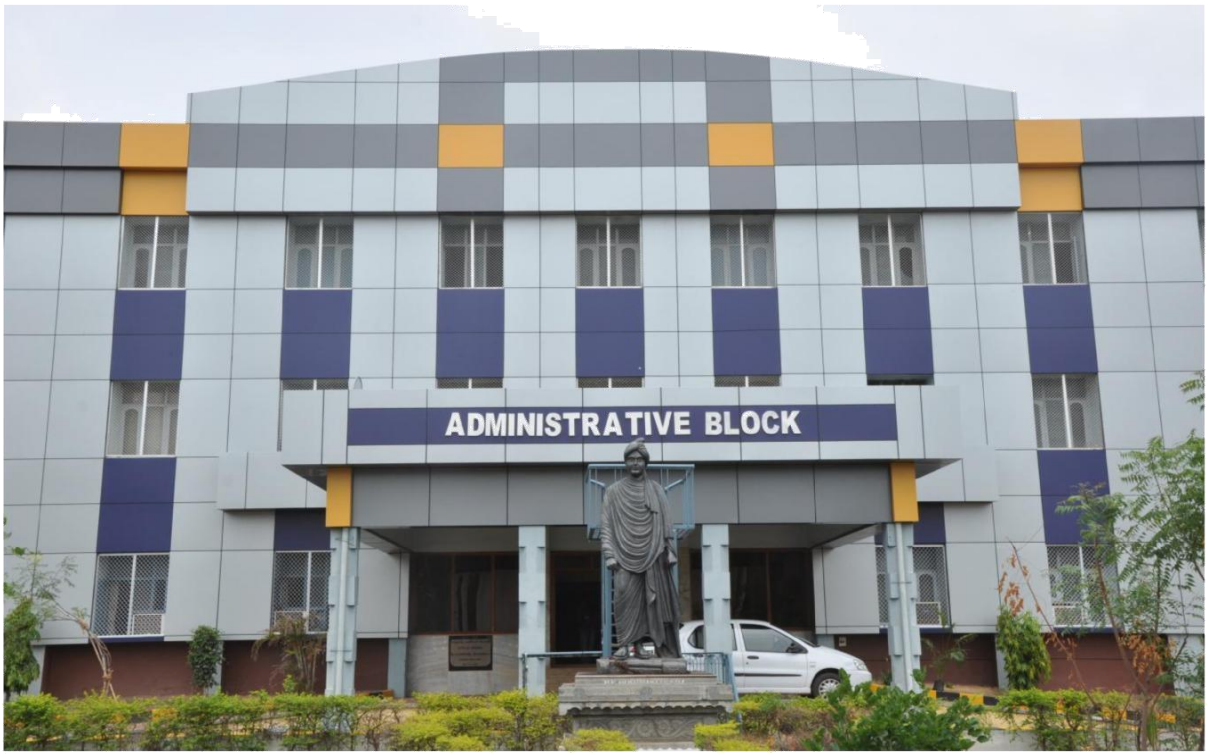

Scheme – 2020

Department of Mechanical Engineering

G. Pulla Reddy Engineering College (Autonomous): Kurnool

Accredited by NBA of AICTE and NAAC of UGC

Affiliated to JNTUA, Anantapuramu

Scheme and Syllabus for

B.Tech. HONORS

in

MECHANICAL ENGINEERING

(With Effect from the Batch Admitted in 2020-21)

DEPARTMENT OF MECHANICAL ENGINEERING

HONORS in Mechanical Engineering

Scheme of Instruction and Examination

S. No	Category	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination Maximum Marks		
				L	T	P/D	End Exam Marks	CIA Marks	Total Marks
I		**Theory**							
1.	PCC	Advanced Thermodynamics	4	3	1		60	40	100
2.	PCC	Non Destructive Testing	4	4			60	40	100
3.	PCC	Vibrations & Machine tool Dynamics	4	3	1		60	40	100
4.	PCC	Optimization Methods	4	3	1		60	40	100
5.		MOOCS-I	2						100
6.		MOOCS-II / Mini Project	2						100
		Total	**20**						

Note:
1. Student has to acquire 20 credits
2. Compulsory MOOC/NPTEL courses for 04 credits (02 courses @ 2 credits each) OR One MOOC course and Mini project @ 2 credits each
3. Honors Degree must be completed simultaneously with a Major degree program.

ADVANCED THERMODYNAMICS (ATD)

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
HME01	PCC	3	1	-	4	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand The laws of thermodynamics and relations

CO2: Understand gas laws and Psychometric processes

CO3: Understand Enthalpy, Entropy, Energy formation and Gibb's phase rule

CO4: Understand the theory of power cycles and their applications

CO5: Understand energy conversion methods

UNIT – I

Review of Thermodynamic Laws and Corollaries: Transient flow analysis, Second law thermodynamics, Entropy, Availability and unavailability, Thermodynamic potential. Maxwell relations, Specific heat relations, Mayer's relation. Evaluation of thermodynamic properties of working substance

UNIT – II

P.V.T Surface: Equation of state. Real gas behavior, Vander Waal's equation, Generalization compressibility factor. Energy properties of real gases. Vapour pressure, Clausius Clapeyron equation. Throttling, Joule. Thompson coefficient. Non-reactive mixtures of perfect gases. Governing laws, Evaluation of properties, Psychometric mixture properties and Psychometric chart, Air conditioning processes, Cooling towers, Real gas mixture.

UNIT – III

Combustion: Combustion Reactions, Enthalpy of formation. Entropy of formation, Reference levels of tables. Energy of formation, Heat reaction, Adiabatic flame temperature generated product, Enthalpies, Equilibrium. Chemical equilibrium of ideal gases, Effect of non-reacting gases equilibrium in multiple reactions, The Van't Hoff's equation. The chemical potential and phase equilibrium. The Gibbs phase rule.

UNIT – IV

Power Cycles: Review binary vapour cycle, co-generation and combined cycles, Second law analysis of cycles. Refrigeration cycles. Thermodynamics of irreversible processes Introduction, Phenomenon logical laws, Onsager's reciprocal relation, Applicability of the Phenomenological relations, Heat flux and entropy production, Thermodynamic phenomena, Thermoelectric circuits

UNIT – V

Direct Energy Conversion Introduction: Fuel cells, Thermo electric energy, Thermionic power generation, Thermodynamic devices magneto hydrodynamic generators, Photovoltaic cells

Text Books

1. Rajput, R. K., Thermal Engineering, Lakshmi Publications, New Delhi.
2. Nag, P. K., Basic and Applied Thermodynamics, TMH Publishers, New Delhi
3. Ganeshan, V., Internal Combustion Engines, TMH Publishers, New Delhi

Reference Books

1. Mahesh. M. Rathore, Thermal Engineering, McGraw Hill Pubishers, New Delhi
2. Rajput, R.K., Applied Thermodynamics, Lakshmi Publications, New Delhi.

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. and the student should answer any one question from each unit. Each Question carries 12 marks.

NON DESTRUCTIVE TESTING (NDT)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
HME02	PCC	4	-	-	4	40	60	100
Sessional Exam Duration : 1 ½ Hrs					**End Exam Duration : 3 Hrs**			

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

CO1:	Understand the principles and classification of NDT methods for failure identification
CO2:	Understand the theory of surface NDT and techniques involved in it
CO3:	Understand Thermography and Eddy current testing methods to detect the flaws
CO4:	Identify the flaws and leaks in the components using ultrasonic and acoustic emission Methods
CO5:	Utilize radiography to identify underlying failure sites

UNIT – I

Overview Of NDT:
NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT, Visual inspection – Unaided and aided

UNIT – II

Surface NDT Methods: Liquid Penetrant Testing – Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results
Magnetic Particle Testing- Theory of magnetism, inspection materials, Magnetisation methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism

UNIT – III

Thermography And Eddy Current Testing:
Thermography- Principles, Contact and non-contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation – infrared radiation and infrared detectors, Instrumentations and methods, applications
Eddy Current Testing - Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation

UNIT – IV

Ultrasonic Testing And Acoustic Emission:
Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A-Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction
Acoustic Emission Technique – Principle, AE parameters, Applications

UNIT – V

Radiography:
Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square law, characteristics of films – graininess, density, speed, contrast, characteristic curves, Penetrometers, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero -Radiography, Computed Radiography, Computed Tomography

Text Books:

1. Baldev Raj, T.Jaya kumar, M.Thavasimuthu, Practical Non-Destructive Testing, Narosa Publishing House
2. Ravi Prakash, Non-Destructive Testing Techniques, 1st revised edition, New Age International Publishers

Reference Books:

1. ASM Metals Handbook, Non-Destructive Evaluation and Quality Control, American Society of Metals, Metals Park, Ohio, USA
2. Paul E Mix, Introduction to Non-destructive testing: a training guide, Wiley, New Jersey
3. Charles, J. Hellier, Handbook of Non-Destructive evaluation, Mc Graw Hill, New York
4. Dr. V. Jayakumar, Dr. K. Elangovan, Non-Destructive Testing of Materials Lakshmi

Web Resources:

https://nptel.ac.in/courses/113/106/113106070/

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second Sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

VIBRATIONS AND MACHINE TOOL DYNAMICS (VMTD)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
HME03	PCC	3	1	-	4	40	60	100
Sessional Exam Duration : 1 ½ Hrs					End Exam Duration : 3 Hrs			

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

CO1:	Understand fundamentals of vibrations, equation of a vibrating system and solve problems on under damping, critical damping and over damping vibrating systems.
CO2:	Compute natural frequency of a single degree freedom systems with forced vibration.
CO3:	Calculate natural frequencies and mode shapes for two degree freedom systems
CO4:	Determine natural frequencies and mode shapes for transverse vibration systems with concentrated load and UDL and torsional vibrations of rotor system.
CO5:	Understand effect of vibrations on cutting conditions, work piece and tool life of a machine tool.

UNIT – I

Fundamentals of vibrations: Basic concepts of vibration, definitions, types of vibrations, methods of vibration analysis.
Single degree freedom systems: Free vibrations, natural frequency, free vibrations with damping, differential equation of S.H.M, critical damping, under damping, over damping, logarithmic decrement.

UNIT – II

Forced vibrations: Single degree freedom forced vibrations, vector representation, and vibrations due to unbalance, vibration force transmitted to the ground, vibration isolation and transmissibility.

UNIT – III

Two degree freedom system: Introduction, vibrations of free damped two degree freedom systems, forced vibrations, semi definite systems, co-ordinate coupling, and vibration absorber.

UNIT – IV

Transverse and torsional vibrations: Natural frequency of free transverse vibrations-single concentrated load, uniformly loaded simply supported shaft, transverse vibration of shaft carrying with several loads-Dunkerley's method, energy method, critical speed of the shaft. Free torsional vibrations-single rotor system, two rotor system, three rotor system and geared system.

UNIT – V

Vibrations of machine tools: Sources of vibration in machine tools, effect of vibration on machine tool, effect of vibration on cutting conditions, effect of vibration on work piece, effect of vibration on tool life, self excited vibration and dynamic stability, elimination of vibrations.

Text Books:

1. G. K. Grover, Mechanical Vibrations, New Chand and Bro's Publishers, Roorkee

2. S. Graham Kelly, Mechanical Vibration, Tata McGraw-Hill, Delhi.

3. G.C. Sen and A.Bhattacharya, Principles of Metal Cutting, New Central Book Agency, New Delhi.

Reference Books:

1. Timoshenko SP and Young DH, Introductory Course on Vibration Problems in Engineering, John Wiley and Sons Publishers, Singapore

2. Thomson William T, Vibration Theory and Applications, Pearson Education, New Delhi

3. V.P. Singh, Mechanical Vibrations, Dhanpat Rai and Sons Publishers, New Delhi,

Web Resources:

https://nptel.ac.in/courses/112/103/112103016/

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second Sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

OPTIMIZATION METHODS (OM)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
HME04	PCC	3	1	-	4	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration : 3 Hrs		

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

CO1:	Solve problems of optimization using Integer programming
CO2:	Solve problems of optimization using Dynamic programming
CO3:	Understand optimization using Genetic algorithms
CO4:	Understand and solve classical optimization problems
CO5:	Solve the simple problems using Lagrangean method and Kuhn conditions.

UNIT – I

Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Classification of Optimization problems.

Integer Programming: Simple applications of integer programming, solution methods of integer programming- Branch and Bound Algorithm, Cutting Plane Algorithm

UNIT – II

Dynamic Programming: Introduction-Bellman's principle of optimality-Application of dynamic programming to Linear programming problem and Capital budgeting problem

UNIT – III

Genetic Algorithm (GA): Introduction, Difference between Genetic Algorithm and Traditional Methods, Simple Genetic Algorithms, Similarity Templates (Schemata), Genetic algorithm operators - selection, crossover and mutation, Simple applications of GA

UNIT – IV

Classical Optimization-1: Introduction; Unconstrained problems of maxima and minima, constrained problems of maxima and minima

UNIT – V

Classical Optimization-2: Constraints in the form of equations - Lagrangian method; Constraints in the form of inequalities -Kuhn-tucker conditions

Text Books:

1. S.D.Sharma , Operations Research, Kedarnath and Co. Publishers, Meerut

2. A.P.Verma , Operations Research, S.K.Kataria & Sons, New Delhi

Reference Books:

1. V. K. Kapoor , Operations Research, S. Chand, New Delhi

2. S.S.Rao, Optimization Theory and Applications, NAI Publishers, Hyderabad

Web Resources:

1. https://nptel.ac.in/courses/105/103/105103210/
2. https://nptel.ac.in/courses/111/105/111105039/
3. https://nptel.ac.in/courses/111/105/111105100/

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second Sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each

section. The student shall answer one question from each section.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.