Systems perspective", IEEE, Conference on "Dependable Systems and Networks Workshop (DSN-W)", 43rd Annual IEEE/IFIP, pages 1-7, 2013.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY	**W.E.F**	**AY:** 2020-2021
FIRST YEAR MASTER OF TECHNOLOGY COMPUTER ENGINEERING	**COURSE NAME**	Research Methodology
	COURSE CODE	EX531
	COURSE CREDITS	02
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME		EVALUATION SCHEME				
		THEORY			PRESENTATION/	TOTAL
LECTURE	PRACTICAL	ECE	IA	PRACTICAL	DEMONSTRATION	
2	-	50	25	–	–	75

PRE-REQUISITE:

1: Nil

COURSE OBJECTIVES :

EX531.CEO.1: To understand the basic framework of research process.
EX531.CEO.2: To identify various sources of information of survey and data collection.
EX531.CEO.3: To Illustrate the use of documentation and evaluate its quality.

COURSE OUTCOMES :

The students after completion of the course will be able to,

EX531.CO1: Classify different types of Research , objective and paradigm of research process.
EX531.CO2: Explore the basics of research framework and Hypothesis.
EX531.CO3: Describe about different data collection methods.
EX531.CO4: Explain the different stages of preparing scholarly writing proposals.

CONTENTS:

Introduction: What is research, Research definition, Objective paradigm for the research, Identifying defining the research problem, Literature it's analysis, Qualitative quantitative research, development of theoretical and conceptual frame work.

Hypothesis and Data Processing: Ethical Issues concerning research participants, Ethical issues in data collection, , Definition and functions of hypothesis, Processing operations, Problems in processing, Coding descriptive and quantitative data, Sampling techniques.

Statistics in research: Data collection methods – use , types , examples , Multivariate analysis, Concept of regression, Establishing validity and reliability.

Writing Research Proposal: Interpretation and its meaning, Readability of Manuscript, techniques, Contents, Report writing, structure, types of report, Procedure of writing research proposal, Writing as thinking, Habit of writing, Skills and thought process in technical writing, Role of computer in technical writing.

PRACTICAL List

Practical No.01	**Web application front end development**	**4 HOURS**
Designing and development of web application using front end technologies.		
Practical No.02	**Web application back end development**	**2 HOURS**
Designing of web application using back end technologies.		
Getting started with Git and GitHub – repository, types of Git workflow, fork, Git pages and Clone		
Configuring AWS cloud services – Compute EC2, Storage –S3		

TEXT BOOKS

1. John W. Creswell," Research Design-Qualitative Quantitative Approaches", SAGE publications, New Delhi ISBN: 0-8039-5254-6
2. Ranjit Kumar," Research Methodology- A Step by Step Guide for Beginners", 2nd ed., Pearson publication, New Delhi ISBN: 978-81-317-0496-7
3. Bernard M. Moret," The Theory of Computation", Pearson Publication ISBN: 978-81-317-0870-5

REFERENCE BOOKS

1. C. R. Kothari," Research Methodology, Methods Techniques", 2nd Edition, New Age International Publication ISBN:978-81-224-1522-3
2. Hamdy A. Taha, "Operation Research- An Introduction", 8th Edition, Pearson Publication , ISBN: 9780132729154

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Advanced Thermodynamics and Combustion Tech
	COURSE CODE	ME541
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	2	NIL	60	40	NIL	50	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME541.CEO.1: To understand the thermodynamic process and the methods for analyzing thermodynamic properties.

ME541.CEO.2: To determine the direction of the process by the analysis of exergy, entropy, free energy, etc.

ME541.CEO.3: To master the property equations and thermodynamic properties of real gases, master the methods for analyzing multi-component systems.

ME541.CEO.4: To acquire basic knowledge of chemical thermodynamics, and grasp the thermodynamic processes and properties of special systems.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME541.CO.1: Perform thermodynamic analysis of realistic problems using computer software.

ME541.CO.2: Apply the first and second laws to combustion processes.

ME541.CO.3: Extend the Knowledge with property equations and thermodynamic properties of real gases.

ME541.CO.4: Evaluate thermodynamic properties and basic concepts of phase equilibrium of multi component systems.

ME541.CO.5: Apply basics of chemical thermodynamic to thermodynamics processes and spacial systems.

THEORY COURSE CONTENT		
UNIT 1	**Equation of State and Laws Of Thermodynamics**	**8 HOURS**
State postulate for Simple System and equation of state, Ideal gas equation, Deviation from ideal gas, Equation of state for real gases, generalized Compressibility chart, Law of corresponding states 2nd law Analysis for Engg. Systems, Entropy flow & entropy generation, Increase of entropy principle, entropy change of pure sub, T-ds relations, entropy generation, thermoelectricity.		
UNIT 2	**Availability Analysis and Properties of Pure Substance**	**8 HOURS**
Reversible work - availability - irreversibility and second – law efficiency for a closed system and steady – state control volume. Availability analysis of simple cycles. Thermodynamic potentials. P-V-T susfaces, phase diagram, phase changes, various properties diagram, 1st order phase transition and 2nd order phase transition, Clapeyron's equation, Ehrenfest's equations, Maxwell's equations, equation for internal energy, enthalpy, entropy, specific heat and joule Thompson coefficient.		
UNIT 3	**Real Gas Behavior and Multi – Component Systems**	**6 HOURS**
Different equations of state – fugacity – compressibility - principle of corresponding States - Use of generalized charts for enthalpy and entropy departure - fugacity coefficient, Lee – Kesler generalized three parameter tables. Fundamental property relations for systems of variable composition. Partial molar properties. Real gas mixtures - Ideal solution of real gases and liquid - activity - equilibrium in multi-phase systems - Gibbs phase rule for non – reactive components.		
UNIT 4	**Chemical Thermodynamics**	**6 HOURS**
Gibb's theorem, Gibbs function of mixture of inert ideal gases, Chemical equilibrium, Thermodynamic equation for phase, Degree of reaction, equation of reaction, law of mass action, heat of reaction and Vant Hoff Isober, Phase Equilibrium for a Single-Component System and Multi-Component System		
UNIT 5	**Statistical Thermodynamics**	**6 HOURS**
Microstates and Macrostates - thermodynamic probability - degeneracy of energy levels - Maxwell – Boltzman, Fermi – Diarc and Bose – Einstein statistics - microscopic interpretation of heat and work, evaluation of entropy, partion function, calculation of the Macroscopic properties from partition functions.		
UNIT 6	**Irreversible Thermodynamics and Entropy Generation Minimization**	**6 HOURS**
Conjugate fluxes and forces - entropy production Onsager's reciprocity relations - thermo – electric phenomena, formulations.heat transfer, trade-off between competing irreversibilites, principle of thermodynamic isolation, structure of heat exchanger irreversibility, energy storage systems, sensible and latent heat storage.		

PRACTICAL		
PRACTICAL NO.01	**Steady flow cyclic system**	**4 HOURS**
Computer aided energy analysis of steady flow cyclic system.		
PRACTICAL NO.02	**Mixture of gases, gas and vapour**	**4 HOURS**
Study of mixture of gases, gas and vapour, estimation of properties and preparation of charts.		
PRACTICAL NO.03	**Statistical thermodynamic techniques**	**4 HOURS**
Analysis of ideal gas system using statistical thermodynamic techniques.		
PRACTICAL NO.04	**Behavior of pure substance**	**8 HOURS**
Study of behavior of pure substance with change in pressure and temperature.		
PRACTICAL NO.05	**Adiabatic flame temperature**	**8 HOURS**
Preparation of computer program to study the effect of percentage of theoretical on adiabatic flame temperature and equilibrium composition for a hydrocarbon fuel. (Program to be run for variable input data.)		

TEXT BOOK

1. Adrian Bejan, "Advanced Engineering Thermodynamics", John Wiley and Cons, 3rd Edition,2006, (ISBN: 978-0-471-67763-5)
2. J.P. Holman, "Thermodynamics", McGraw – Hill Inc., 1988. Fourth Edition, (ISBN: 9780070296084) 3.
3. Yunus A. Cengel , Micha el A. Boles, " Thermodynamics- An Engineering approach", McGraw-Hill Education , 8th International edition, (ISBN13 9789814595292)

REFERENCE BOOK

1. Kenneth Wark Jt.m, "Advanced Thermodynamics for Engineers", McGrew – Hill Inc., 1995, (ISBN : 9780071135504)
2. Smith J.M. and Van Ness H.C.,"Introduction to Chemical Engineering Thermodynamics", McGraw – Hill Inc., Fourth. Edition, 1987. (ISBN : 0070587019)
3. Sonntag R.E., and Van Wylen G, "Introduction to Thermodynamics, Classical and Statistical Thermodynamics", John Wiley and Sons, Third Edition, 1991, (ISBN :978-0471614272)
4. Sears F.W. and Salin ger G.I., "Thermodynamics, Kinetic Theory and Statistical Thermodynamics", Narosa Publishing House, New Delhi, Third Edition 1993, (ISBN : 978-81-85015-71-2)

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Advanced Heat Transfer
	COURSE CODE	ME542
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	2	NIL	60	40	NIL	50	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME542.CEO.1: To identify different mode of heat and mass transfer occurring in thermal system.
ME542.CEO.2: To examine the methods of analyzing free and forced convection.
ME542.CEO.3: To analyze steady and transient conduction problem.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME542.CO.1: Apply principles of heat transfer by conduction also to develop mathematical models for uniform and non uniform fins.
ME542.CO.2: Employ mathematical functions and heat conduction charts in tackling transient heat conduction problems.
ME542.CO.3: Interpret the phenomenon of Natural Convection and Forced Convections of heat transfer.
ME542.CO.4: Apply analytical/logical skill while Modeling various Heat transfer phenomenon in boiling and condensation.
ME542.CO.5: Apply the concept of radiation heat transfer for enclosure analysis.

THEORY COURSE CONTENT		
UNIT 1	**Introduction to Modes and Conduction**	**6 HOURS**
Modes of Heat Transfer, Steady and Transient Heat Transfer, Conduction, Thermal Conductivity, Thermal diffusivity, Various Boundary and Initial Conditions, General Heat Conduction Equation in Cartesian, cylindrical and spherical co-ordinate, Thermal Resistance, Critical Thickness of Insulation. Different types of fins and their analysis.		
UNIT 2	**Transient Heat Conduction**	**6 HOURS**
Lumped capacitance and its validity, General lumped capacitance analysis, spatial effects. Problems related with conventional geometries. Use of Haisler and Grober charts, Biot and Fourier numbers. Heat Conduction with moving boundary- heat conduction in melting and solidification, Moving Heat Source.		
UNIT 3	**Forced Convection External Forced Convection**	**6 HOURS**
Concept of velocity and thermal boundary layers: Laminar and Turbulent flow, Parallel flow over Flat plates, Flow across cylinders and spheres, Flow across tube banks- Inline and staggered arrangement. Internal Forced Convection Entrance region, Laminar and Turbulent flow in tubes. Introduction to compact heat exchangers.		
UNIT 4	**Natural Convection Physical Mechanism**	**6 HOURS**
Equation of motion and Grashoff's Number, Natural Convection over surfaces, Natural convection from finned surfaces and PCBs, Natural Convection inside enclosures (Rectangular, Cylinder and Sphere), Combined Natural Convection and Radiation, Combined Natural and Forced Convection		
UNIT 5	**Boiling and Condensation**	**6 HOURS**
Boiling: Boiling modes, the boiling curve, modes of pool boiling, correlations. Forced convection boiling. Two phase flow. Condensation: Physical mechanisms, laminar film condensation on a vertical plate. Turbulent film condensation, film condensation on radial systems, film condensation in horizontal tubes, on banks of tubes, Drop-wise condensation correlations.		
UNIT 6	**Thermal Radiation**	**6 HOURS**
Thermal Radiation: Thermal radiation, Blackbody radiation, Radiation intensity, Radiation properties, Atmospheric and Solar radiation, Shape factor, Radiation heat transfer in two surface enclosures, Radiation shields, Radiation exchange between Emitting and Absorbing gases.		

PRACTICAL		
PRACTICAL NO.01		**4 HOURS**
Transient Heat Conduction using Heisler and Grober charts.		
PRACTICAL NO.02		**4 HOURS**
Numerical method in heat conduction & convection.		
PRACTICAL NO.03		**4 HOURS**
Combined Natural and Forced Convection heat transfer.		
PRACTICAL NO.04		**4 HOURS**
Boiling and Condensation.		
PRACTICAL NO.05		**4 HOURS**
Radiation Heat Transfer in Two Surface Enclosures.		

TEXT BOOK

1. John H Lienhard, "A Heat Transfer Textbook: Fourth Edition", Dover Publications, (ISBN-13 : 978-0-486-47931-6)
2. S.P. Sukhatme, "Heat Transfer" Fourth Edition, Universities press, (ISBN: 81 7371 544 0)
3. Y V C Rao, "Heat Transfer" First Edition, Universities press, (ISBN: 81 7371 384 7)
4. Suhas V. Patankar, "Numerical Heat Transfer and Fluid Flow", (ISBN: 0-89116-522-

REFERENCE BOOK

1. Bergman, Theodore L.; Lavine, Adrienne S.; Incropera, Frank P.; DeWitt, David P., "Fundamentals of Heat and Mass Transfer, Fundamentals of Heat and Mass Transfer", New York,1985,Wiley Publication, 2011,(ISBN 0470501979)
2. Frank Kreith:, "Principles of Heat Transfer", Harper and Row Publishers, New York, Fourth edition,1986, (ISBN 0060437855)
3. Donald Q. Kern, "Process Heat Transfer", Tata McGraw Hill Publishing Company Ltd., New Delhi. 1950, (ISBN 9780074632178)
4. Oszisik, "Heat Transfer", McGraw Hill,1985, (ISBN 9780070664609)
5. Yunus A. Cengel, "Heat Transfer A Practical Approach", McGraw Hill International Edition, 2007, (ISBN 0073129305)
6. J P Holman, "Heat Transfer",McGraw-Hill Companies;1996, 8th edition, (ISBN 0078447852)

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY	**W.E.F**	**AY:** 2020-2021
FIRST YEAR MASTER OF TECHNOLOGY COMPUTER ENGINEERING	**COURSE NAME**	Technical Writting
	COURSE CODE	EX533
	COURSE CREDITS	02
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME		EVALUATION SCHEME				
		THEORY			PRESENTATION/	TOTAL
LECTURE	PRACTICAL	ECE	IA	PRACTICAL	DEMONSTRATION	
2	-	–	25	–	50	75

PRE-REQUISITE:

1: Research Methodology

COURSE OBJECTIVES :

EX533.CEO.1: To share the skills and finer aspects of scientific and technical writing with the research students of the Institute order to prepare technical documents clearly, concisely, consistently, and effectively, following internationally accepted standards.

EX533.CEO.2: Students will be made to evaluate the correct error-free writing by being well versed in rules of English grammar and cultivate relevant technical style of communication presentation at their work place and also for academic uses.

EX533.CEO.3: To provide overview of technical English for research paper writing with a special focus on research methods typical for classroom based studies of pedagogical innovations.

COURSE OUTCOMES :

The students after completion of the course will be able to,

EX533.CO1: Creates substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as comprehension, reading, writing and speaking etc.

EX533.CO2: Find information about scientific and technical publications using two premier analytics information resources: the Web of Science platform and Derwent Innovation Index for the patent information discovery.

EX533.CO3: Identify plagiarism and explain how to prevent it.

EX533.CO4: Read and analyze several articles to form your own opinion on a topic - make connections between several articles.

EX533.CO5: Write a 7- 8-page research paper / review paper by using source material correctly with MLA format.

CONTENTS:

Introduction: Introduction to Technical Communication: Reading Skill, Basics of English Grammar, Introduction to Effective Writing: Effective writing as an art, principles of effective writing, types and stages of effective writing, notions of correctness and appropriateness, essentials of academic writing Technical Instructions: Purpose, Content Structure: Understanding the Audience, Creative Writing: Use of tools, Guidelines for Technical Writing, Microsoft Word, Text Editor for Drafting Content, The Role of Visuals in Technical Instructions, the features of Authorizing Tool, Adobe Frame maker, Desktop Publishing and Help Publishing Tool, Snag IT, Image Capturing Tool MS-Visio Image Drawing Tool.

Role of Ethics in Technical Instructions: Role of Ethics in Technical Instructions Understanding the subject: formulating ideas for the paper, developing a thesis statement Preparing the anatomy of the paper: Literature review, research methodology, Writing the results, analysis of the results, discussion and conclusion, apply correct citation, formatting, write the first draft, revise, edit and proofread, Use of tools for research paper help: Grammar checkers, plagiarism checkers, citation generators. Selecting a journal / conference: Targeting a high impact factor journal in Elsevier, IEEE, Springer, Wiley etc., Introduction to the Web of Science, Science Citation Index (SCI)/SCI Expanded (SCIE) and Scopus, preparing the manuscript according to the chosen journal's requirements, submission ethics, and use of peer review comments in a constructive way, submission, revision and galley proof. Proposal writing, the Web of Science platform and Derwent Innovation Index for the patent information discovery, Patent Searching, Drafting and Filing.

Internal Assessment Activities		
Activity No.01	**Preparing the document on**	**6 HOURS**
a) A representative official correspondence. b) Work progress report c) Technical brochures and newsletters d) Instruction Manual e) Demo patent writing		
Activity No.02	**Technical discussions**	**2 HOURS**
Graded technical discussions will be planned online and in class		
Activity No.03	**Quiz**	**2 HOURS**
Quiz on every major component of the course.		
Activity No. 04	**Writing gist**	**2 HOURS**
Writing gist from a set of related papers		
Activity No.05	**Writing the technical blogs**	**2 HOURS**
Writing the technical blogs		

Demonstration/Presentation		
	Presentation /Demonstration Students will have to submit and present :	**.**
Project proposal to be submitted to the funding agencies of repute (Peer review) Review paper / Research paper or research letter.		

TEXT BOOKS

1. Kenneth G. Budinski, Writing Engineers' Guide to Technical, ASM internationals, ISBN: 978-0-87170-693-5
2. Gerald. J. Alred, Charles. T.Brusaw, and Walter. E. Oliu, Handbook of Technical Writing, St. Martin's Press, New York, Ninth Ed., ISBN 1250004411, 2008
3. Hofmann, A. Angelika, Scientific Writing and Communication, Oxford University Press, Oxford., ISBN 0199947562 2014

REFERENCE BOOKS

1. Meenakshi Raman and Sangeeta Sharma, Technical Communication – Principles and Practices Oxford Univ. Press, 2016
2. Websites: https://swayam.gov.in/nd1$_n$oc19$_h$s31/$Dated$: 22$ndMay$2020

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Advanced Fluid Mechanics
	COURSE CODE	ME543
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	2	NIL	60	40	NIL	50	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME543.CEO.1: To remember the fundamentals of fluid mechanics.
ME543.CEO.2: To apply the Navier Stokes equation for fluid flow systems.
ME543.CEO.3: To apply knowledge of boundary layer theory for several airfoils.
ME543.CEO.4: To analyze turbulent flow and compressible flow.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME543.CO.1: Recall basic of fluid mechanics.
ME543.CO.2: Apply the governing equations in different forms.
ME543.CO.3: Apply knowledge of boundary layer theory for several airfoils.
ME543.CO.4: Analyze turbulent flow and compressible flow.

THEORY COURSE CONTENT		
UNIT 1	**Governing Equations: Review of Fluid Mechanics**	**6 HOURS**
Definition and properties of Fluids, Fluid as continuum, Continuum model, and Flow kinematics: - Langragian and Eulerian description, Basic flow-analysis techniques, Flow Patterns: Streamlines, Streak lines, and Pathlines. Reynolds transport theorem, Conservation of mass, Linear momentum equation, Energy equation, Frictionless flow, Bernoulli equation. Acceleration field of a fluid, differential equation of mass conservation, Boundary Conditions for the basic equations, Velocity Potential, Stream Function, Vorticity.		
UNIT 2	**Navier-Stokes Equations**	**6 HOURS**
Generalized form of NSE, Special forms: Euler equations, Bernoulli equation Exact solutions: fully developed flow in channel, pipe, flow between concentric rotating cylinders, Couette flow, Stokes First problem (unsteady flow), Creeping flow past a sphere, cylinder.		
UNIT 3	**Boundary Layers**	**6 HOURS**
Boundary layer assumptions, equations, Flow over a flat plate, Similarity (Blasius) solution, Falkner-Skan equation, Momentum integral method, Flow separation. Flow past a circular cylinder, Magnus effect; Kutta-Joukowski lift theorem; Concept of lift and drag.		
UNIT 4	**Potential Flows**	**6 HOURS**
Elementary Plane-Flow Solutions: Circulation, Superposition of Plane-Flow Solutions: Irrotational vortex, Vortex flow, Doublet, Complex potential functions. Conformal transformation to analyze the flow over flat plate, cylinder, oval body and airfoils. Thin airfoil theory – generalized airfoil theory for cambered and flapped airfoils.		
UNIT 5	**Turbulent flow**	**6 HOURS**
Turbulent flow, losses during flow through pipes. Pipes in series and parallel – transmission of power through pipes, characteristics of turbulence, laminar-turbulent transition, Correlation functions, Mean and fluctuations, Governing equations, Turbulent boundary layer, Boundary conditions, shear stress models, Prandtl's mixing length, Velocity profile over a flat plate and in pipes, Equations for free shear layers: mixing layer, plane and axisymmetric jet, and wake, two equation model (k-σ), Large Eddy Simulation, Various Turbulent Models.		
UNIT 6	**Compressible Flow**	**6 HOURS**
One-dimensional flow: Fanno and Rayleigh curve, Normal shock relations, Introduction to oblique shocks, Prandtl-Meyer expansion waves, and simple supersonic wind tunnel – Design of supersonic wind tunnel Nozzle. Two dimensional Subsonic flow: - Flow with small perturbations, Flow past a wave shaped wall – Gothert's rule-Laitone's modification of Prandtl Glauret rule – affine transformations – Hodograph method –Tangent Gas approximations – Rayleigh Johnson method.		

PRACTICAL		
PRACTICAL NO.01		**4 HOURS**
Flow over a cylinder/sphere at different Re. Pressure variation over the body and drag Estimation.		
PRACTICAL NO.02		**4 HOURS**
Flow past an aerofoil: Pressure measurements, calculation of lift.		
PRACTICAL NO.03		**4 HOURS**
Flow through a converging-diverging nozzle: subsonic and supersonic flows.		
PRACTICAL NO.04		**4 HOURS**
Friction factor determination: incompressible flow through pipes/ducts of variable cross section.		
PRACTICAL NO.05		**4 HOURS**
Laminar/Turbulent boundary layer over a flat plate.		

TEXT BOOK

1. Dr. R K Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Pulications,2010, (ISBN: 978-81-318-0815-3)
2. E. Ratha Krishnan, "Gas Dynamics", PHI Learning Pvt. Ltd New Delhi, 2004, (ISBN : 9788120348394)
3. Dr. P.N. Modi, Dr. S. M. Seth, "Fluid Mechanics and Hydraulic Machines", Standard book house,2009 (ISBN No. 78-8189401269)

REFERENCE BOOK

1. S.M.Yahya, "Fundamentals of Compressible flow", New Age Publishers, Third edition, 1992, (ISBN: 8122414680)
2. Streeter, "Fluid Dynamics", McGraw Hill, New York, 2010, (ISBN: 9780070701403)
3. William Graebel, "Advanced Fluid Mechanics", Academic Press,2007, (ISBN: 9780123708854)
4. Kundu, Cohen, Dowling,"Fluid Mechanics", Elsevier India, 2015, ISBN-13: 978-0124059351
5. FOX, McDONALD, PRITCHARD, "Fluid Mechanics", Wiley publication,2015 (ISBN No. 978-81-265-4128-7)
6. A J Raudkivi , Owls books, Toledo, "Advanced Fluid Mechanics", USA, 1972, (ISBN : 0470709405)

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Design of Heat Transfer Equipment's
	COURSE CODE	ME544
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	2	NIL	60	40	NIL	50	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME544.CEO.1: To understand the functioning of different heat transfer equipment's.
ME544.CEO.2: To Understand thermal behavior of heat transfer equipment's.
ME544.CEO.3: To Design the heat transfer equipment's from thermal point of view.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME544.CO.1: List the different types heat exchangers, cooling towers and furnaces
ME544.CO.2: Select the different types of heat exchangers, cooling towers and furnaces according to application.
ME544.CO.3: Apply the different methods to calculate effectiveness and pressure drop in heat exchanger.
ME544.CO.4: Analyze different heat transfer Equipment's from thermal point of view.
ME544.CO.5: Select and design appropriate heat transfer equipment for a given application.

THEORY COURSE CONTENT		
UNIT 1	**Classification of Heat Exchangers**	**8 HOURS**
Introduction, Classification, Overview of Heat Exchanger Design Methodology, Process and Design Specifications, Thermal and Hydraulic Design, Mechanical Design, Optimum Design , Heat Exchanger Variables and Thermal Circuit, Assumptions, Basic Definitions, ϵ - NTU Method , The P-NTU Method , TEMA , Multi-pass Exchangers, LMTD, Heat Exchanger Arrays and Multi-passing, Sizing and Rating Problems, Kern Method, Bell Delaware Method, Numerical on Shell and tube HEX.		
UNIT 2	**Solution Methods for Determining Exchanger Effectiveness**	**6 HOURS**
Exact Analytical Methods, Approximate Methods, Numerical Methods, Matrix Formalism, Chain Rule Methodology , Flow-Reversal Symmetry, Design Problems, Longitudinal Wall Heat Conduction Effects, Multipass Exchangers, Non-uniform Overall Heat Transfer Coefficients, Temperature - Length - Combined Effect.		
UNIT 3	**Shell and tube heat exchangers**	**6 HOURS**
Shell and tube heat exchangers - tube layouts, baffle spacing, classification of shell and tube exchangers, Design calculation of shell and tube heat exchangers, shell-side film coefficients, shell-side equivalent diameter, true temperature difference in a 1-2 heat exchanger, influence of approach temperature on correction factor, shell and tube sides pressure drop; performance analysis of 1-2 heat exchangers, design calculation of shell and tube heat exchangers; flow arrangements for increased heat recovery.		
UNIT 4	**Heat Transfer Characteristics**	**6 HOURS**
Dimensionless Surface Characteristics, Experimental Techniques for Determining Surface Characteristics, Steady-State Kays and London Technique, Wilson Plot Technique, Transient Test Techniques, Friction Factor Determination, Hydrodynamic ally Developing Flows, Thermally Developing Flows, Extended Reynolds Analogy, Heat Exchanger Surface Geometrical Characteristics, Selection of Heat Exchangers and Their Components, Temperature Difference Distributions.		
UNIT 5	**Direct contact heat transfer**	**6 HOURS**
Classification of cooling towers, wet-bulb and dew point temperatures, Lewis number, cooling-tower internals, heat balance, heat transfer by simultaneous diffusion and convection; Design and analysis of cooling towers, determination of the number of diffusion units, performance evaluation of cooling towers, influence of process conditions and operating variables on their design		
UNIT 6	**Heat Pipes**	**8 HOURS**
Heat pipes - types and applications, operating principles, working fluids, wick structures, control techniques, pressure balance, maximum capillary pressure, liquid and vapor pressure drops, effective thermal conductivity of wick structures, capillary limitation on heat transport capability, sonic, entrainment and boiling limitations, determination of operating conditions; Heat pipe design – fluid selection, wick selection, material selection, preliminary design considerations, heat pipe design procedure, determination of heat pipe diameter, design of heat pipe containers, wick design, entertainment and boiling limitations, design problems; Non conventional heat pipes – flat, rotating, reciprocating and disc shaped heat pipes, heat pipes in cooling microelectronics – micro and mini heat pipes.		

PRACTICAL		
PRACTICAL NO.01		**4 HOURS**
Visit to study heat exchanger manufacturing.		
PRACTICAL NO.02		**4 HOURS**
Study of Instrumentation used related to Heat exchanger.		
PRACTICAL NO.03		**4 HOURS**
Study of plate heat exchanger		
PRACTICAL NO.04		**4 HOURS**
Experimentation on any one Heat exchanger		
PRACTICAL NO.05		**4 HOURS**
Experimentation on Heat pipe		

TEXT BOOK

1. Process Heat Transfer – Donald Q. Kern, Tata McGraw-Hill
2. Process Heat Transfer – Hewitt ,Shires & Bott, CRC Press

REFERENCE BOOK

1. Cooling Tower, Fundamentals- John C. Hensley, SPX Cooling Technologies
2. Heat exchangers Selection, Rating and Thermal Design – Sadik Kakac,Hongtan Liu, Anchasa Pramunjanaroenkij, CRC Press
3. Heat Pipes Theory, Design & Applications – D.A. Reay, P.D.Dunn, Pergamon
4. Cooling Techniques for Electronic Equipment– Dave S. Steinberg, Wiley-InterScience Publication
5. Fundamentals of Heat Exchanger Design -Ramesh K. Shah, Dusan P. Sekulic,Wiley-India
6. Compact Heat Exchangers- Kays, W. M. and London, A. L., 2nd Edition, McGraw – Hill, New York.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
FIRST YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Project-I
	COURSE CODE	ME545
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	NIL	NIL	50	50

PRE-REQUISITE : Research Methodology, Technical Writing

COURSE OBJECTIVES :

ME545.CEO.1: To Manage the selection and initiation of individual projects

ME545.CEO.2: To conduct project planning activities that accurately forecast project costs, timeline and quality.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME545.CO.1: Identify the real life problem/ important concepts / current applications from engineering domain

ME545.CO.2: Describe the aim and objective of selected problem statement

ME545.CO.3: Describe the plan and cost of the project

CONTENTS

Project work is divided into four stages namely Project Stage I, Project Stage II, Project Stage III and Project Stage IV. Project Stage I is entirely related with selection of PROBLEM STATEMENT /problem by the students related to thrust areas identified by respective departments. Synopsis submission and mid trimester presentation will be conducted by department based on following points,

- Literature survey
- Motivation and Problem Statement
- Goals and Objectives

Final Project Stage I Report submission and Presentation shall be conducted at the end of the trimester. End-Trimester Assessment (ETA) presentation shall be conducted in front of eminent expert from Academics or Industry.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Advances in IC Engines
	COURSE CODE	ME661
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : Advanced Thermodynamics and Combustion Technology

COURSE OBJECTIVES :

ME661.CEO.1: To recall the fundamentals of I.C engines and testing of an engine for analyzing its performance.

ME661.CEO.2: To study the combustion and its controlling factors in order to design efficient engine

ME661.CEO.3: To study emissions from I.C. engines and its controlling methods, various emission norms.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME661.CO.1: Recall basics of alternative fuel technology.

ME661.CO.2: Apply fundamentals of IC engines to enhance its performance-emission characteristics.

ME661.CO.3: Develop models for simulation-based engine calibration

ME661.CO.4: Demonstrate the emission controlling methods and emission standards for various engines.

THEORY COURSE CONTENT		
UNIT 1	**Measurement & Testing**	**6 HOURS**
Basics of IC engine, engine performance parameters, measurement and testing of engine operating parameters, performance maps, Mathematical models of SI and CI Engines.		
UNIT 2	**Alternate Fuels**	**6 HOURS**
Thermo-chemistry of Fuel – Air mixtures, Solid fuels, liquid fuels, gaseous fuels, hydrogen, new generation alternative fuels and their properties. Dual & Multi fuel engines: Performance advantages, modifications required in fuel system.		
UNIT 3	**Engine Design**	**6 HOURS**
Engine design parameters, Preliminary analysis, cylinder number, size and arrangement, experimental development. Design of engine combustion chamber for IDI and DI engines.		
UNIT 4	**Electronic Injection System**	**6 HOURS**
Electronic fuel injection control system, spray structure, atomization, penetration, drop size distribution, spray evaporation, injection timing. Mixing formation and control, Modern EFI systems: GDI, MPFI, CRDI etc.		
UNIT 5	**Engine Emissions & Control**	**6 HOURS**
Genesis and formation of engine emissions, Air pollution due to IC engines: HC, CO, NOx, particulates, other emissions, Emission measuring equipments, Strategies for control of emissions: exhaust gas recirculation, Catalytic converter, SCR, modern methods. Trends in vehicle emission standards, emission limits, test procedures, driving cycles.		
UNIT 6	**Simulation Technique**	**6 HOURS**
Simulation-based engine calibration: Tools, Techniques, and Applications, Modern developments in IC Engines: VVT, VGT, DTSI, PCCI, HCCI, LTC. Detail mechanism of NVH (Noise vibration and Harshness) in engine.		

TEXT BOOK

1. V Ganesan, "Internal Combustion Engines", 4th edition, Tata McGraw Hill, 2012, (ISBN-10: 1259006190)
2. Jack Erjavec and Rob Thompson, "Automotive Technology", 6th edition, Delmar Thomson Learning, 2014, (ISBN-10: 1133933734)
3. Mathur M. L., "Internal Combustion Engine", 4th edition, Dhanpat Rai Publication, (ISBN-10: 8189928465)
4. Shyam K. Agrawal. , "Internal Combustion Engine", 4th edition, New Age publishers, 2007, (ISBN-10: 8122417825)

REFERENCE BOOK

1. Charles Fayette Taylor, "The Internal Combustion Engine in Theory and Practice", Volume I & II, 2nd The MIT Press, 1985, (ISBN: 9780262200523)
2. Bosch Gmbh, Robert Bosch GmbH, "Gasoline Engine Management, Bosch handbook",2nd edition, Professional Engineering Publishing, 2004, (ISBN 10: 1860584349)
3. Gordon P Blair, "Design and Simulation of four stroke engines", 4th edition, SAE
4. International, 1999, (ISBN-10: 0768004403)
5. Willard W. Pulkrabek, Engineering Fundamentals of the Internal Combustion Engine, 2nd Edition, Pearson Prentice Hall, 2004.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Energy Conservation and Management
	COURSE CODE	ME662
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME662.CEO.1: To remember importance of energy conservation and management.
ME662.CEO.2: To understand the concept of thermal systems.
ME662.CEO.3: To apply knowledge of various modes of energy conservation.
ME662.CEO.4: To understand various global protocols regarding Energy conservation an management

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME662.CO.1: Recall importance of energy conservation and management.
ME662.CO.2: Understand the concept of thermal system.
ME662.CO.3: Apply knowledge of various modes of energy conservation.
ME662.CO.4: Understand various global protocols regarding Energy conservation an management

THEORY COURSE CONTENT		
UNIT 1	**Energy scenario**	**5 HOURS**
Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future. Energy Conservation Act 2001 and related policies: Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers		
UNIT 2	**Financial Management and Energy Monitoring and Targeting**	**6 HOURS**
Investment-need, appraisal and criteria, financial analysis techniques simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs) Energy Monitoring and Targeting: Defining monitoring & targeting, elements of monitoring & targeting		
UNIT 3	**Energy Management & Audit: Thermal Systems**	**8 HOURS**
Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering		
UNIT 4	**Energy Efficiency in Thermal Utilities and systems:**	**24 HOURS**
Boilers: Types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities. Boiler efficiency calculation, evaporation ratio and efficiency for coal, oil and gas. Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation, Thermic fluid heaters, super critical boilers. Steam System: Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, condensate and flash steam recovery system, identifying opportunities for energy savings. Steam utilization, Performance assessment more details, installation, thermo-compressor, steam pipe insulation, condensate pumping, steam dryers Furnaces: Classification, general fuel economy measures in furnaces, excess air, heat distribution, temperature control, draft control, waste heat recovery. Forging furnace heat balance, Cupola, non-ferrous melting, Induction furnace, performance evaluation of a furnace, hot air generators. Insulation and Refractories: Insulation-types and application, economic thickness of insulation, heat savings and application criteria, Refractory-types, selection and application of refractories, heat loss. Cold insulation. Heat Exchangers: Types, networking, pinch analysis, multiple effect evaporators, condensers, distillation column, etc. Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential. Cogeneration: Definition, need, application, advantages, classification, saving potentials. Heat balance, steam turbine efficiency, tri-generation, micro turbine. Heating, ventilation, air conditioning (HVAC) and Refrigeration System: Factors affecting Refrigeration and Air conditioning system performance and savings Opportunities. Vapor absorption refrigeration system: Working principle, types and comparison with vapor compression system and saving potential, heat pumps and their applications, section on ventilation system, ice bank system, and performance assessment of window and split room air conditioners, Star labeled pumps, cold storage refrigeration, and humidification system		

UNIT 5	Energy and environment, air pollution, climate change:	5 HOURS

United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM – Bachat Lamp Yojna and industry; Prototype Carbon Fund (PCF)

TEXT BOOK

1. L.C. Witte, P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation", Hemisphere Publication, Washington, 1988, (ISBN 0891163220)
2. O. Callaghn, P.W., "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981, (ISBN: 0080272878)

REFERENCE BOOK

1. G.C. Dryden, "The Efficient Use of Energy", Publ. Butterworth-Heinemann, London, 1982, (ISBN 1483107914)
2. W.C. turner, "Energy Management Hand book", Wiley, New York, 1982, (ISBN 1466578289)
3. W.R. Murphy and G. Mc KAY, "Energy Management", Butterworth's, London 1982, (ISBN 0408005084)

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Computational Fluid Dynamics
	COURSE CODE	ME663
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : Advanced Heat Transfer, Advanced Fluid Mechanics

COURSE OBJECTIVES :

ME663.CEO.1: Recall the knowledge of fluid mechanics and heat transfer.
ME663.CEO.2: Develop a two dimensional flow problem by using CFD.
ME663.CEO.3: Apply the Discretization scheme to solve Navier-stokes equation and Reynold's transport theorem.
ME663.CEO.4: Analyze different turbulence models to the flow problems

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME663.CO.1: Identify the key aspects of fluid mechanics and heat transfer relevant to the setting up of a problem for CFD, and to the interpretation of the results.
ME663.CO.2: Develop a two-dimensional flow problem for CFD solution, including geometry, boundary conditions, flow models and solution parameters.
ME663.CO.3: Appreciate the significance of error control and validation in CFD.
ME663.CO.4: Describe the nature of turbulent flows and explain why 'turbulence models' are necessary to many CFD solutions

THEORY COURSE CONTENT		
UNIT 1	**Introduction to CFD**	**8 HOURS**
Governing equations: the continuity equation, momentum equation and energy equations, convective forms of the equations and general description, Reynolds transport theorem. Classification of partial differential equations; physical examples of elliptic, parabolic and hyperbolic equations. Mathematical nature of the flow equations & their boundary conditions, Grid generation.		
UNIT 2	**Finite Difference Methods and Finite Volume Methods**	**8 HOURS**
Discretization: Basic discretization techniques applied to model equations and systems of equations: finite difference, finite volume and finite element methods. Application of FEM to ID and 2D problems in fluid flow and heat transfer Analysis of numerical schemes, Numerical Integration, Solvers and Algorithms.		
UNIT 3	**Euler's equations and Navier-Stokes Equations**	**8 HOURS**
Solution to Euler's equations: Formulations of Euler equations, Discretization methods for Euler equations Navier-Stokes Equations: Governing equation, Properties of Navier-Stokes equation, discretization of NS equation.		
UNIT 4	**Turbulence Modeling**	**6 HOURS**
Introduction, Statistical representation of turbulent flows: General Properties of turbulent quantities, Closure problem: Necessity of turbulence modeling, Reynolds average Navier stokes (RANS) equation, Different types of turbulence model: Eddy viscosity models, Mixing lengths model, Turbulent kinetic energy and dissipation, k-ϵ model, Advantages and disadvantages of k-ϵ model, Two-equation models: k-ϵ model and k-ω model, Reynolds stress equation model (RSM).		

TEXT BOOK

1. Taylor, C and Hughes J.B., "Finite Element Programming of the Navier Stock Equation", Pineridge Press Ltd. U.K., 1st Edition 1981, (ISBN: 0-906674-16-6)
2. Fletcher C. A. J., "Computational Techniques for Fluid Dynamics: Fundamental and General Techniques", Springer-Verlag, 1st Edition, 1987, (ISBN: 0387181512/ 978-0387181516)
3. Bose T. K., "Numerical Fluid Dynamics", Narosa Publishing House, 1st Edition, 1997, (ISBN: 8173191662, 9788173191664)

REFERENCE BOOK

1. Versteeg H. K., Malalasekera. W., " An introduction to computational fluid dynamics: The finite volume method", Prentice Hall, 2nd Edition, 2007, (ISBN: 9780131274983/ 978-0131274983)
2. Anderson, D.A., Tannehill, I.I., and Pletcher, R.H., "Computational Fluid Mechanics and Heat Transfer", Hemisphere Publishing Corporation, New York, USA, 3rd Edition, 2012, (ISBN: 1591690374/ 978-1591690375)
3. Niyogi P., Laha M.K., Chakrabarty S.K., "Introduction to Computational Fluid Dynamics", Pearson Education, India, 1st Edition, (ISBN: 8177587641/ 9788177587647)
4. Muralidhar, K and Sundararajan T., "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, New Delhi, 1st Edition, 2003, (ISBN: 1842651722)
5. Ghoshdastidar, P. S., "Computer Simulation of flow and heat transfer", Tata McGraw-Hill Publishing Company Ltd.,1st Edition, 1998, (ISBN: 0074631500/9780074631508)

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Compressible Fluid Flow and Gas Dynamics
	COURSE CODE	ME664
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : Advanced Fluid Mechanics

COURSE OBJECTIVES :

ME664.CEO.1: To basic fundamentals of compressible flow concepts.
ME664.CEO.2: To understand non-dimensional numbers in compressible flow and to solve the simple compressible flow problems.
ME664.CEO.3: To apply the effect of compressibility in nozzles and diffusers, design criteria of nozzles and diffusers.
ME664.CEO.4: To analyze isentropic compressible flow problems.
ME664.CEO.5: To judge fluid properties, and their static-dynamic nature.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME664.CO.1: Understand the fluid properties, and their static-dynamic nature.
ME664.CO.2: Understand fundamental behavior of compressible fluid.
ME664.CO.3: Apply their understanding in solving real life problem.
ME664.CO.4: Analyze isentropic compressible flow problems.
ME664.CO.5: Judge fluid properties, and their static-dynamic nature.

THEORY COURSE CONTENT		
UNIT 1	**Basic concepts and isentropic flows**	**8 HOURS**
Introduction to Compressible Flow- Concept of continuum-system and control volume approach-conservation of mass, momentum and energy- stagnation state- compressibility-Entropy relations. Wave propagation- Acoustic velocity-Mach number-effect of Mach number on compressibility- Pressure coefficient-physical difference between incompressible, subsonic, sonic and supersonic flows- Mach cone-Sonic boom-Reference velocities- Impulse function-adiabatic energy equation-representation of various flow regimes on steady flow adiabatic ellipse		
UNIT 2	**Flow through Constant Area Ducts**	**8 HOURS**
One dimensional steady isentropic flow- Adiabatic and isentropic flow of a perfect gas- basic equations-Area-Velocity relation using 1D approximation-nozzle and diffuser-mass flow rate-chocking in isentropic flow-flow coefficients and efficiency of nozzle and diffuser- working tables-charts and tables for isentropic flowoperation of nozzle under varying pressure ratios –over expansion and under expansion in nozzles.		
UNIT 3	**Normal Shock**	**6 HOURS**
Irreversible discontinuity in supersonic flow- one dimensional shock wave- stationary normal shock-governing equations- Prandtl- Meyer relations- Shock strength- Rankine- Hugoniot Relation- Normal Shock on T-S diagram- working formula- curves and tables-Oblique shock waves - supersonic flow over compression and expansion corners (basic idea only).		
UNIT 4	**Jet Propulsion**	**6 HOURS**
Flow in a constant area duct with friction (Fanno Flow) – Governing Equations- Fanno line on h-s and P-v diagram- Fanno relation for a perfect gas- Chocking due to friction- working tables for Fanno flow-Isothermal flow		
UNIT 5	**Space Propulsion**	**5 HOURS**
Flow through constant area duct with heat transfer (Rayleigh Flow)- Governing equations- Rayleigh line on h-s and P-v diagramRayleigh relation for perfect gas- maximum possible heat additionlocation of maximum enthalpy point- thermal chocking- working tables for Rayleigh flow.Types of rocket engines – Propellants-feeding systems – Ignition and combustion –Theory of rocket propulsion – Performance study – Staging – Terminal and characteristic, Velocity – Applications – space flights.		

TEXT BOOK

1. J. D. Anderson, "Modern Compressible flow", McGraw Hill, 3rd Edition, 2003, (ISBN-13: 978-0072424430)
2. H. Cohen, G.E.C. Rogers and Saravanamutto, "Gas Turbine Theory", Longman Group Ltd., 2008. ISBN-13: 978-0132224376
3. J. D .Anderson, "Fundamentals of Aerodynamics", McGraw Hill, 5th Edition, (ISBN-13: 978-0073398105)

REFERENCE BOOK

1. G.P. Sutton, "Rocket Propulsion Elements", Oscar Biblarz, 2010, (ISBN-13: 978-0470080245)
2. A.H. Shapiro, "Dynamics and Thermodynamics of Compressible fluid Flow", John Wiley & Sons; Volume 1 edition (1 March 1977), (ISBN-13: 978-0471066910)
3. Robert D. Zucker Oscar Biblarz, "Fundamentals of Gas Dynamics", Wiley; 2 edition (July 15, 2002), (ISBN-13: 978-0471059677)
4. N.J. Zucrow, "Aircraft and Missile Propulsion", vol.1 & II, John Wiley, 1975, (ISBN-13: 978-1124142098)
5. Gas Turbines, V. Ganesan, Tata McGraw Hill Publishing Co., New Delhi, 1999. (ISBN: 9780070681927)
6. Anderson, Modern compressible flow, 3e McGraw Hill Education, 2012

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2021
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Advanced Air Conditioning & Refrigeration Tech
	COURSE CODE	ME671
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME671.CEO.1: To Tell variety of air conditioning systems and its applications
ME671.CEO.2: To state complete control systems and its choice
ME671.CEO.3: To Apply various methods in duct system design.
ME671.CEO.4: To Solve numericals on Applied Psychrometry and summer and winter load calculations

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME671.CO.1: Solve numericals on Applied Psychrometry and summer and winter load calculations
ME671.CO.2: Apply various methods in design of duct system
ME671.CO.3: State variety of air conditioning systems, its applications, complete control systems and its choice

THEORY COURSE CONTENT		
UNIT 1	**Multipressure systems**	**6 HOURS**
Introduction, need of multistage system, Intermediate pressure, two stage compression with flash gas removal and liquid intercooler, single compressor with multiple evaporator: individual and multiple expansion valves, individual compressors, cascade system: application and numerical (numerical only by using p-h chart).		
UNIT 2	**Thermal Comfort**	**6 HOURS**
Thermal comfort, Heat transfer from human body by sensible and latent heat transfer. Metabolic heat generation, steady state and unsteady state model for heat transfer, effect of clothing and definition of effective temperatures. PMV and PPD. ASHRAE comfort chart, Infiltration and ventilation, Indoor Air Quality (IAQ), Sources of indoor air pollution, Methods of control of IAQ, Fresh air requirements for IAQ.		
UNIT 3	**Heating and Cooling load calculations**	**6 HOURS**
Differences between winter and summer load calculations, Inside and Outside design conditions, Various sources of the internal and external heat gains, heat losses, Solar radiation, Solar radiation through glass, SHGC and shading coefficients, Heat transfer through building structure, Methods of heat load calculations, Numerical on summer and winter load calculations.		
UNIT 4	**Advanced system design**	**6 HOURS**
Load estimating: comfort conditions, weather data, solar heat gain, cooling and heating loads. Air-conditioning systems: central and unitary systems, duct design and fan selection, heating and cooling coil design, cooling tower design and selection, air cleaners and scrubbers, hydronic heating and cooling systems, humidification and dehumidification equipement, automatic controls, noise reduction. Energy conservation and air conditioning for special applications: waste heat, recovery, cogeneration of power and refrigeration, industrial air conditioning, textile processing, clean spaces.		
UNIT 5	**Air conditioning systems**	**6 HOURS**
All air systems, All water systems, Air water systems, Direct Refrigerant, Unitary systems, Chilled ceilings and chilled beams, displacement ventilation, VAV Air Conditioning, Air cooled VRV (VRF) systems, Water cooled VRV (VRF), Two stage Evaporative cooling, Desiccant Dehumidification, Heat Pumps and their types Air Conditioning applications –Supermarkets, Restaurants, Kitchen exhaust ventilation systems Hospitals, Office buildings.		
UNIT 6	**Control systems for Refrigeration and Air conditioning applications**	**6 HOURS**
Closed loop and open loop control systems, Choice of control systems, Types of control action, Energy sources, controllers and controlled devices, Control based on space temperature, Control based on outside temperature, Control based on heating and cooling medium, Control of humidity, Complete control systems.		

TEXT BOOK

1. Jan F.Kredier, "Handbook of Heating, Ventilation and Air Conditioning" CRC Press LLC, 1st edition, Year-2000, (ISBN 9780849395840).
2. C P Arora, "Refrigeration and Air conditioning", Tata McGraw Hill Publication, 3rd edition,Year-2008, (ISBN-13:9780070083905).

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Industrial Hydraulics and Pneumatics
	COURSE CODE	ME672
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : Advanced Fluid Mechanics

COURSE OBJECTIVES :

ME672.CEO.1: To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.

ME672.CEO.2: To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.

ME672.CEO.3: To evaluate the hydraulic or pneumatic devices for their performance.

ME672.CEO.4: To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

ME672.CEO.5: To design suitable hydraulic and pneumatic circuit for given application.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME672.CO.1: Explain the Fluid power and operation of different types of devices.

ME672.CO.2: Summarize the features and functions of actuators and Flow control valves.

ME672.CO.3: Explain the different types of Hydraulic circuits and systems.

ME672.CO.4: Explain the working of different pneumatic circuits and systems.

ME672.CO.5: Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.

THEORY COURSE CONTENT		
UNIT 1	**Introduction to Industrial Fluid Power Systems**	**6 HOURS**
Fluid power and its history. Governing laws for fluid flow: Pascal's law, continuity equation, Bernoulli's theorem, Boyle's, Charles's. Working fluids used in hydraulic & pneumatic systems its ISO/BIS standards and designations, properties, advantages and limitations. Hydraulic systems - concept, application, advantages and limitations. Pneumatic systems - concept, application, advantages and limitations.		
UNIT 2	**Devices in Hydraulic and Pneumatic system**	**6 HOURS**
Control valves and its types. Directions control valves and its types-symbolic representation, construction, function. Pressure control valves and its types- symbolic representation, construction, function. Flow control valves and its types-symbolic representation, construction, function. Actuator and its type. Hydraulic motors and cylinders-single and double acting cylinder, symbolic representation of hydraulic actuators, cylinders and motors. Construction and working of rotary actuators such as gear, vane, piston motors, Compressors.		
UNIT 3	**Basic Hydraulics and pneumatics systems**	**6 HOURS**
Basic Hydraulic System. Types, construction, working, applications and selection criteria. Hydraulic Pumps, Hydraulic Actuators, cylinder cushions and mountings. Hydraulic Control valves, Hydraulic Accessories Basic Pneumatic System- types, construction, working, application, selection criteria. Applications of following air preparation and conditioning elements: Air compressors. Air receivers and air dryers. Air Filters, Regulators, Lubricators (FRL unit). Pneumatic Actuators, Pneumatic Control valves.		
UNIT 4	**Hydraulic and pneumatic circuits designs**	**6 HOURS**
Design of circuits for Drilling, Planning, Shaping, Punching, Press. Electro-pneumatic circuits. Sequential circuit design for a simple application using cascade method, Selection, fault finding and maintenance of hydraulic components, Selection criteria of pneumatic components – Installation fault finding and maintenance of pneumatic components. Hydraulic and Pneumatic power packs.		
UNIT 5	**Installation of hydraulic and pneumatic system**	**6 HOURS**
Causes and remedies for common troubles arising in hydraulic elements. Maintenance of hydraulic systems. Maintenance schedule. Troubleshooting of hydraulic system. Causes and remedies for troubles arising in pneumatic elements. Maintenance of pneumatic system. Maintenance schedule. Troubleshooting of pneumatic system.		
UNIT 6	**Hydro-pneumatics**	**6 HOURS**
Concept, advantages and disadvantages. Types, construction, working, Circuit diagram and application of following hydro pneumatic elements: Air oil reservoir. Hydraulic series check unit. Hydraulic parallel check unit. Hydro pneumatic cylinder. Air oil intensifier. Comparison between hydro pneumatic, hydraulic and pneumatic systems.		

TEXT BOOK

1. Anthony Esposito," Fluid Power with Applications", PHI / Pearson Education, 2005.
2. Douglas M. Considine," Process Instruments and Control Handbook" McGraw-Hill, New York. 1985
3. Majumdar, S.R., "Pneumatic Systems – Principles and Maintenance", Tata McGraw Hill, 2007.

REFERENCE BOOK

1. Andrew Jaico, "Hydraulic And Pneumatics A Technician's & Engineer's Guide",Butterworth-Heinemann; 3 edition (March 11, 2011) Publishing House, 2/e, 2013, (ISBN-13: 978-0080966748)
2. Noah Manring, "Hydraulic Control Systems", Wiley; 1 edition (April 15, 2005), (ISBN-13: 978-0471693116)
3. Fluid Power Generation, Transmission and Control Jagadeesha, T. Universities Press (India) Private Limited, 1/e, 2014, (ISBN: 9788126539543)
4. Shanmuga sundaram.K, "Hydr aulic and Pneumatic controls", SChand & Co, 2006.
5. Majumdar, S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw Hill, 2001
6. Micheal J, Pinches and Ashby, J.G., "Power Hydraulics", Prentice Hall, 1989.
7. 99 Example of pneumatic application, Author G Prede & D. Schloz Publisher FESTO –AG Germany.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Cryogenics and Vacuum Technology
	COURSE CODE	ME673
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME673.CEO.1: To Recall the fundamentals of cryogenic and vacuum Technology
ME673.CEO.2: To Summarize various cryogenic and Vacuum operated system
ME673.CEO.3: To Identify the safety techniques for cryogenic and vacuum system
ME673.CEO.4: To Discover the advance application of Cryogenic Engineering

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME673.CO.1: Recall the fundamentals of cryogenic and vacuum Technology
ME673.CO.2: Summarize various cryogenic and Vacuum operated machines
ME673.CO.3: Identify the safety techniques for cryogenic and vacuum system
ME673.CO.4: Discover the advance application of Cryogenic Engineering

THEORY COURSE CONTENT		
UNIT 1	**Introduction to Cryogenic Systems**	**6 HOURS**
Introduction to Cryogenic and its applications, Properties of Cryogenic fluids, Properties of Material at Cryogenic temperature, Gas liquefaction and refrigeration system ,Gas separation and Purification		
UNIT 2	**Thermodynamics of Cryogenic system**	**8 HOURS**
Thermodynamic Cycles in Cryogenics: Carnot Liquefaction Cycle, F.O.M. and Yield of Liquefaction Cycles. Inversion Curve - Joule Thomson Effect. Liquefaction Cycles: Linde- Hampson Cycle, Precooled Linde- Hampson Cycle, Claudes Cycle, Collins Cycle, Dual Pressure Cycle **Cryogenic Refrigerators:** J.T. Cryocoolers, Stirling Cycle Refrigerators, G.M. Cryocoolers .Pulse Tube Refrigerators, Regenerators used in Cryogenic Refrigerators, Magnetic Refrigerators Storage and transfer of Cryogenic liquids **Cryogenic Insulations. Cryostat design. Safety in Cryogenics**		
UNIT 3	**Vacuum Techniques**	**8 HOURS**
Basic Theory of Vacuum Techniques: Gas kinetic theory, pressure, conductance, gas flow regimes, vapour pressure, pumping speed, throughput. **Vacuum Pumps:** Mechanical, diffusion, molecular drag, turbo molecular, cryopumps, ion pumps - general working principles, operating regimes. **Vacuum Instrumentation**: Vacuum gauges, gas regulators, flow meters, residual gas analyzers, interpretation of data. Design Concepts: Materials, chambers, components, joins, seals, valves. Overall system design and integration. **Problem Solving**: Leak detection and detectors, gas signatures. **Vacuum Applications:** Freeze drying, packaging, vacuum coating, microelectronics, particle accelerators, distillation, metallurgical processes, television and X-ray tubes, cryogenic insulation, space simulation.		
UNIT 4	**Advanced Application in Cryogenics**	**6 HOURS**
Vortex tube and applications, Cryogenic Engine for space vehicles Cryogenic Applications: Applications in gas industry cryogenic fluids space research, Cryobiology, food processing, electronics nuclear and high energy physics, chemical Processing metal manufacturing cryogenic power generation, medicine, analytical Physics and chemistry.		

REFERENCE BOOK

1. Barron R. F., "Cryogenic Systems", 2nd Ed., Oxford University Press, 1985, (ISBN-0-19-503567-4).
2. Timmerhaus K. D. and Flynn T. M., "Cryogenic Process Engineering", 1st ed., Springer, 1989, ISBN-0-19-503567-4. ISBN-10: 1468487582, (ISBN-13: 978-1468487589)
3. Randall F. Barron, "Cryo genics Systems", Second Edition Oxford Univesity Press New York, Clarendon Press, Oxford, 1985. ISBN: 0195035674 9780195035674.
4. V.V. Rao, T.B. Ghosh, K.L. Chopra,, Vacuum Science and Technology, Allied Publishers Ltd., New Delhi, ISBN: 9788170237631, 8170237637
5. A. Roth, Vacuum Technology, North Holland Publishing Company, Amsterdam ISBN 10: 0444108017 / ISBN 13: 9780444108012.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Steam Engineering
	COURSE CODE	ME674
	COURSE CREDITS	3
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	NIL	60	40	NIL	NIL	100

PRE-REQUISITE : Advanced Thermodynamics and Combustion Technology.

COURSE OBJECTIVES :

ME674.CEO.1: To recall the fundamentals of boilers and significance of mountings and accessories.
ME674.CEO.2: To apply energy conservation principle for steam generation
ME674.CEO.3: To analyze the performance of boilers.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME674.CO.1: Recall basics of steam piping system, its components for a process and also economical and effective insulation.
ME674.CO.2: Apply knowledge of thermal system for sources of waste heat design a systems for waste heat recovery.
ME674.CO.3: Develop controls and instrumentation for effective monitoring of the process.
ME674.CO.4: Design a steam piping system, its components for a process and also economical and effective insulation.

THEORY COURSE CONTENT		
UNIT 1	**Introduction**	**7 HOURS**
Fundamentals of steam generation, Quality of steam, Use of steam table, Mollier Chart, Sub critical and Super critical Steam Generators, Fluidized Bed Boilers, Mountings and Accessories, Combustion stoichiometry in boilers, Determination of adiabatic flame temperature, quantity of flue gases, Boiler water treatment - need, types / methodology, IBR, Boiler standards.		
UNIT 2	**Piping & Insulation**	**5 HOURS**
Water Line, Steam line design and insulation; Insulation-types and application, Economic thickness of insulation, Heat savings and application criteria, Refractory-types, selection and applications. Piping accessories: Valves (types, selection and characteristics) moisture separators, strainers etc.		
UNIT 3	**Steam Systems**	**5 HOURS**
Assessment of steam distribution losses, Steam leakages, Steam traps and trap monitoring, Condensate and flash steam recovery system, Steam Engineering Practices; Steam Based Equipment's / Systems: Steam operated pumps, Flash vessels, Stalling etc.		
UNIT 4	**Boiler Performance Assessment**	**8 HOURS**
Performance Test codes and procedure, Boiler Efficiency, Analysis of losses; performance evaluation of accessories; factors affecting boiler performance. Chimney height, Chimney Efficiency, Condition for maximum discharge. Reheat-regenerative cycle, binary cycle, topping and superimposed cycle.		
UNIT 5	**Energy Conservation and Waste Minimization**	**5 HOURS**
Energy conservation options in Boiler; waste minimization, methodology; economic viability of waste minimization. Steam Audit and Performance matrix of steam systems.		
UNIT 6	**Instrumentation & Control**	**6 HOURS**
Consideration of modern steam generators, Process instrumentation; control and monitoring. Need, types, applications for flow, pressure and temperature measuring and controlling instruments.		

TEXT BOOK

1. T. D. Estop, A. McConkey, Applied Thermodynamics, Parson Publication.
2. Domkundwar; a Course in Power Plant Engineering; Dhanapat Rai and Sons.
3. Yunus A. Cengel and Boles, "Engineering Thermodynamics ", Tata McGraw-Hill Publishing Co. Ltd.

REFERENCE BOOK

1. Energy Efficiency in Thermal Utilities; Bureau of Energy Efficiency.
2. Energy Performance Assessment for Equipment & Utility Systems; Bureau of Energy Efficiency.
3. Edited by J. B. Kitto & S C Stultz; Steam: Its Generation and Use; The Babcock and Wilcox Company.
4. P. Chatopadhyay; Boiler Operation Engineering: Questions and Answes; Tata McGrawHill Education Pvt Ltd, N Delhi.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Project-II
	COURSE CODE	ME651
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
NIL	8	NIL	NIL	NIL	50	50	100

PRE-REQUISITE : Project-I

COURSE OBJECTIVES :

ME651.CEO.1: To analyze and design the idea/ real time industrial problem/ current application from engineering domain

ME651.CEO.2: To evaluate an alternative approaches and justify the use of selected tools and methods

ME651.CEO.3: To inculcate skills in engineering product design and development process, budgeting, Planning, testing, effective trouble-shooting practices.

ME651.CEO.4: To understand the roles and responsibility, accountability and learn team work ethics.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME651.CO.1: Design the real life problems by applying the knowledge and problem solving ability.

ME651.CO.2: Analyze alternative approaches, find feasible solution and apply most appropriate one.

ME651.CO.3: Use standard engineering tools and processes for analysis, design, simulation, testing, implementation and deployment of idea into practice.

ME651.CO.4: Participate effectively in multidisciplinary and heterogeneous teams exhibiting team work.

CONTENTS

Project Stage II is related with Goals and Objectives, System Architecture, Algorithm/Methodology. Project report submission and mid trimester presentation will be conducted by department based on following points,

- Literature survey
- Motivation and Problem Statement
- Goals and Objectives
- Problem statement
- System Architecture
- System Analysis and Design
- UML, DFD, Design Details
- Proposed Algorithm
- Expected Outcome and Result

Preparation of manuscript (paper) on Literature survey Final Project Stage II Report submission and Presentation shall be conducted at the end of the trimester. End-Trimester Assessment (ETA) presentation shall be conducted in front of eminent expert from Academics or Industry.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Project-III
	COURSE CODE	ME652
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
NIL	20	NIL	NIL	NIL	150	50	200

PRE-REQUISITE : Project-II

COURSE OBJECTIVES :

ME652.CEO.1: To inculcate skills in engineering product design and development process, budgeting, Planning, testing, effective trouble-shooting practices.
ME652.CEO.2: To follow the standard guideline to meet the objective for development of Project.
ME652.CEO.3: To understand the roles and responsibility, accountability and learn team work ethics.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME652.CO.1: Design the real life problems by applying the knowledge and problem solving ability.
ME652.CO.2: Use standard engineering tools and processes for analysis, design, simulation, testing, implementation and deployment of idea into practice.
ME652.CO.3: Show the evidence of independent evaluation.
ME652.CO.4: Critically analyzed the result and their implementation methodology.

CONTENTS

Project Stage III is related with Design, Algorithm /Methodology Implementation Results. Project report submission and mid trimester presentation will be conducted by department based on following points,

- Literature survey
- Motivation and Problem Statement
- Goals and Objectives
- Problem statement
- System Architecture
- System Analysis and Design (UML, DFD, Design Details)
- Proposed Algorithm
- Methodology/Approach
- Implementation
- Results
- Preparation of manuscript (paper) on Literature survey as mentioned in Project Work II
- Preparation of manuscript (paper) on analysis and design
- Publication details of paper on Literature survey and Design (Peer reviewed International conference like IEEE, ACM, Elsevier, Springer etc)

Final Project Stage III Report submission and Presentation shall be conducted at the end of the trimester. End-Trimester Assessment (ETA) presentation shall be conducted in front of eminent expert from Academics or Industry

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2020 – 2022)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
SECOND YEAR MASTER OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Project-IV
	COURSE CODE	ME653
	COURSE CREDITS	10
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MCE	ECE	IA	PRACTICAL	DEMONSTRATION	
NIL	20	NIL	NIL	NIL	200	100	300

PRE-REQUISITE : Project-III

COURSE OBJECTIVES :

ME653.CEO.1: To follow the standard guideline to meet the objective for development of Project
ME653.CEO.2: To test rigorously before deployment of Systems
ME653.CEO.3: To Verify and Validate the work Undertaken
ME653.CEO.4: To Consolidate the work and preparation of final report

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME653.CO.1: Show the evidence of independent evaluation.
ME653.CO.2: Critically analyzed the result and their implementation methodology.
ME653.CO.3: Validate the results with standard tools and techniques.
ME653.CO.4: Understand the importance of documentation and report writing.

CONTENTS

Project work IV is related with Analysis Design, algorithm/methodology, implementation, Results, Result analysis using various charts/graphs, Project report submission and end trimester presentation will be conducted by department based in following points.

- Literature survey
- Motivation and Problem Statement
- Goals and Objectives
- System architecture
- System analysis and design (UML, DFD, Design Details)
- Proposed Algorithm
- Methodology/Approach
- Implementation
- Result Analysis and discussions
- Conclusions and future scope
- Preparation of manuscript (paper) on literature survey as mentioned in project work –II.
- Preparation on manuscript (paper) on design as mentioned in Project work –III.
- Publication details of paper on Literature survey and Design (Peer reviewed International conference like IEEE, ACM, Elsevier, Springer etc. as mentioned in project Work – III)

Publication details of paper on Result analysis (Peer reviewed / free International Journal) Final Project Stage IV Report submission and Presentation shall be conducted at the end of the trimester. End-Trimester Assessment (ETA) presentation shall be conducted in front of eminent expert from Academics or Industry.