।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील अभियांत्रीकीच्या पदवी स्तरावरील अंतीम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील अभियांत्रीकीच्या पदवी स्तरावरील अंतीम वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

B. E. final year - Electrical Engineering

B. E. final year - Computer Engineeing

B. E. final year - Mechanical Engineering

B. E. final year - Civil Engineering

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.

जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२१–२२/८९

दिनांक : २४.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
"DNYANTEERTH", VISHNUPURI, NANDED

PROPOSED CURRICULUM FOR
B.E. (MECHANICAL ENGINEERING)
(CGPA Revised)
w.e.f. 2021-22

Teaching Scheme – B. E. (Final Year) Mechanical Engineering (CGPA Revised)

SEMESTER – VII **Effective from 2021 - 2022**

Sr. No.	Category	Sub Code	Subject	Teaching Scheme				Marking Scheme					Theory Total	Semester Total
				TH	P	T	CR	PR	OR	TW	MSE	ESE		
1	Professional Core Course	PCC ME 701	Automation in Manufacturing	3	2		4		25#	25	30	70	100	150
2	Professional Core Elective Course	PCEC MEL 702 A To D	Elective III	3			3			25	30	70	100	125
3	Professional Core Elective Course	PCEC MEL 702 A To D	Elective IV	3			3			25	30	70	100	125
4	Open Elective Course	OEC 703 A-B	Open Elective-II	2		1	3			50	15	35	50	100
5	Professional Core Course	PCC ME 704	Mechanical Engineering Lab III (Analysis)		4		2	50@		25				75
6	Humanities and Social Sciences including Management Course	HSMC 705	Interview technique and Mock Exercise		2		1		25@	25				50
7	Mini Project	PRO ME 706	Mini Project		4		2	50@		25				75
8	Industrial Training-II	IT ME 707	Industrial Training-II	2			2		50@	50				100
9	Mandatory Course	MC ME 708	NPTEL Course III		2		1							
			Semester Total	13	14	01	21	**100**	**100**	**250**	105	245	**350**	**800**

TH – Theory , P– Practical, T – Tutorial , CR – Credit , PR – Practical OR – Oral , TW – Term work, MSE – Minor Semester Examination, ESE – End Semester Examination, @- Internal Assessment, # - External Assessment.

PCEC ME 702- A - Refrigeration and Air Conditioning
PCEC ME 702- B - Finite Element Method
PCEC ME 702- C - Power Plant Engineering
PCEC ME 702- D - Gas Dy. and Jet Propulsion

OEC 703 A - Product Design and Development
OEC 703 B - Maintenance and Reliability

Dr. M. K. Rodge
S.G.G.S.I.E. & T,
Vishnupuri, Nanded

Mr. S. S. Deolgaonkar
GRACE
Vishnupuri, Nanded

Dr. R. S. Kamble
GRACE
Vishnupuri, Nanded

(Chairman)
Dean Engineering
SRTM University Nanded

Teaching Scheme –B. E. (Final Year) Mechanical Engineering (CGPA Revised)

SEMESTER – VIII **Effective from 2021 - 2022**

Sr. No.	Category	Sub Code	Subject	Teaching Scheme				Marking Scheme					Theory Total	Semester Total
				TH	P	T	CR	PR	OR	TW	MSE	ESE		
1	Professional Core Elective Course	PCEC MEL 801 A to E	Elective V	3			3		25@	25	30	70	100	150
2	Professional Core Elective Course	PCEC MEL 801 A to E	Elective VI	3			3		25@	25	30	70	100	150
3	Open Elective Course	OEC 802 A to D	Open Elective III	2		1	3			50	15	35	50	100
4	Open Elective Course	OEC 802 A to D	Open Elective IV	2		1	3			50	15	35	50	100
5	Humanities and Social Sciences including Management Course	HSMC 803	Entrepreneurship Development		2		1		25 @	25				50
6	Final Project & Seminar	PRO ME 804	Final Project & Seminar		10		5		100@ 100 #	50				250
7	Mandatory Course	MC ME 805	NPTEL Course IV		2		1							
			Semester Total	10	14	02	19		**275**	**225**	90	210	**300**	**800**

TH – Theory , P– Practical, T – Tutorial , CR – Credit , PR – Practical, OR – Oral , TW – Term work, MSE – Minor Semester Examination, ESE – End Semester Examination, @- Internal Assessment, # - External Assessment.

PCEC MEL 801 A - Industrial Engineering and Management
PCEC MEL 801 B - Automobile Engineering
PCEC MEL 801 C - Design of Transmission System
PCEC MEL 801 D - Total Quality Management
PCEC MEL 801 E - Machine Tool Design

OEC 802 A - Numerical Methods for Engineer
OEC 802 B - Internet of Things
OEC 802 C - Cyber Law and Ethics
OEC 802 D - Artificial Intelligence.

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(Chairman)
Dean Engineering
SRTM University Nanded

Mechanical Engineering

Seventh Semester

Curriculum Details

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Automation in Manufacturing

Subject Code : PCC-ME-701

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	--	2	4	30	70	--	25#	25	150

Course Objectives:

The course is designed to address the following:

1. The aim of the course is to understand the importance of automation in the of field machine tool based manufacturing
2. To get the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC
3. To understand the basics of control system and the role of manufacturing automation

Contents:

Module 1: Introduction to Automation (10 Hrs)

Introduction: Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation, Fixed Automation, Programmable Automation. Automation Principles and Strategies.

Module 2: Computer Control of Machine Tools (10 Hrs)

Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing, Computer process control, Continuous versus discrete control, Forms of Computer process Control.

Module 3: Computer Aided Design (08 Hrs)

Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods, Solid Modeling Techniques, Visual realism, Computer Animation.

Module 4: Computer Aided Manufacturing (08 Hrs)

Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC Adaptive Control Low cost automation, Tool path generations & verifications, standard controllers, digital manufacturing.

Module 5: Mechanical & Electro mechanical Systems (10 Hrs)

Pneumatics and Hydraulics, Illustrative Examples and case studies Introduction to Modeling and Simulation: Pneumatic sensors & amplifiers, Logic devices, developing pneumatic circuits for automatic die casting machine, Boolean algebra.

List of Experiments: - (The Term Work shall consists the record of minimum of **eight** experiments out of the following list)

1. To operate CNC Machine & try to change different parameters & controls to see their effect during machining.
2. To prepare CNC part program using G & M code for simple pocket milling operation.
3. To prepare CNC part program using G & M code for plain turning, step turning & taper turning operation.
4. To prepare CNC part program using G & M code for simple contour milling operation or drilling operation by using subroutine.
5. To prepare CNC part program using G & M code for plain turning, step turning & taper turning operation by using canned cycle.
6. To perform manufacturing simulation, by importing solid model into CAM environment of any CAM software.
7. To observe & use Flexible station in an industry.
8. To do simulation for manufacturing operation.
9. To develop any solid model assembly & detail using CAD modeling packages.
10. To study the hardware of a retrofit and CNC machine tools.
11. To simulate machining of component using PRO- E.
12. Selection of various equipments required with the specifications from Internet/Catalogue: To convert a manual machine tool/system into an automatic machine tool/system.
13. Study and applications of Hydraulic software
14. Study and applications of Pneumatic software.
15. Study and applications of PLC software.
16. To design an automated part feeder.
17. Developing pneumatic circuits for machines and systems.

Course Outcomes:

After learning the course the students should be able to:

CO1 To Understand the basics of Automation & Control system in Manufacturing.

CO2 To use fundamentals of FMS & Automation principle in manufacturing.

CO3 To apply concepts of soft & hard Automation.

CO4 To understand functioning of NC machines, CNC machines, CAD, CAM.

Text Books:

1. Mikell P. Groover, Automation, Production Systems, and Computer-integrated Manufacturing, prentice Hall
2. SeropeKalpakjian and Steven R. Schmid, Manufacturing – Engineering and Technology, 7th edition, Pearson
3. P.N. Rao "CAD/CAM: Principles and applications" Tata McGraw Hill, New Delhi. ISBN: 0070583730 7.
4. P.N. Rao, N.K. Tewari, T.K. Kundra "Computer Aided Manufacturing" Tata McGraw Hill, New Delhi. ISBN: 9780074631034

Reference Books:

1. Paul G. Ranky "Computer Integrated Manufacturing: an introduction with case studies" Prentice-Hall International. ISBN: 0131656554
2. J. N. Reddy "An Introduction to Finite element Methods" Tata McGraw Hill. ISBN: 0072466855
3. Nanua Singh "Systems approach to computer-integrated design and manufacturing" Wiley. ISBN: 0471585173
4. David D. Bedworth, Mark R. Henderson and Philip M. Wolfe "Computer Integrated design and Manufacturing", McGraw-Hill, ISBN: 0070042047
5. Nick Dawkins - Automation and Controls
6. Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang - Computer Aided Manufacturing, Pearson 2009 3. Peter G. Martin and Gregory Hale - Automation Made Easy

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Refrigeration and Air conditioning

Subject Code : PCEC MEL 702- A

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	--	--	3	30	70	--	--	25	125

Course Objectives:

The course is designed to address the following:

1. Learning the fundamental principles and different methods of refrigeration and air conditioning.
2. Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
3. Comparative study of different refrigerants with respect to properties, applications and environmental issues.
4. Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
5. Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

Contents:

Module 1: Fundamentals and Applications of Refrigeration and Air Conditioning (08 Hrs.)

Reverse Carnot cycle, block diagram of refrigerator & heat pump (numerical), modified reverse Carnot cycle (Bell Coleman cycle)

Applications Domestic Refrigerator, Domestic Air Conditioners, Automotive Air Conditioners, Evaporative coolers, water coolers, Commercial Refrigeration- Dairy, Cold storage, Ice plant, Commercial Air Conditioning

Module 2: Refrigerants and Vapor Compression (08 Hrs.)

Refrigerants Classification of refrigerants, Desirable properties of refrigerants, environmental issues, Ozone depletion and global warming, ODP, GWP, selection of environment friendly refrigerants, secondary refrigerants, anti-freeze solutions

Vapour Compression Cycle Working of simple vapour compression system, representation of vapour compression cycle (VCC) on T-s and P-h diagram, COP, effect of operating parameters on performance of VCC, actual VCC, methods of improving COP using flash chamber, sub-cooling

Module 3: Refrigeration Systems (10 Hrs.)

Vapour absorption systems: Introduction, Working of simple vapour absorption system (VAS), desirable properties of binary mixture (aqua-ammonia), performance evaluation of simple VAS (simple numerical treatment), actual VAS, Li- Br absorption system, three fluid system (Electrolux refrigeration), applications of VAS, comparison between VCC and VAC

Module 4: Psychometric and Air conditioning (08 Hrs.)

Heat exchangers classification, Overall Heat transfer coefficient, heat exchanger analysis- use of log mean temperature difference (LMTD) for parallel & counter flow heat exchangers, Special case of condensers & evaporators and heat exchangers where heat capacities of fluids are same, The effectiveness-NTU method for parallel and counter flow heat exchangers.

Module 5: Components of refrigeration and air conditioning systems & Air Conditioning Systems (08 Hr.)

Components of refrigeration and air conditioning systems Working of reciprocating, screw and scroll compressors, working of air cooled, water cooled and evaporative condensers, Working of DX, Flooded, forced feed evaporators, Expansion devices – Capillary tube, TXV, EXV, operating and safety controls.

Working of summer, winter and all year-round AC systems, unitary and central air conditioning, Window Air Conditioning, Split Air Conditioning.

Module 6 Air Distribution Systems (06 Hrs.)

Air handling unit, Classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct (friction losses, dynamic losses), air flow through simple duct system, equivalent diameter, methods of duct system design: equal friction, velocity reduction, static regain method (numerical on duct system design)

Term Work

Term work shall consist of assignments on each module.

Course Outcomes:

After learning the course the students should be able to:

CO1 Illustrate the fundamental principles and applications of refrigeration and air conditioning system
CO2 Obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems
CO3 Present the properties, applications and environmental issues of different refrigerants
CO4 Calculate cooling load for air conditioning systems used for various applications
CO5 Operate and analyze the refrigeration and air conditioning systems**.**

Text Books:

1. 1.Arora C. P., Refrigeration and Air Conditioning, Tata McGraw-Hill
2. Manohar Prasad, Refrigeration and Air Conditioning, Willey Eastern Ltd, 1983
3. McQuiston, ― Heating Ventilating and air Conditioning: Analysis and Design‖ 6th Edition, Wiley India
4. Arora and Domkundwar, Refrigeration & Air Conditioning, Dhanpatrai & Company, New Delhi
5. Khurmi R.S. and Gupta J.K., Refrigeration and Air conditioning, Eurasia Publishing House Pvt. Ltd, New Delhi,1994.
6. Ballaney P.L., Refrigeration and Air conditioning, Khanna Publishers, New Delhi, 1992

Reference Books:

1. Dossat Ray J, Principles of refrigeration, S.I. version, Willey Eastern Ltd, 2000
2. Stockers W.F and Jones J.W., Refrigeration and Air conditioning, McGraw Hill International editions 1982.
3. Threlkeld J.L, Thermal Environmental Engineering, Prentice Hall Inc., New Delhi
4. Aanatnarayan, Basics of refrigeration and Air Conditioning, Tata McGraw Hill Publications
5. Roger Legg, Air Conditioning System Design, Commissioning and Maintenance
6. ASHRAE & ISHRAE handbook

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Finite Element Method

Subject Code : PCEC MEL 702- B

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	--	--	3	30	70	--	--	25	125

Course Objectives:

The course is designed to address the following:

1. To notify with applications of numerical techniques for solving problems.
2. To introduce the concepts of Mathematical Modeling of Engineering Problems.
3. To understand the importance of FEM to a range of Engineering Problems.
4. To explain the fundamentals of finite element analysis of solids and structures.

Contents:

Module 1 Introduction (06 hrs)

Historical Background, Applications of FEM in various fields, Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains, General description of Finite Element Method, Application and limitations.

Module 2 Description of the Method (08 hrs)

Step wise procedure of Finite element method, Variation techniques for derivation of finite element equations, Assembly procedure, solution methods.

Module 3 One-Dimensional Problems (10 hrs)

One Dimensional Second Order Equations, Discretization, Element types- Linear and Higher order Elements, Types of elements based on geometry, Temperature effects, Variational approach solution techniques, Derivation of Shape functions and Stiffness matrices and force vectors, Assembly of Matrices – Solution of problems from solid mechanics and heat transfer.

Module 4 FEA of Two Dimensional Problems (10 hrs)

Introduction, FE modeling, Formulation of constant strain triangular element, Problem modeling and boundary conditions, Application to Field Problems – Thermal problems

Module 5 Isoparametric Formulation (08 hrs)

Isoparametric elements, Shape functions for iso parametric elements The 4- nodes quadrilateral, Numerical integration and Matrix solution techniques Computation of stiffness, matrix and load vectors.

Module 6 Computer Implementation of The Finite Element Method (06 hrs)

Preprocessing, Post Processing and Interpretation of results and design modification

Term Work

Term work shall consist of assignments on each module.

Course Outcome: After learning the course the students should be able to:

CO1 Understand the concept of finite element method to solve various Mechanical Engineering problems.

CO2 Apply the knowledge of FEM for 1D stress analysis and heat transfer analysis.

CO3 Understand the role and significance of shape functions in finite element formulations and use of linear, quadratic, and cubic shape functions for interpolation

CO4 Be aware of global, local, and natural coordinates

CO5 Formulate and solve problems of trusses, beams, planar loading and axisymmetric.

CO6 Understand the formulation of two-dimensional elements (triangle and quadrilateral continuum and shell elements)

Text Books / Reference Books:

1. Reddy. J.N., "An Introduction to the Finite Element Method", 3rd Edition, Tata McGraw-Hill, 2005
2. Introduction to Finite Element Method in Engineering by S.S.Rao, Butterworth Heinmann Publication.
3. Finite Elements in engineering, Chandrupatla T. R., 2nd Edition, PHI,2000
4. Finite Element Procedures by Bathe K.J., Prentice Hall of India, New Delhi.
5. Concepts and Applications of Finite Element Analysis, R D Cook, Wiley India.Finite Element Method with applications in Engineering – Desai- Pearson Education ANSYS & other software manuals.

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Power Plant Engineering

Subject Code : PCEC-MEL-702-C

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	--	--	3	30	70	--	--	25	125

Course Objectives:

The course is designed to address the following:

1. To provide an overview of power plants and the associated energy conversion issues.

Contents:

Module 1: Coal based thermal power plants (12 Hrs)

Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration

Module 2: Systems Gas turbine and combined cycle power plants (08 Hrs)

Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

Module 3: Systems Gas turbine and combined cycle power plants (10 Hrs)

Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

Module 4: Power from Renewable Energy Sources (10 Hrs)

Hydroelectric power plants, classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems Energy

Module 5: Energy, Economic and Environmental Issues of Power Plants (10 Hrs)

Economic and environmental issues, power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

Term Work

Term work shall consist of assignments on each module.

Course Outcomes:

After learning the course the students should be able to:

CO1 Explain layout , construction and working of the components inside a thermal power plant

CO2 Explain layout, construction and working of the components inside a Diesel, Gas and Combined Cycle Power Plants

CO3 Explain layout , construction and working of the components inside a Nuclear Power Plant

CO4 Explain layout , construction and working of the components inside Renewable Energy Power Plants

CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of the environmental hazards and estimate the costs of the electrical energy production

Text Books:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.

2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

3. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Gas Dynamics and Jet Propulsion

Subject Code : PCEC MEL 702- D

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	--	--	3	30	70	--	--	25	125

Course Objectives:

The course is designed to address the following:

1. To understand the features of compressible isentropic flows and irreversibilities like shocks.
2. To understand the basics of subsonic and supersonic flow.
3. To provide a basic knowledge of jet and rocket propulsion technologies.
4. To understand the working principles of Jet propulsion.

Contents:

Module 1 Introduction (10 hrs)

Basic Concepts: Compressible flow, definition, Mach waves and Mach cone, stagnation states, Mass, momentum and energy equations of one-dimensional flow, Isentropic flow through variable area ducts,

Module 2 Isentropic Flow (08 hrs)

Isentropic Flow: nozzle s and diffusers, subsonic and supersonic flow I variable area ducts, choked flow, Area-Mach number relations for isentropic flow Non-isentropic flow in constant area ducts, Rayleigh and Fanno flows,

Module 3 Normal and Oblique Shocks (08 hrs)

Normal shock relations, oblique shock relations, Variation of flow parameters across the normal and oblique shocks - Prandtl Meyer relations – Expansion of supersonic flow, Use of table and charts - Applications. isentropic and shock tables

Module 4 Jet Propulsion (10 hrs)

Theory of jet propulsion, thrust equation, thrust power and propulsive efficiency, Operating principle and cycle analysis of ramjet, turbojet, turbofan and turboprop engines.

Module 5 Space Propulsion (10 hrs)

Types of rocket engines, propellants & feeding systems, ignition and combustion, theory of rocket propulsion, performance study, staging, terminal and characteristic velocity, space flights

Term Work

Term work shall consist of assignments on each module.

Course Outcomes: After completing of this course, students will be able to;

CO1 Understand the thermodynamic cycles of jet engines.

CO2 Understand the basics of compressible fluid flow in inlets of compressors and turbines.

CO3 Analyze Jet engines; determine propulsion efficiency and design of inlets and outlets.

CO4 Understand the Jet propulsion systems working principles.

Text Books:

1. Ahmed F. El-Sayed, Aircraft Prpoulsion and Gas Turbine Engines, CRC Press, 2008.

2. H.S. Mukunda, "Understanding Aerospace Chemical Propulsion", Interline Publishing, 2004.

3. Hill P. and Peterson C., Mechanics & Thermodynamics of Propulsion, Addison Wesley, 1992.

4. Zucrow N. J., Aircraft and Missile Propulsion, Vol.I& II, John Wiley, 1975.

5. Sutton G.P., Rocket Propulsion Elements, John Wiley, New York, 1986.

6. Yahya S. M. - 'Compressible Flow' - Tata McGraw Hill India – 2009

Reference Books

M C Ramaswamy, "Gas Dynamics and Space Propulsion" Jaico Publishing House; First edition(1 February 2007)

H W Liepmann and Anatol Roshko, "Elements of Gas Dynamics (Dover Books on Aeronautical Engineering)" Dover Publications (9 April 2013).

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Product Design and Development

Subject Code : OEC-703-A

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	1	--	3	15	35	--	--	50	100

Course Objectives:

The course is designed to address the following:

1. To introduce the product design concept
2. To study the concept of Conceptual design
3. To teach various methods of Industrial design and robust design
4. To provide information on the concept of Design for manufacture and assembly.
5. To explain the importance of the legal factors, social issues, engineering ethics related to product design
6. To introduce the concept of Concurrent engineering, rapid prototyping Content

Content

Module 1 Introduction to Product Design (10 Hrs)

Classification and specification of product, Product life cycle, Product design, Modern product development process, Innovative thinking, Morphology of design

Module 2 Conceptual Design and Design optimization (12 Hrs)

Generation, selection and embodiment of concept, Product Architecture. Industrial design: Process and need Introduction to Robust design concepts: Taguchi Design and DOE. Basics of Design optimization

Module 3 Design for manufacture and assembly (12 Hrs)

Fundamentals of Design for Manufacturing and Assembly, Methods of designing for Mfg. & Assy. Fundamentals of Designs for Maintainability, Designs for Environment. , Product costing. Legal factors and social issues. Engineering ethics and issues of society related to design of products.

Module 4 Concept of Concurrent Engineering, Rapid Prototyping (10 Hrs)

Introduction to Concurrent Engg , Rapid prototyping , Tools for product design – Drafting / Modeling software, CAM Interface. Patents & IP Acts. Overview, Disclosure preparation

Term Work

Term work shall consist of assignments on each module.

Course Outcomes

After completing this course, students will be able to;

CO1 Understand and explain the product design concept

CO2 Understand and explain the concept of Conceptual design

CO3 Explain the concept of Industrial design and robust design concepts.

CO4 Understand the concept of Design for manufacture and assembly.

CO5 Understand the legal factors, social issues, engineering ethics related to product design

CO6 Understand the concept of Concurrent engineering, rapid prototyping

Text Books / Reference Books:

1. Engineering Design by Dieter George E. McGraw Hill Pub. Company, 2000.
2. Product design and development by Ulrich Karl T and Eppinger Steven D., McGraw Hill Pub. Company 1995.
3. Product Design and Manufacture by Chitale AK and Gupta RC, Prentice-Hall of India, New Delhi
4. Handbook of Product Design for Manufacturing, Bralla, James G., McGraw Hill Pub. 1986

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Maintenance and Reliability

Subject Code : OEC 703 B

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	1	--	3	15	35	--	--	50	100

Course Objective:

The course is designed to address the following:

1. To study the fundamental concept of Reliability and Maintenance
2. To study the various types of probability theories
3. To study the reliability systems
4. To study the system reliability analysis
5. To understand the role of Failure Mode, Effects and Criticality Analysis
6. To study the preventive Maintenance, TPM

Course Content:

Module 1 Maintenance Engineering: I (06 Hrs)

Introduction -Fundamentals of Maintenance Engineering, Objectives of maintenance, types of plant maintenance – Breakdown Maintenance, Schedule Maintenance, Preventive Maintenance, Predictive Maintenance, maintainability, factors affecting maintainability, system down time, Maintenance Engineering its importance in material & energy conservation, inventory control , productivity, safety, pollution control etc.,

Module 2 Maintenance Engineering II (08 Hrs)

Total Productive Maintenance (TPM), Maintenance Policy, Spare Parts Management – Characteristics of Spare Parts, Conventional Classification, Codification Concept, Classification of Spares for Stocking policy

Module 3 Fundamental concepts of Reliability (06 Hrs)

Reliability definitions, failure, failure density, failure Rate, hazard rate, Mean Time To Failure (MTTF), Mean Time Between Failure (MTBF), maintainability, availability, modes of

failure, areas of reliability, quality and reliability assurance rules, product liability, importance of reliability.

Module 4 Probability theory (06 Hrs)

Set theory, laws of probability, total probability theorem, probability distributions -binomial, normal, Poisson, lognormal, Weibull, exponential, standard deviation, variance, skew-ness coefficient,

Module 5 System Reliability (06 Hrs)

Type of System - Systems with components in series, Systems with components in parallel, System with component in series and parallel, Systems with standby components; Operating characteristics v curves; Reliability and Life testing plans – Type of Test, life testing plans using exponential distribution

Module 6 Replacement Analysis (08 Hrs)

Introduction, Reason for replacement, factors for Replacing Equipment, Methods used invselection of v Alternatives – Total life average method, Annual cost method, Present worth method,

Term Work

Term work shall consist of assignments on each module.

Course Outcomes

After completing this course, students will be able to;

CO1 Understand the fundamental concept of Reliability and Maintenance & the various types of probability theories.

CO 2 Analyze and use particular maintenance strategies like, predictive, preventive etc.

CO3 Illustrate the role of Failure Mode, Effects and Criticality Analysis

CO4 Adopt Reliability principles in product life cycle management.

Reference Books:

1. S. N. Chary, “Production and Operation Management” –4th Edition, McGraw Hill Publication

2. O. P. Khanna, , “Industrial Engineering and Managemen” –Dhanpat Rai Publication

3. Amitava Mitra, “Quality Control and Improvement” –3rd Edition, John Wiley and Sons.

4. R. C. Mishra, “Maintenance Engineering” PHI

5. Hand Book by Higgins, “Maintenance Engineering” Mc-Graw hill publication.

6. C. E. Ebeling , “Reliability and Maintenance Engineering” Mc-Graw hill publication

7. Balagurusamy, “Reliability Engieering” Tata McGraw-Hill Education.

Text Book

1. Srivastava Sushil Kumar, Maintenance Engineering Principles, Practices & Management, S Chand & Co Ltd.
2. Alakesh Manna, A Textbook of Reliability and Maintenance Engineering, Dreamtech Press (1 February 2020).

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Mechanical Engineering Lab III (Analysis)

Subject Code : PCC-ME-704

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
-	--	4	2	-	-	50 @	--	25	75

Course Objectives:

The course is designed to address the following:

4. To give exposure to software tools needed to analyze engineering problems
5. To expose the students to different applications of simulation and analysis tools

Contents:

1. FEA Software for stress analysis 2-D truss subjected to plane forces

2. FEA Software for modal analysis 1-D beam (simply supported or cantilever beams)

3. FEA Software for frames subjected to transverse forces and moments

4. FEA Software for 1-D temperature analysis

5. Static stress concentration factor calculation for a plate with center hole subjected to axial loading in tension using FEA software.

6.2D Forced convection problem using FEA software.

7. Modal analysis of any machine component using FEA software.

8. Stress and deflection analysis of any machine component consisting of 3-D elements using FEA software.

.**Term Work:**

1. Students should do convergence study for all assignment problems.

2. Use different element types from element library
3. If possible use sub model/symmetry option.

Course Outcomes:

After learning the course the students should be able to:

CO1 Analyze stresses and strains induced in 2-D truss subjected to plane forces

CO2 Analyze stresses and strains induced in 1-D beam (simply supported or cantilever beams)

CO3 Use FEA software for Static stress concentration factor calculation

CO4 Use FEA software to solve 2D Forced convection problem

CO5 Analyze any machine component using FEA software.

CO6 Analyze Stress and deflection of any machine component consisting of 3-D elements using FEA software.

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Interview Techniques and Mock Exercise

Subject Code : HSMC 705

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
--	--	2	1	--	--	--	25@	25	50

Course Objective (s):

The course is designed to address the following:

- To explore the interview skills and techniques to the Engineering aspirants.
- To understand the selection processes and procedures via group discussions, aptitude tests and psychometric tests.
- To inculcate an essential interview etiquettes, manners and a kind of professionalism amongst the aspirants.
- To train budding Engineering for Interview Processes so as to excel in their respective industrial field.

Syllabus Contents:

Module 1: Pre Interview Functions (06 Hrs)

- Know yourself
- Know the Interview Process
- Selection Criteria
- Types of interviews
- Interview Competencies
- Keys to Succeed in Interview

Module 2: Interview Process and Candidates (06 Hrs)

- Candidate Philosophy for Interview
- Reason for Selection and Rejection of Candidates
- Common Mistakes During Interview
- Do’s and Don’ts of Interviews

- Physical Appearances for Interview
- FAQs in the Interview
- **Test 01:** Aptitude Test in Interview
- **Test 02:** Psychometric Test in Interview

Module 3: Group Discussion and Selection Process (06 Hrs)

- Group Discussion: Meaning and Importance
- Why Group Discussion
- Types of Group Discussion
- Essential Skills Required For Group Discussion
- Group Discussion Etiquettes
- Non-Verbal Communication in Group Discussion
- **Test 01: Perform Group Discussion in Classroom**
- **Test 02: Watch Group Discussion Videos**

Module 4: Interview Etiquettes and Manners (06 Hrs)

- Interview Etiquettes and Manners
- Humility, Honesty and Sincerity
- Practicing Good Manners
- Tips for Corporate Grooming
- Professionalism and Socializing Skills
- **Exercise 01 :** Test Your Etiquette
- **Exercise 02 :** Test Your Manners

Module 5 : Preparing Resume (06 Hrs)

- Drafting for Interview
- Drafting Job Application
- Drafting and Sending Emails
- Bio-data, CV and Resume
- Tips for CV/ Resume Writing

Module 6: Interview Exercise (08 Hrs)

- Find out different aptitude tests applied in selection processes of MNC's and prepare for the same.

- Find out and solve 03 question papers of Aptitude Tests to improve your technical competencies.
- Watch group discussion videos and learn group discussion techniques.
- Watch mock interviews of students and identify common mistakes done by them.
- Perform interviews in classroom, record students' performance and reflect upon their mistakes.

Course Outcome (s):

After learning the course the students should be able to:

CO1: Learners would be familiar with different interview skills and techniques employed in the industrial and the corporate world.

CO2: Students would be able to perform well in interview by developing body language, rationalizing their aptitude and attitude for the interview.

CO3: They would be able to participate effectively in group discussions, accept leadership and express their ideas effectively.

CO4: Students would be able to draft effective job applications and resume, CVs accurately as per the needs of the industries.

CO5: Students would develop right frame of mind by learning socializing skills, corporate etiquettes, and manners.

Reference:

1. How to Win interview – Tushar Kokane – Educreation Publications New Delhi
2. Soft Skills – Know yourself and Know your world by Dr.K.Alex – S.Chand and Publications, New Delhi
3. The Ace of Soft Skills, by Gopalswamy Ramesh and Mahadevan Ramesh, Pearson. 2010.

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Mini Project

Subject Code : PRO ME 706

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
--	--	4	2	--	--	50@	--	25	75

Students have to make extensive literature survey and identify the problem in view to complete Final Project of Eighth semester. Problem identification and pre work of the project should be carried out and presented in the department.

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : Industrial Training - II

Subject Code : IT ME 707

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	--	--	2	--	--	--	50@	50	100

Every Student has to undergo 4 weeks industrial training after completion of Sixth Semester Examination, Performance of training will be assessed in the 7 th semester. He has to submit continuous assessment and report of training to the Department and work should be represented in presentation before the Head of Department and faculties and students.

Course Name : Final Year Mechanical Engineering

Semester : Seventh

Subject Title : NPTEL Course - III

Subject Code : MC –ME - 708

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
--	--	2	1	--	--	--	--	--	--

Every Student has to complete minimum four weeks NPTEL web and video course from mechanical engineering department which is available on portal nptel.ac.in. It is preferred that student should attend any one course related to subjects of Fifth semester.

Certification courses are offered twice a year (Jan-Jun, Jul-Dec). Joining a course is free. Learning can be done by watching videos and this is tested by the weekly assignments, which are to be submitted online within the prescribed deadline.

There is a certification examination that the student can take for a nominal fee at the end of the course to earn certificates from the IITs.

To earn credits of this course the students need to produce the NPTEL course completion Certificate and online submitted assignments to the department before end semester practical examination.

Mechanical Engineering

Eighth Semester

Curriculum Details

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Industrial Engineering and Management

Subject Code : PCEC MEL 801- A

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	---	--	3	30	70	--	25@	25	150

Course Objectives:

The course is designed to address the following:

1. Student will understand work system design processes/ tools.
2. Student will understand the production planning activities.
3. Student will understand the quality concepts and its measures.
4. Student will get industry ready by understanding the concepts of TQM, Six Sigma, JIT and ISO.
5. Contribute to the success of companies through effective problem solving technique
6. Effectively manage business operations and project management teams
7. Graduates of the industrial engineering and engineering management program are expected to meet the challenges for contemporary professional practice
8. Able to adapt and solve the increasingly complex problems faced by industry;
9. Embrace innovation through intellectual diversity and creative problem solving; and continue to develop holistically as a learner to become leaders of tomorrow

Course Content:

Work System Design: (12 Hrs)

Productivity – concepts and measurements; method study, micro-motion study, principles of motion economy; work measurement -stop watch time study, work sampling, standard data, PMTS; ergonomics; job evaluation, merit rating.

Production Planning and Inventory Control: (12 Hrs)

Forecasting –time series method, casual methods, moving average, exponential smoothing, trend and seasonality. Layout of Facilities- types of layout, mass or continuous production, The job shop or intermittent system of production, computerized layout system, relationship diagram. Aggregate production planning, master production scheduling, MRP.

Inventory Control : **(10 Hrs)**

Functions, costs, classifications, deterministic models.

Management of Quality: **(12 Hrs)**

The organizational philosophy and the system of quality, Quantitative aspects of quality management, Acceptance sampling, multiple sampling procedures, concept of AOQL, introduction to zero defects, six sigma, total quality management, ISO, JIT.

Term Work

Term work shall consist of assignments on each module.

Oral Examination
It shall consist of an oral based on the above syllabus and term work.

Course Outcomes: After learning the course the students should be able to:

1. This subject also helps a student to be a self-employable by getting knowledge of management techniques.
2. Statistical Knowledge enhances chances to get a certification from worldwide famous organization like ASQ. i.e. American Society for Quality
3. Student will demonstrate Commitment to quality, timeliness, and continuous improvement in production rate in manufacturing sector
4. Enhancing General awareness of Work System Design, Production Planning and Inventory Control, Management of Quality

Text Books:

1.Kanawaty G, (ed.), "Introduction to Work study", fourth edition, ILO 1992.

2. S. N. Chary, "Theory and problems in Production and Operations Management", TATA McGraw Hill publishing company limited, New Delhi 2002.

3.Dr. D. S. Hira and Prem Kumar Gupta, "Operations Research", S. Chand & company, New Dehi.

4.O. P. Khanna, "Industrial Engineering and Management", Dhanpat Rai Publication.

Reference Books

1. Engineering Maintenance Management 2nd Edition, Kindle Edition, by Benjamin W. Niebel.
2. Integrating Productivity and Quality Management (Industrial Engineering , 1995) by Johnson Edosomwan.

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Automobile Engineering

Subject Code : PCEC MEL 801 – B

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	---	--	3	30	70	--	25@	25	150

Course Objectives:

The course is designed to address the following:

1. To inculcate involvement in learning by adapting a holistic approach through well designed curriculum, pedagogy and evaluation for a successful professional career.

2. To provide a strong foundation in physical sciences and analytics to enable comprehensive understanding of the basic principles of Automobile Engineering.

3. To develop knowledge and skill in applying engineering principles to conceive, design, analyze, manufacture, maintain and recycle Automobile Engineering systems and components.

4. To equip the students with essential fundamental knowledge from other relevant disciplines to infuse a multi-disciplinary approach.

5. To empower the students through projects, internships leading to development of creativity, self-confidence and team spirit.

6. To create the ambience with scope for developing communication and life skills so as to meet the needs of the society in the globalized environment

Syllabus:

MODULE 1 (6 Hrs)

General introduction, types of automobiles, classification of automobiles, chassis and body, frames, frameless construction, sub-frames, defects in frames. Different systems in an automobile, brief introduction to important parts. Automobile engines, different parts and auxiliary systems, engine terminology, four-stroke and two-stroke operation, multi-cylinder engines, engine balance, power overlap. Engine accessories, engine lubrication, points of lubrication, types of lubrication systems, wet sump and dry sump, lubrication schedule, properties of lubricants, oil pumps, oil filters, crankcase dilution and crankcase ventilation.

MODULE 2 (10 Hrs)

Fuel induction in SI and CI engines, fuel pumps and air cleaners, problems in carburetors, direct injection of gasoline, MPFI and TBI, advantages and disadvantages, concepts of electronic injection, diesel injection systems, concepts of supercharging and turbo-charging, waste-gating principle. Principle of ignition, ignition coil, condenser and distributor, ignition systems without storage battery, electronic ignition, ignition timing and ignition advance, spark plugs. Combustion in SI engines and CI engines, swirl and turbulence, types of combustion chambers in automobile engines. Engine cooling, heat balance, effects of improper cooling, air cooling, radiator details and functioning, thermostats, anti-freeze additives, heater core

MODULE 3 (6 Hrs)

Manual transmission and types of gear box, sliding-mesh, constant-mesh and synchromesh gear boxes, types of dog clutches, gear shift mechanism, principles of automatic transmission. Clutch operation and types, multiplate and cone clutches, clutch construction and lining. Propeller shafts, universal joints, slip joint, Hotch-Kiss drive and torque tube drive, transaxle and transfer case, radius rods, four-wheel drive arrangement. Automobile emissions, their harmful effects, pollution control measures, catalytic converters, exhaust system layout, mufflers, resonators. Engine parameters, brief discussion of testing devices, engine service, engine tuning, engine re-boring, cyaniding, nitriding, de-carbonization.

MODULE 4 (8 Hrs)

Braking systems, layouts for mechanical braking, hydraulic braking, pneumatic braking, master cylinder, wheel cylinder, tandem cylinder, shoe brakes, disc brakes, requirements of brake fluid, power brakes, concept of ABS and traction control, parking brakes. Steering system, principles and need of steering, components parts, steering gear, steering ratio, steering lock, turning radius, center point. Steering, wheel geometry, power steering principle and typical schemes, Front axle scheme and end connections, rear axle, functions, types of rear axle, loads on rear axles, axle casing.

MODULE 5 (6 Hrs)

Suspension system, functions of suspension, component parts, coil springs, leaf springs, air springs, shock absorbers, torsion bars, stabilizer bars, typical combinations of components in suspension systems, MacPherson strut suspension, its merits. Wheel and tyres, wheel assembly and parts, pressed wheels and cast wheels, wheel rim, tyres, aspect ratio, tyres with tubes and tubeless tyres, advantages, construction of a tyre, plies, radial plies, tyre treads and tyre specifications.

MODULE 6 **(4 Hrs)**

Electrical systems, generator circuit and need for cut-out, starting with solenoid and over-running clutch, lighting points in a passenger car, high beam and restricted high beam from head lights, circuits for flashers, horn, wind screen wiper, fuel level indicator, speedometer

Term Work

Term work shall consist of assignments on each module.

Oral Examination
It shall consist of an oral based on the above syllabus and term work.

Course Outcomes: After learning the course the students should be able to:

CO 1 Identify the different parts of the automobile

CO 2 Explain the working of various parts like engine, transmission, clutch, brakes

CO 3 Describe how the steering and the suspension systems operate.

CO 4 Understand the environmental implications of automobile emissions

CO 5 Develop a strong base for understanding future developments in the automobile industry

Text Books:

1. Kamaraju Ramakrishna, "Automobile Engineering", PHI Learning, New Delhi, 1st Print, 2012.
2. Jain &Asthana, "Automobile Engineering", Tata McGraw-Hill, New Delhi, 2002.
3. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.
4. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.
5. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.
6. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

References:

1. Heinz Heisler, "Advanced Vehicle Technology", Elsevier, New Delhi, 2011.

2. Crouse &Anglin, "Automotive Mechanics", Tata McGrawHill, New Delhi, 10th Edition 2007.

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Design of Transmission System

Subject Code : PCEC MEL 801 -C

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	---	--	3	30	70	--	25@	25	150

Course Objectives:

The course is designed to address the following:

1. To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
2. To understand the standard procedure available for Design of Transmission of Mechanical elements.
3. To learn to use standard data and catalogues (Use of P S G Design Data Book permitted)
4. To learn about the design procedures for mechanical power transmission components

Course Content

MODULE 1 (06 Hrs)

Design of Flat belts and pulleys – Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

MODULE 2 (10 Hrs)

Speed ratios and number of teeth-Force analysis -Tooth stresses – Dynamic effects – Fatigue strength – Factor of safety – Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears.

MODULE 3 **(06 Hrs)**

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

MODULE 4 **(08 Hrs)**

Geometric progression – Standard step ratio – Ray diagram, kinematics layout -Design of sliding mesh gear box – Design of multi speed gear box for machine tool applications – Constant mesh gear box – Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

MODULE 5 **(08 Hrs)**

Torque converters for automotive applications. Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches- Electromagnetic clutches. Band and Block brakes – external shoe brakes – Internal expanding shoe brake.

MODULE 6 **(06 Hrs)**

Describe typical AC Transmission and Distribution system with line diagrams. Differentiate the features and working of HVAC and HVDC systems. State the power electronic components and circuits in a typical in a HVDC system with line diagrams.

Term Work

Term work shall consist of assignments on each module.

Oral Examination

It shall consist of an oral based on the above syllabus and term work.

Course Outcomes:

After learning the course the students should be able to:

CO 1 Apply the concepts of design to belts, chains and rope drives.

CO 2 Apply the concepts of design to spur, helical gears.

CO 3 Apply the concepts of design to worm and bevel gears.

CO 4 Apply the concepts of design to gear boxes.

CO 5 Apply the concepts of design to cams, brakes and clutches

Text Books:

1. Bhandari V, “Design of Machine Elements”, 4th Edition, Tata McGraw-Hill Book Co, 2016.

2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill, 2008.

3. Shigley J., Mischke C., Budynas R. and Nisbett K., Mechanical Engineering Design, 8thed.,

4. Jindal U.C., Machine Design: Design of Transmission System, Dorling Kindersley, 2010.

5. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, Sixth Edition, Tata McGraw-Hill , 2003.

6. Sundararajamoorthy T. V, Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2003.

References:

1. Maitra G.M., Prasad L.V., “Hand book of Mechanical Design”, II Edition, Tata McGraw-Hill, 1985.

2. Bhandari, V.B., “Design of Machine Elements”, Tata McGraw-Hill Publishing Company Ltd., 1994.

3. Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000,

4. Hamrock B.J., Jacobson B., Schmid S.R., “Fundamentals of Machine Elements”, McGraw-Hill Book Co., 1999.

5. Ugural A,C, “Mechanical Design, An Integrated Approach”, McGraw-Hill , 2003.

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Total Quality Management

Subject Code : PCEC MEL 801 -D

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	---	--	3	30	70	--	25@	25	150

Course Objectives:

The course is designed to address the following:

1. To facilitate the understanding of Quality Management principles and process.
2. To learn the basic concepts of quality and quality from organizational point of view.
3. To learn the concept of total quality management from western and Japanese approach.
4. To learn the internal politics, quality culture, education and training of the organization.
5. To be aware of international/national Quality awards
6. To facilitate the understanding of total quality management principles and processes

Module I INTRODUCTION: (08 Hrs)

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

Module II TQM PRINCIPLES: (10 Hrs)

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating

Module III TQM TOOLS & TECHNIQUES: (12 Hrs)

The seven traditional tools of quality – New management tools–Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

Module IV TQM TOOLS & TECHNIQUES II: (10 Hrs)

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

Module V QUALITY SYSTEMS: (10 Hrs)

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

Term Work

Term work shall consist of assignments on each module.

Oral Examination

It shall consist of an oral based on the above syllabus and term work.

Course outcomes:

After learning the course the students should be able to:

1. Students should be able to Quality environment of the organization.
2. Student should be able to know the TQM approachfor manufacturing/service organizationin length.
3. Student should be able to know various Quality terms like Tolerance and Variability, PDCA cycle,Crosby's 10 points and Deming's 14 Points.
4. Student should be able to know international/national Quality awards

TEXT BOOK:

1. Besterfield D.H. et al., Total qualityManagement, 3rd ed., Pearson Education Asia, 2006.
2. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.
3. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.
4. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

5. Dale H. Besterfiled, et at., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (2006).

6. Dale H. Besterfiled, et at., “Total quality Management”, Pearson Education Asia, Third Edition, Indian Reprint 2006

7. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

8. Total Quality Management by N.V.R Naidu, G. Rajendra New Age international,,First Edition,Jan 20062.Total Quality Management by R.S Naagarazan ,New Age international,3e, 2015

9. 103.Quality Control & Application by B. L. Hanson & P. M. Ghare, Prentice Hall of India, 2004

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6 th Edition, South-Western (Thomson Learning), 2005.

2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.

3. Total Quality Management by V.S Bagad Technical Publications, First Edition,Jan 20082.

4. Total Quality Management by S. Rajaram Dreamtech Press, First Edition, Jan 2008

5. Feigenbaum.A.V. ―Total Quality Management; 4 edition (August 1, ‖, McGraw-Hill Professional

6. Oakland.J.S. ―Total Quality Management‖,, 3rd Edition, 2003. Butterworth – Hcinemannltd Oxford

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Machine Tool Design

Subject Code : PCEC MEL 801 – E

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
3	---	--	3	30	70	--	25@	25	150

Course Objective:

The course is designed to address the following:

1. Students will understand design concept of the machine tool components.
2. Students will understand the concept of design of speed and feed boxes.
3. Students will understand various driving systems and control systems in machine tool.
4. To gain the knowledge of different drives and mechanisms used in machine tools
5. To gain the knowledge of design criterion for machine tool structure, design procedure, factors affecting stiffness of machine tool structure and their profile
6. To gain the knowledge of design of structures, guideways, spindles of machine tools
7. To gain the knowledge of various Vibrations used in machine tools
8. To gain the knowledge of various Machine Tools Testing

Course Content:

Introduction: (04 Hrs)

General requirements of machine tool design, kinematics of machine tool, various driving systems used in machine tools like, mechanical, electrical and hydraulic, stepless regulation of speeds.

Regulation of Speed and Feed Rates: (06 Hrs)

Basic design consideration in the design of variable speed range in the machine tools, layout of speed in geometric, logarithmic and arithmetic progression, saw diagram, range ratio, graphical representation of speed on structural and ray diagram, design of speed and feed boxes and their classification, gear box design.

Machine Tool Structure (bed, column, cross-rail): (04 Hrs)

Functions and their requirements, design criterion for machine tool structure, design procedure, factors affecting stiffness of machine tool structure and their profile.

Machine Tool Spindles: (06 Hrs)

Functions of spindle, materials and requirements for spindles, design of spindles, effect of machine tool compliance on machine accuracy, bearings for spindles.

Machine Tool Guide-ways and Slide-ways: **(6 Hrs)**

Design based on force of beds, slide ways, carriage, tables of Lathes, shapes of guide-ways and slide-ways of milling machines, materials, methods of adjusting clearance in guide-ways, design of slide-ways for wear resistance, hydraulic guide-way, antifriction guide-way, Protecting devices for slide-way.

Vibrations of Machine Tools: **(08 Hrs)**

Effects of vibration on machine tool on cutting controls, work piece, tool life, sources of vibrations, types of vibrations (forced, chatter, stickup vibrations) and its minimization, shock absorbers.

Control systems in Machine Tools: **(04 Hrs)**

Functions, requirements and classification of control systems for speeds and feeds, manual and automatic control systems

Machine Tools Testing: **(08 Hrs)**

Static and dynamic rigidity, methods of increasing rigidity of structure, procedure for assessing dynamic stability, dynamic characteristics, experimental determination of
dynamic characteristics of machine tool, dynamic characteristics of cutting process, stability analysis, static and dynamic testing of machines as per Schlesinger's test and Tobias stability.

Term Work

Term work shall consist of assignments on each module.

Oral Examination

It shall consist of an oral based on the above syllabus and term work.

Course Outcomes

After learning the course the students should be able to:

1. Ability enhancement for the design of various components of structures, guideways, spindles of machine tools
2. Ability enhancement to adopt & implement the recent trends required as per the applications
3. Students are able to understand the knowledge of vibration of machine tool, different control systems in machine tool and different machine tool testing methods

Reference Books:

1. N. K Mehta, Machine Tool Design and Numerical Control, Tata McGraw Hill, SecondEdition, 2005
2. D. K. Pal and S. K. Basu, Design of Machine Tools, Oxford-IBH, Second Revised Edition 2005.

3. Machine Tool Design Handbook, Central Machine Tool Institute, Bangalore, Tata McGrawHill, First Edition, 2005.
4. A. Bhattacharya and G. C. Sen, Principles of Machine Tools, New Central Book Agency Calcutta, 3rd Edition, 1973.
5. T. Kundra, P.N. Rao, N. K. Tiwari, Numerical Control and Computer Aided Manufacturing, Tata McGraw Hill, 3rd Edition, 2000.

Text Books

1. Tool Design/ Donaldson/ Fifth Edition, McGraw Hill
   Principles of Machine Tools/ G.C. Sen and A. Bhattacharyya /New Central Book Agency.

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Numerical Method for Engineers

Subject Code : OEC 802- A

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	1	--	3	15	35	--	--	50	100

Course objective:

The course is designed to address the following:

1. To understand the meaning of quantitative techniques.
2. To have effective decisions–making; model formulation and applications those are used in solving business decision problems.

Course Content:

Module 01: Introduction (04 Hrs)

Errors, different Types of Errors, basic methods for finding root

Module 02: Root finding method (06 Hrs)

Bisection method, false- position method, Newton-Raphson method, the Secant method and multiple roots**.**

Module 03: Interpolation (06 Hrs)

Newton's Divided-Difference interpolating polynomials, Lagrange Interpolating polynomials

Golden-Section search, Quadratic Interpolation and Newton's method.

Module 04 Multi-dimensional Search- (08 Hrs)

Direct Methods: Evolutionary Optimization, Simplex Method. Gradient Method: Cauchy's steepest Decent Method.

Module 05 : Linear Programming (LP) (08 Hrs)

Model Formulation for various types of LP problems, Canonical and Standard form, Graphical, Simplex and Dual Simplex methods for solving general LP problems, Concept of Duality, Assignment, Transportation and Travelling Salesman problem.

Module 06 : Project Management (08 Hrs)

Projects and their description, work break down structure, network diagram and Fulkerson's rule, CPM, PERT, crashing, resource leveling and scheduling

Term Work

Term work shall consist of assignments on each module.

Course Outcome: After learning the course the students should be able to:

1. Apply Mathematical Modeling and for Engineering Problem Solving.
2. Understand different root finding methods.
3. Solve Mathematical Equations by various methods.
4. Solve system of linear equation
5. Apply Numerical Integration.

Text Books:

1. R.W .Hamming"Numerical Methods for Engineers",Second Edition.

2. Turgut Ozan, "Applied Mathematical Programming for Engineering and Production Management", Prentice Hall (1986)

Reference Books:

1. Chapra, Canale, "Numerical Methods for Engineers", McGraw-Hill Int.

2. Shastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India Delhi.

3. P. K. Gupta and D. S. Hira, "Operations Research, 3rd Edition", S. Chand and Company Ltd.

4. R. Paneerselvam, "Operations Research", Prentice Hall of India (2002)

5. Ravindran, Philips, Soldberb, "Operations Research: Principles and Practices", 2nd Edition, John Wiley and Sons (2000)

6.H. S. Kasana and K. D. Kumar, “Introductory Operations Research: Theory and Applications”, Springer International Edition (2003)

Course Name : Final Year Mechanical Engineering

Semester : Eight

Subject Title : Internet of Things

Subject Code : OEC 802 B

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	1	--	3	15	35	--	--	50	100

COURSE OBJECTIVES:

The course is designed to address the following:

1. To Understand the Architectural Overview of IoT.
2. To Understand the IoT Reference Architecture and Real World Design Constraints
3. To Understand the various IoT Protocols (Data link, Network, Transport, Session, Service)

Course Contents:-

Module 1: OVERVIEW (10 Hrs.)

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management

Module 2: REFERENCE ARCHITECTURE (10 Hrs.)

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Module 3: IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS (08 Hrs.)

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zig bee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Module 4: TRANSPORT & SESSION LAYER PROTOCOLS (06 Hrs.)

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

Module 5: SERVICE LAYER PROTOCOLS & SECURITY (06 Hrs.)

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer.

Term Work

Term work shall consist of assignments on each module.

Course Outcomes: After learning the course the students should be able to:

1. Able to understand the application areas of IOT.
2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
3. Able to understand building blocks of Internet of Things and characteristics.

Text/Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**",** 1st Edition, Academic Press, 2014.

2. Peter Waher**, "**Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI

3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

5. Vijay Madisetti and Arshdeep Bahga, **"**Internet of Things (A Hands-on-Approach)**",** 1st Edition, VPT, 2014.

Course Name : Final Year Mechanical Engineering

Semester : Eight

Subject Title : Cyber Law & Ethics

Subject Code : OEC 802 C

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	1	--	3	15	35	--	--	50	100

Course Objectives:-

The course is designed to address the following:

1. Understand the core concepts of Defensive and Offensive Security.
2. Understanding of breaching the networks domains and systems.
3. Understanding the ethics of Hacking.
4. Limitations of Penetration Testing.
5. Cyber Crime Case s and IT act India and amendments.

Course Contents:-

Module 1: (12 Hrs.)

The Business Aspects of Penetration Testing, The Technical Foundations of Hacking, Foot printing and scanning Enumeration and Step - by-Step System Hacking, The Business Aspects of Penetration Testing, Automated Security Assessment Tools, Trojans and Backdoors, Sniffers Session Hijacking and Denial of Service Web Server Hacking Web application Vulnerabilities and Database Attacks

Module 2: (08 Hrs.)

Wireless Technologies, Security and Attacks IDS Honeypots and Firewalls Buffer Overflow Cryptographic Attacks and Defenses Social Engineering and Physical Security

Module 3: (10 Hrs.)

Understanding Copy Right in Information Technology, Understanding the technology of Software, software copyright vs Patent debate, Authorship Assignment issues, Commissioned work, Work for hire Idea/Expression dichotomy, Copy right in internet, Legal Issues in internet and Software

Copyright Jurisdiction Issues, Copyright Infringe Remedies of Infringement Multimedia, Copyright issues, Software Piracy, Patents understanding.

Module 4: (10 Hrs.)

Cyber Crimes, Understanding Cyber Crimes in context of Internet, Indian Penal Law & Cyber Crimes Fraud Hacking Mischief, International law, Obscenity and Pornography Internet, Potential of Obscenity Indian Law On Obscenity & Pornography Technical, Legal solutions International efforts Changes in Indian Laws, Ecommerce & Taxation, UNCITRAL model law of E,-Commerce, Indian Legal Position on E-Commerce IT Act 2000/Indian Evidence, Act/Draft law on E-Commerce.

Term Work

Term work shall consist of assignments on each module.

Course Outcomes:

After learning the course the students should be able to:

CO1 Understanding concepts related to cyber world and cyber law in general

CO2 Develop competitive edge on various facets of cyber crimes

CO3 Problems arising out of online transactions and provoke them to find solutions

CO4 Intellectual property issues in the cyber space and the growth and development of the law

CO5 Regulation of cyber space at national and international level.

CO6 Upholding ethical standards in cyber laws and intellectual property issues

Reference Books

1. Gray Hat Hacking: The Ethical Hackers Handbook by Allen Harper, Shon Harris, Cyber Laws by C.K punia, Sumit Enterprises

2. Cyber Crime and Law Enforcement t by V. D. Dudeja, Commonwealth Publishers

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Artificial Intelligence

Subject Code : OEC 802-D

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
2	1	--	3	15	35	--	--	50	100

Course Objectives:-

The course is designed to address the following:

1. Choose the appropriate representation for an AI problem or domain model, and construct domain models in that representation
2. Choose the appropriate algorithm for reasoning within an AI problem domain
3. Implement and debug core AI algorithms in a clean and structured manner
4. Design and analyze the performance of an AI system or component
5. Describe AI algorithms and representations and explain their performance, in writing and orally
6. Critically read papers on AI systems.

Course Contents:-

Module 1: Introduction (06 Hrs)

The AI problems, AI technique, philosophy and development of Artificial intelligence.

Module 2: Problem Spaces and Search (08 Hrs)

State space search, Uninformed and informed search techniques: BFS, A*, variations of A*. Local search and optimization: hill climbing, simulated annealing

Module 3: Adversarial Search and Game Playing (06 Hrs)

Minimax algorithm, alpha-beta pruning, stochastic games, Constraint satisfaction problems

Module 4: Knowledge and Reasoning (08 Hrs)

Logical agents, Propositional logic, First-order logic, Inference in FoL: forward chaining, backward chaining, resolution, and Knowledge representation: Frames, Ontologies, Semantic web and RDF

Module 5: Introduction to PROLOG (08 Hrs)

Facts and predicates, data types, goal finding, backtracking, simple object, compound objects, use of cut and fail predicates, recursion, lists, and simple input/output, dynamic database.

Module 6: Uncertain knowledge and reasoning (06 Hrs)

Probabilistic reasoning, Bayesian networks, Fuzzy logic

Term Work

Term work shall consist of assignments on each module.

Course Outcomes : After learning the course the students should be able to:

1. Artificial intelligence enhance work force and create jobs.
2. AI helps flag bais and drive diversity.
3. AI creates business oriented architecture.
4. AI makes positive impact on the world with other technologies.

Text Books

1. "Artificial intelligence " by Eliane Rich and Kevin Knight, Tats McGraw Hill.
2. "Introduction to Artificial Intelligence" by Eugene, Charniak, Drew McDermott, Addison Wisley.

Reference Books-

1. “Artificial Intelligence: A Modern Approach” by Stuart Russell and Peter Norvig
2. “Artificial Intelligence: A New Sythesis” by Nils J Nilsson
3. “Artificial Intelligence” by Negnevitsky
4. “Artificial Intelligence and Machine Learning” by Anand Hareendran S and Vinod Chandra S S “Artificial Intelligence Techniques for Computer Graphics illustrated edition” by Plemenos.

Course Name : Final Year Mechanical Engineering

Semester : Eight Sem.

Subject Title : Entrepreneurship Development

Subject Code : HSMC 803

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
--	--	2	1	--	--	--	25@	25	50

Course Objectives:

The course is designed to address the following:

1. Identifying your entrepreneurial traits.
2. Identifying business opportunities that suites student's.
3. Use the support system to zero down to students Business Idea.
4. Develop comprehensive business plans.
5. Prepare plans to manage the enterprise effectively.

Contents:

Module 1 Entrepreneurship, Creativity & Opportunities (04 hrs)

1.1) Concept, Classification & Characteristics and qualities of Entrepreneur

1.2) Creativity and Risk taking.

1.2.1) Concept of Creativity & Qualities of Creative person.

1.2.2) Risk Situation, Types of risk & risk takers.

1.3) Entrepreneurship as a career.

1.3.1) Process of Setting up new Business.

1.3.2) LPG Policy.

1.3.3) Impact of LPG.

1.3.4) Emerging high growth areas.

1.4) Business idea methods and techniques to generate business idea.

1.5) Technical & Financial feasibilities

1.6) SWOT analysis for arriving on product / services.

Module 2 Information and Support Systems (04 hrs)

2.1) Information Needed and Their Sources.

Information related to project, Information related to support system, Information Related to procedures and formalities

2.2) Support Systems: (MCED, NI-MSME, PMEGP, DI, KVIC)

1) Small Scale Business Planning, Requirements.

2) Govt. & Institutional Agencies, Formalities

3) Statutory Requirements and Agencies.

Module 3 Market Assessment (04 hrs)

3.1) Marketing -Concept and Importance

3.2) Market Identification, Survey Key components

3.3) Market Assessment

3.4) Market study process

3.5) Market Segmentation

3.6) Product Life Cycle

Module 4 Financial Management & Accounting. (04 hrs)

Business Finance

4.1) Cost of Project

1) Sources of Finance

2) Types of Capitals

3) Budgeting with (Production Budget with variance report)

4) Profitability

5) Break Even Analysis

6) Financial Ratios and Significance

Business Account (No numerical)

4.2) Accounting Principles, Methodology

1) Book Keeping

2) Financial Statements,

3) Concept of Audit,

Module 5 : Business Plan & Preparation of Project Report (06 hrs)

5.1) Business plan steps involved from concept to commissioning

Activity Recourses, Time, Cost

5.2) **Project Report**

1) Meaning and Importance

2) Components of project report/profile **(Give list**)

5.3) **Project Appraisal**

1) Meaning and definition

2) Technical, Financial feasibility

3) Cost benefit Analysis

Module 6 Enterprise Management and Modern Trends (04 hrs)

6.1) **Enterprise Management**: -

1) Essential roles of Entrepreneur in managing enterprise

2) Quality Assurance

3) T.Q.M Total Quality Management

4) Quality Circle

Importance of Quality, Importance of testing

6.2) E-Commerce

1) 5 s and six Sigma

Concept and process

6.3) Global Entrepreneur

Term Work

List of Assignments:

1. Submit a profile summary of a successful Entrepreneur
2. Generate Business idea Product / service through Brainstorming.
3. Identify business opportunities suitable to you.
4. Survey Industries of your stream; grade them according to level of Production, Investment, turnover, pollution to prepare report on.
5. Visit a bank/financial institution to enquiry about various funding schemes for small scale enterprise.
6. Compile the information from financial agencies that will help you starting up your enterprise.
7. Prepare technical feasibility report of a chosen product/service.
8. Prepare your long term, short term, & long term Goals for starting your enterprise.
9. Prepare marketing strategy for your chosen product / service.
10. Find the Breakeven point for the business idea chosen by you.

Micro Project:

- **Prepare business plan for your chosen small scale Enterprise.**

Oral Examination

It shall consist of an oral based on the above syllabus and term work.

Course Outcomes: After learning the course the students should be able to:

1. Appreciate the importance of embarking on self-employment and has developed the confidence and personal skills for the same.

2. Identify business opportunities in chosen sector / sub-sector and plan and market and sell products / services.

3. Start a small business enterprise by liaising with different stake holders 4. Effectively manage small business enterprise.

Text Books:

1. “Entrepreneurial Development” Neerali Prakashan

Reference Books:

1. “Entrepreneurial Development” by Khanka S S
2. Entrepreneurial Development and Small Business Management” by Dr. P T Vijayashree & M Alagammai
3. Dynamics of Entrepreneurial Development and Management” by V Desai
4. Business Development for Dummies by Anna Kennedy
5. “Entrepreneurial Development” by Nuzhath Khatoon
6. “Entrepreneurial Development” by Dr C B Gupta and Dr N P Srinivasan.

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : Final Project and Seminar

Subject Code : PRO ME 804

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
--	--	10	5	--	--	--	100@ 100#	50	250

It is intended to start the project work early in the seventh semester and carry out both design and fabrication of a mechanical device whose working can be demonstrated. The design is expected to be completed in the seventh semester and the fabrication and demonstration will be carried out in the eighth semester.

Course Name : Final Year Mechanical Engineering

Semester : Eighth

Subject Title : NPTEL Course - IV

Subject Code : MC –ME - 805

Teaching Scheme (in hrs)			Total Credit (TH +T+P)	Examination Scheme					
				Theory		Practical			Total
TH	T	P	CR	MSE	ESE	PR	OR	TW	
--	--	2	1	--	--	--	--	--	--

Every Student has to complete minimum four weeks NPTEL web and video course from mechanical engineering department which is available on portal nptel.ac.in. It is preferred that student should attend any one course related to subjects of Fifth semester.

Certification courses are offered twice a year (Jan-Jun, Jul-Dec). Joining a course is free. Learning can be done by watching videos and this is tested by the weekly assignments, which are to be submitted online within the prescribed deadline.

There is a certification examination that the student can take for a nominal fee at the end of the course to earn certificates from the IITs.

To earn credits of this course the students need to produce the NPTEL course completion Certificate and online submitted assignments to the department before end semester practical examination.