



**VEL TECH MULTI TECH
Dr RANGARAJAN Dr.SAKUNTHALA
ENGINEERING COLLEGE**

(An ISO 9001: 2008 Certified Institution)
(Owned by 'VEL Shree R. Rangarajan
Dr. Sakunthala Rangarajan Educational Academy)
(Approved by AICTE, New Delhi &
Govt. of Tamil Nadu and affiliated to Anna University)



SYLLABUS

WEEKLY SCHEDULE

VI SEMESTER 2014 - 2015

DEPARTMENT OF MECHANICAL

III YEAR DEGREE COURSE

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Chennai – 600062
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Programme Educational Objectives

The PEO of the Mechanical Engineering programme is to enable the students to:

- I. Graduates will apply their knowledge and skills, to solve the problems in the field of Mechanical Engineering occurring in industries and transportation
- II. Graduates of the programme will employment as Mechanical engineers in engineering and business or will be admitted for higher studies
- III. Graduates of the programme will solve problem with professionalism
- IV. Graduates will be taught and exposed to the emerging technologies to cope up with technological obsolescence

Programme Outcomes

- a. Graduates will demonstrate knowledge of engineering mathematics, physics, chemistry and mechanical engineering
- b. Graduates will demonstrate the ability to design and analyze machine elements and mechanisms
- c. Graduates will demonstrate the ability to design and analyze thermal systems
- d. Graduates will demonstrate the ability to manufacture automobile components and related system
- e. Graduates will demonstrate skills to use latest CAD/CAM/CAE software and sophisticated equipments for analyzing and solving mechanical engineering problems
- f. Graduates will acquire leadership, entrepreneurship qualities and demonstrate knowledge of professional practice and team-work
- g. Graduates will demonstrate an ability to effectively communicate technical information in speech, presentation and in writing
- h. Graduates will acquire skills and ability for life-long learning
- i. Graduates will be able to participate and succeed in competitive examinations like IES, GATE etc.

Department's Vision

“To emerge as a department for mechanical engineering nurturing, excellence in education and in the emerging areas of mechanical, thermal, manufacturing and automobile disciplines.”

Department's Mission

“To build a centre for renewable energy with generation and utilization.”

“To nurture the creativity and innovation of young minds”.

“To provide consultancy to industries, and take up joint projects with industry.”

“To establish Research and Development centers with emphasis on minimization of carbon foot prints”.

“To develop the center of excellence for technology transfer in industrial automation”.

WEEKLY SCHEDULE
ACADEMIC YEAR: 2014– 2015

Sl.No	WEEKS	DATE	
		FROM	TO
1	WEEK1	02.01.15	09.01.15
2	WEEK2	12.01.15	16.01.15
3	WEEK3	19.01.15	23.01.15
4	WEEK4	27.01.15	30.01.15
5	WEEK5	02.02.15	06.02.15
6	WEEK6	09.02.15	13.02.15
7	WEEK7	16.02.15	20.02.15
8	WEEK8	23.02.15	27.02.15
9	WEEK9	02.03.15	06.03.15
10	WEEK10	09.03.15	13.03.15
11	WEEK11	16.03.15	20.03.15
12	WEEK12	23.03.15	27.03.15
13	WEEK13	30.03.15	01.04.15
14	WEEK14	06.04.15	10.04.15
15	WEEK 15	13.04.15	17.04.15
16	WEEK16	20.04.15	24.04.15
17	WEEK17	27.04.15	30.04.15

SUBJECT CONTENTS

SL.NO	SUBJECT CODE	SUBJECT NAME
THEORY		
1	MG 2351	Principles of Management
2	ME 2351	Gas Dynamics & Jet Propulsion
3	ME 2352	Design of Transmission Systems
4	ME 2354	Automobile Engineering
5	ME 2353	Finite Element Analysis
6	ME 2026	Unconventional Manufacturing Processes
PRACTICAL		
7	ME 2355	Thermal Engineering lab II
8	ME2356	Design & Fabrication project
9	GE2321	Communication Skills lab

TEST SCHEDULE

SL.NO	SUBJECT CODE	SUBJECT NAME	UNIT TEST I	UNIT TEST II	UNIT TEST III	UNIT TEST IV	UNIT TEST V
1	MG 2351	Principles of Management	22.01.15 FN	11.02.15 FN	03.03.15 FN	23.03.15 FN	13.04.15 FN
2	ME 2351	Gas Dynamics & Jet Propulsion	22.01.15 AN	11.02.15 AN	03.03.15 AN	23.03.15 AN	13.04.15 AN
3	ME 2352	Design of Transmission Systems	23.01.15 FN	12.02.15 FN	04.03.15 FN	24.03.15 FN	15.04.15 FN
4	ME 2354	Automobile Engineering	23.01.15 AN	12.02.15 AN	04.03.15 AN	24.03.15 AN	15.04.15 AN
5	ME 2353	Finite Element Analysis	24.01.15 FN	13.02.15 FN	05.03.15 FN	25.03.15 FN	16.04.15 FN
6	ME 2026	Unconventional Manufacturing Processes	24.01.15 AN	13.02.15 AN	05.03.15 AN	25.03.15 AN	16.04.15 AN

MODEL THEORY

Sl. NO	DATE	SUB.CODE	SUBJECT
1	20.04.2015	MG 2351	Principles of Management
2	21.04.2015	ME 2351	Gas Dynamics & Jet Propulsion
3	22.04.2015	ME 2352	Design of Transmission Systems
4	23.04.2015	ME 2354	Automobile Engineering
5	24.04.2015	ME 2353	Finite Element Analysis
6	27.04.2015	ME 2026	Unconventional Manufacturing Processes

MG2351 PRINCIPLES OF MANAGEMENT

WEEK: 1 - OVERVIEW OF MANAGEMENT (UNIT 1)

Definition - Management - Role of managers. Evolution of Management thought - Organization and the environmental factors
Trends and Challenges of Management in Global Scenario

WEEK: 2 UNIT TEST I

WEEK: 3 – PLANNING (UNIT 2)

Nature and purpose of planning - Planning process - Types of plans – Objectives - Managing by objective (MBO) Strategies

WEEK: 4

Types of strategies - Policies – Decision Making - Types of decision
Decision Making Process

WEEK: 5

Rational Decision Making Process - Decision making under different conditions

WEEK: 6 UNIT TEST II

WEEK: 6 – ORGANIZING (UNIT 3)

Nature and purpose of organizing - Organization structure – Formal and informal groups / Organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization

WEEK: 7

Delegation of authority - Staffing - Selection and Recruitment - Orientation –

WEEK: 8

Career Development - Career stages – Training - Performance Appraisal

WEEK: 9 UNIT TEST III

WEEK: 10 - DIRECTING (UNIT 4)

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories.

WEEK: 11

Communication – Barriers to effective communication - Organization Culture - Elements and types of culture – Managing cultural diversity

WEEK: 12 UNIT TEST IV

WEEK: 13 - CONTROLLING (UNIT 5)

Process of controlling - Types of control - Budgetary and non - budgetary control techniques

WEEK: 14

Managing Productivity - Cost Control. Purchase Control – Maintenance Control - Quality Control - Planning operations

WEEK: 15 UNIT TEST V

WEEK: 16 MODEL EXAM

WEEK: 17 MODEL EXAM

TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W.L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.

ME 2351 GAS DYNAMICS AND JET PROPULSION

WEEK:1-BASIC CONCEPTS AND ISENTROPIC FLOWS (UNIT 1)

Energy and momentum equations of compressible fluid flows – Stagnation states. Mach waves and Mach cone – Effect of Mach number on compressibility Isentropic flow through variable ducts – Nozzle and Diffusers – Use of Gas tables

WEEK: 2 UNIT TEST I

WEEK: 3 FLOW THROUGH DUCTS (UNIT 2)

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow)

WEEK: 4

Variation of flow properties – Use of tables and charts.

WEEK: 5

Generalised gas dynamics

WEEK: 6 UNIT TEST II

WEEK: 7 – NORMAL AND OBLIQUE SHOCKS (UNIT 3)

Governing equations – Variation of flow parameters across the normal and oblique shocks

WEEK: 8

Prandtl – Meyer relations – Use of table and charts – Applications

WEEK: 9 UNIT TEST III

WEEK: 10 JET PROPULSION (UNIT 4)

Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operation principle

WEEK: 11

Cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines

WEEK: 12 UNIT TEST IV

WEEK: 13 - SPACE PROPULSION (UNIT 5)

Types of rocket engines – Propellants-feeding systems – Ignition and combustion – Theory of rocket propulsion –

WEEK: 14

Performance study Staging. Terminal and characteristic velocity – Applications – space flights

WEEK: 15 UNIT TEST V
WEEK: 16 MODEL EXAM
WEEK: 17 MODEL EXAM

TEXT BOOKS:

1. Anderson, J.D., Modern Compressible flow, McGraw Hill, 3rd Edition, 2003.
2. H. Cohen, G.E.C. Rogers and Saravanamutto, Gas Turbine Theory, Longman Group Ltd., 1980.
3. S.M. Yahya, fundamentals of Compressible Flow, New Age International (P) Limited, New Delhi, 1996.

ME 2352 DESIGN OF TRANSMISSION SYSTEMS

WEEK: 1- DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS (UNIT 1)

Selection of V belts and pulleys-selection of Flat belts and pulleys
Wire ropes and pulleys – Selection of Transmission chains and Sprockets
Design of pulleys and sprockets

WEEK: 2 UNIT TEST I

WEEK: 3 SPUR GEARS AND PARALLEL AXIS HELICAL GEARS (UNIT 2)

Gear Terminology-Speed ratios and number of teeth-Force analysis -
Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety

WEEK: 4

Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears

WEEK: 5

Pressure angle in the normal and transverse plan - Equivalent number of teeth-forces and stresses, estimating the size of the helical gears

WEEK: 6 UNIT TEST II

WEEK: 7 – BEVEL, WORM AND CROSS HELICAL GEARS (UNIT 3)

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.

WEEK: 8

Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

WEEK: 9 UNIT TEST III

WEEK: 10 - DESIGN OF GEAR BOXES (UNIT 4)

Geometric progression - Standard step ratio - Ray diagram, kinematics layout

WEEK: 11

Design of sliding mesh gear box -Constant mesh gear box – Design of multi speed gear box

WEEK: 12 UNIT TEST IV

WEEK: 13- DESIGN OF CAM CLUTCHES AND BRAKES (UNIT 5)

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses.

WEEK: 14

Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches internal and external shoe brakes.

WEEK: 15 UNIT TEST V

WEEK: 16 MODEL EXAM

WEEK: 17 MODEL EXAM

TEXT BOOKS:

1. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, Sixth Edition, TataMcGraw-Hill , 2003.
2. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", AnuradhaPublications, Chennai, 2003.

ME 2353 FINITE ELEMENT ANALYSIS**WEEK: 1- FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS (UNIT 1)**

Weighted residual methods – general weighted residual statement – weak formulation of the weighted residual statement – comparisons
Piecewise continuous trial functions example of a bar finite element – functional and differential forms – principle of stationary total potential Rayleigh Ritz method – piecewise continuous trial functions – finite Element method – application to bar element

WEEK: 2 UNIT TEST I**WEEK: 3 ONE DIMENSIONAL FINITE ELEMENT ANALYSIS (UNIT 2)**

General form of total potential for 1-D applications – generic form of finite element equations – linear bar element – quadratic element – nodal approximation – development of shape functions

WEEK: 4

Element matrices and vectors – example problems – extension to Plane truss– development of element equations – assembly – element connectivity – global equations

WEEK: 5

Solution methods –beam element – nodal approximation – shape functions – element matrices and vectors – assembly – solution – example problems

WEEK: 6 UNIT TEST II**WEEK: 7 TWO DIMENSIONAL FINITE ELEMENT ANALYSIS (UNIT 3)**

Introduction – approximation of geometry and field variable – 3noded triangular elements – four noded rectangular elements – higher order elements – generalized coordinates approach to nodal approximations – difficulties – natural coordinates and coordinate transformations – triangular and quadrilateral elements – ISO-parametric elements – structural mechanics applications in 2-dimensions

WEEK: 8

Elasticity equations – stress strain relations – plane problems of elasticity – element equations – assembly – need for quadrature formulæ – transformations to natural coordinates – Gaussian quadrature – example problems in plane stress, plane strain and axisymmetric applications

WEEK: 9 UNIT TEST III

WEEK: 10 - DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD (UNIT 4)

Introduction – Vibration problems – equations of motion based on weak form – longitudinal vibration of bars – transverse vibration of beams – consistent mass matrices – element equations –solution of Eigen value problems

WEEK: 11

Vector iteration methods – normal modes – transient vibrations – modelling of damping – mode superposition technique – direct integration methods

WEEK: 12 UNIT TEST IV

WEEK: 13 - APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS (UNIT 5)

One dimensional heat transfer element – application to one-dimensional heat transfer problems- scalar variable problems in 2-

WEEK: 14

Dimensions – Applications to heat transfer in 2

Dimension – Application to problems in fluid mechanics in 2-D

WEEK: 15 UNIT TEST V

WEEK: 16 MODEL EXAM

WEEK: 17 MODEL EXAM

TEXT BOOK:

1. P.Seshu, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd. New Delhi, 2007. ISBN-978-203-2315-5

ME 2354 AUTOMOBILE ENGINEERING

WEEK: 1- VEHICLE STRUCTURE AND ENGINES (UNIT 1)

Types of Automobiles, vehicle construction and different layouts
Chassis, frame and body, resistances to vehicle motion and need for a
gearbox Components of engine-their forms, functions and materials

WEEK: 2 UNIT TEST I

WEEK: 3 ENGINE AUXILIARY SYSTEMS (UNIT 2)

Electronically controlled gasoline injection system for SI engines,
electronically controlled diesel injection system

WEEK: 4

Injector system, Rotary distributor type and common rail direct
injection system

WEEK: 5

Electronic ignition system, turbo chargers, Engine Emission control
by three way catalytic converter system

WEEK: 6 UNIT TEST II

WEEK: 7 – TRANSMISSION SYSTEMS (UNIT 3)

Clutch-types and construction gear boxes- manual and automatic, gear
shift mechanisms

WEEK: 8

Over drive, transfer box, fluid flywheel –torque converter , propeller
shaft, slip joints, universal joints ,Differential, and rear axle,
Hotchkiss Drive and Torque Tube Drive.

WEEK: 9 UNIT TEST III

WEEK: 10- STEERING, BRAKES AND SUSPENSION SYSTEMS (UNIT 4)

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, types of Suspension Systems.

WEEK: 11

Pneumatic and hydraulic braking systems, Antilock braking system and traction control.

WEEK: 12 UNIT TEST IV

WEEK: 13 - ALTERNATIVE ENERGY SOURCES (UNIT 5)

Use of natural gas, Liquefied petroleum gas. Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance

WEEK: 14

Combustion and Emission Characteristics of SI and CI engines with these alternate fuels – Electric and Hybrid Vehicles, Fuel Cell

WEEK: 15 UNIT TEST V

WEEK: 16 MODEL EXAM

WEEK: 17 MODEL EXAM

TEXT BOOKS:

1. Kirpal Singh, “ Automobile Engineering Vol 1 & 2 “, Standard Publishers, Seventh Edition ,1997, New Delhi
2. Jain,K.K.,and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002

ME 2606 UNCONVENTIONAL MANUFACTURING PROCESSES

WEEK: 1- INTRODUCTION (UNIT 1)

Unconventional machining Process – Need, Classification – Brief overview of all techniques.

WEEK: 2 UNIT TEST I

**WEEK: 3 - MECHANICAL ENERGY BASED PROCESSES
(UNIT 2)**

Abrasive Jet Machining – Water Jet Machining –working principle, equipment used

WEEK: 4

Abrasive water jet machining, Ultrasonic Machining–working principle, equipment used.

USM, AJM, WJM, AWJM– surface finish and Process parameters

WEEK: 5

USM, AJM, WJM, AWJM – MRR-Variation in techniques used – Applications

WEEK: 6 UNIT TEST II

**WEEK: 7– ELECTRICAL ENERGY BASED PROCESSES
(UNIT 3)**

Electric Discharge Machining (EDM)- working Principles- equipments-Process Parameters

WEEK: 8

MRR- electrode / Tool – Power Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM - surface finish – Applications

WEEK: 9 UNIT TEST III

**WEEK: 10 - CHEMICAL AND ELECTRO-CHEMICAL
ENERGY BASED PROCESSES (UNIT 4)**

Chemical machining and Electro-Chemical machining (CHM and ECM) Etchants-maskant-techniques of applying maskants

WEEK: 11

Process Parameters -surface finish -- MRR-Applications Principles of ECM-equipments-MRR-Electrical circuit-Surface roughness-Process Parameters-ECG and ECH Applications

WEEK: 12 UNIT TEST IV

WEEK:13 - THERMAL ENERGY BASED PROCESSES (UNIT 5)

Laser Beam machining (LBM), plasma Arc machining (PAM)
Principles-Equipment Types - Beam - control techniques- Laser
Drilling- Surface finish

WEEK:14

Electron Beam Machining (EBM). Principles-Equipment-Types-
Beam control techniques-Surface finish – Applications

WEEK: 15 UNIT TEST V

WEEK: 16 MODEL EXAM

WEEK: 17 MODEL EXAM

TEXT BOOK:

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers
Pvt. Ltd., NewDelhi, 2007

ME2355 THERMAL ENGINEERING LAB – II LIST OF EXPERIMENTS

HEAT TRANSFER

Thermal conductivity measurement by guarded plate method
Thermal conductivity of pipe insulation using lagged pipe apparatus
Natural convection heat transfer from a vertical cylinder
Forced convection inside tube
Heat transfer from pin-fin (natural & forced convection modes)
Determination of Stefan-Boltzmann constant
Determination of emissivity of a grey surface
Effectiveness of Parallel/counter flow heat exchanger

REFRIGERATION AND AIR CONDITIONING

Determination of COP of a refrigeration system
Experiments on air-conditioning system
Performance test on single/two stage reciprocating air compressor.

ME2356 DESIGN AND FABRICATION PROJECT

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems. The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution and if possible with an industry guide also.

The item chosen may be small machine elements (Example-screw jack, coupling, machine vice, cam and follower, governor etc), attachment to machine tools, tooling (jigs, fixtures etc), small gear box, automotive appliances, agricultural implements, simple heat exchangers, small pumps, hydraulic /pneumatic devices etc.

The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts relating to fabrication.

GE2321 COMMUNICATION SKILLS LABORATORY

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.
