

SCHEME OF EXAMINATION
B.TECH. 4th Year Mechanical Engineering (Auto) -8th Semester

S. No	Code	Subjects Name	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam
			L	T	P/D	Total	Sessional	Theory	Practical/ viva-voce		
1	MEA 402E	Fundamental of Robotics Engineering	3	1	-	4	50	100	-	150	3
2	MEA 404E	Measurement and Instrumentation	4	1	-	5	50	100	-	150	3
3	ME 426E	Total Quality Management	4	1	-	4	50	100	-	150	3
4	MEA 406E	Automotive Electronics & Microcontrollers	3	1	-	5	50	100	-	150	3
5	MEA 408E	Auto Fuel and Lubricant	3	1	-	4	50	100	-	150	3
6	MEA 410 E	Measurement and Instrumentation Lab	-	-	2	2	50	-	25	75	3
7	ME 410 E	Project –II	-	-	9	9	100	-	100	200	3
8	ME 411 E	Seminar	2	-	-	2	25	-	-	25	-
9	ME 412 E	Comprehensive Viva - Voce	-	-	-	-	50	-	-	50	3
10	ME 414 E	General Fitness & Professional Aptitude	-	-	-	-	-	-	75	75	3
	TOTAL		19	5	11	35	475	500	200	1175	

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted. Under ME-411E Some of the students may be evaluated in 7th semester and remaining in 8th Sem. Marks will be added in 8th Sem.

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**B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Fundamental of robotics Engineering
MEA-402E**

L	T	P	Total
3	1		4

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam: 3 Hrs.	

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT-I

INTRODUCTION

Robot components, robot classification and specification, Work envelopes, other basic parameters of robots.

ROBOT END-EFFECTORS

Types, mechanical grippers, gripper force analysis, gripper selection, process tooling, compliance.

UNIT-II

ROBOT DRIVES AND ACTUATORS

Characteristics of actuating systems, Drives - electric, hydraulic, pneumatic and their relative merits. Speed reduction.

ROBOT SENSORS

Robot sensors, sensor classification, micro-switches, proximity sensors, photo-electric sensors, rotary position sensors, sensor usage and selection, sensors and control integration

UNIT-III

ROBOT MECHANICS

Robot kinematics - spatial descriptions and transformations, inverse transformation matrices, conventions of fixing frames to links, inverse robot kinematics – solvability, algebraic vs geometric solutions, examples of inverse manipulator kinematics. Differential motion and velocities - Differential motions of a robot and its hand frame, tool configuration jacobian, resolved motion rate control, manipulator jacobian, static forces and moments Robot dynamics - Lagrangian mechanics, effective moments of inertia, dynamic equations for multi-degree of freedom robots.

UNIT IV

ROBOT APPLICATIONS

Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection

automation, Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference, Economics and social aspects of robotics, Future applications.

Text Books:

1. Introduction to Robotics: Analysis, systems and applications by S.Y. Niku, Pearson Education.

References:

1. Introduction to Robotics by J.J. Craig, Pearson Education

2. Robotics: Control, sensing, vision and intelligence by KS Fu, P Gonzalez, CSG Lee, McGraw Hill

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B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Measurement and Instrumentation
MEA-404E

L	T	P	Total
4	1		5

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam: 3 Hrs.	

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT-I

Basic Statistical Concepts: Types of Measured Quantities (Discrete and Continuous), Central Tendency of Data, Mode, Median, Arithmetic Mean, Best Estimate of true Value of Data, Measures of Dispersion, Range, Mean Deviation, Variance, Standard Deviation, Normal Distribution, Central Limit Theorem, Significance Test, Method of Least Squares, Graphical Representation and Curve Fitting of Data.

Instruments and Their Representation: Introduction, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration

UNIT-II

Static and Dynamic Characteristics of Instruments: Range and span, accuracy and precision, calibration, hysteresis and dead zone, sensitivity and linearity, threshold and resolution; speed of response, lag, fidelity and dynamic error, dead time and dead zone. Zero, first and second order systems and their response to step, ramp and sinusoidal input signals.

Errors in Measurement: Sources of errors, systematic and random errors; statistical analysis of test-data, probable error and probability tables, ejection of test data; curve fitting, error propagation; Design and planning of experiments and report writing.

Force, Acceleration and Torque Measurement : Seismic Devices, Spring Mass & Force Balance Type, Calibration, Hydraulic Load Cell, Pneumatic Load Cell, Elastic Force Devices, Separation of Force Components, Electro Mechanical Methods, Strain Gage, Torque Transducer, Toque Meter.

UNIT-III

Sensors and Transducer: Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive and reluctance type, Electromagnetic, Electrodynamic, Eddy Current, Magnetostrictive, Variable Inductance, Linearly Variable Differential Transformer, Variable Capacitance, Piezo-Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits, Temperature Compensation, Balancing and Calibration, Opto-Electrical Transducers, Photo Conductive Transducers, Photo Voltaic Transducers, Digital Transducers, Frequency domain transducer, Vibrating string transducer, Data Acquisition Systems, Data processing, Data Display and Storage. Modern Automotive Instrumentation, Study of automotive sensors and actuators.

Position, displacement, and velocity Measurement: Introduction, Relative motion Measuring Devices, Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic, Absolute Motion Devices.

UNIT-IV

Pressure Measurement: Moderate Pressure Measurement, Monometers, Piezo Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer, Low Pressure Measurement, Calibration and Testing,

Flow Measurement: Quantity Meters, Positive Displacement Meters, Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rotameters, Pitot-Static Tube Meter, Drag Force Flow Meter, Turbine Flow Meter, Electronic Flow Meter, Electro Magnetic Flow meter. Hot-Wire Anemometer.

Temperature Measurement : Introduction, Measurement of Temperature, Non Electrical Methods, Solid Rod Thermometer, Bimetallic Thermometer, Liquid-in-Glass thermometer, Pressure Thermometer, Electrical Methods, Electrical Resistance Thermometers, Semiconductor Resistance Sensors (Thermistors), Thermo-Electric Sensors, Thermocouple Materials, Radiation Methods (Pyrometry), Total Radiation Pyrometer, Selective Radiation Pyrometer.

Text Books :

1. Measurement systems Application and Design. Ernest O. Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002.
2. Measurement and Instrumentation in Engineering, Francis S. Tse and Ivan E. Morse, Marcel Dekker.
3. Principles of Measurement and Instrumentation – Alan S. Morris, Prentice Hall of India.
4. Mechanical Measurements: T.G. Beckwith, W.L. Buck and R.D. Marangoni Addison Wesley.
5. Instrumentation, Measurement and Analysis – B.C. Nakra and K.K. Chaudhary, Tata McGraw Hill
6. Mechanical Measurements by D. S. Kumar, Kataria & Son
7. Instrumentation devices & systems: Rangan, Mani, Sarma
8. A course in mechanical instrument & instrumentation: A.k.Sawhney

B. Tech (Eighth Semester) Mechanical Engineering (Auto)
Total Quality Management
ME 426 E

L	T	P/D	Total
4	1	-	5

Sessional: 50 marks
Theory: 100 marks
Total: 150 Marks
Duration of Exams: 03
hours

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Concept of Quality, Quality as the basis of market competition, Historical review, Quality philosophy of Deming, Juran, Crosby etc., Obstacles, Integrating productivity and Quality. Organization of Quality, Quality council, Total Quality Culture, Quality leadership, Quality awards, Total employee involvement, Quality circles, Attitude of top management, executives and workers, Operators responsibility of Quality, causes of operator's errors, Motivation.

UNIT II

Introduction to TQM, Models for TQM. TQM implementation, Advantages of TQM, Obstacles to TQM, TQM in service sector. Concepts of Quality function deployment, cause and effect diagram, SWOT analysis, Continuous improvement, PDCA cycle, Supplier partnership, Supplier certification, Pareto diagram, Scatter diagram, Benchmarking, Taguchi's Quality Engineering, Failure mode and effect analysis, Total productive maintenance, Introduction to JIT, JIT Quality management, SQC, SPC, DPR, Kaizen, Six sigma concept.

UNIT III

Introduction to ISO 9000 series of standards, other quality systems, Implementation, Documentation, Internal audits, Registration, Closing Comments.

UNIT IV

Beyond ISO 9000 horizon, Introduction to ISO 14000, Series standards, Concepts of ISO 14001, EMS Benefits, ISO 10011- 10014, Quality systems.

Suggested Books:

1. Total Quality Management: By Bosterfield et al., Pearson Education India, 2001.
2. The Essence of Total Quality Management: By Johan Bank, Prentice Hall of India 2000.
3. Managing for Total Quality: By Logothelis Prentice Hall of India, 2000.
4. Total Quality Management: By Sundra Raju, Tata McGraw Hills publishing company, 1997.
5. TQM and ISO 9000: By K.C. Arora, S.K. Kataria & Sons 2000.
6. ISO 9000 Quality System: By Dalde & Saurabh, Standard Publishing, 1994.

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**B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Automotive Electronics and Microcontrollers
MEA 406E**

L	T	P	Total
3	1		4

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam	: 3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Basic Electronics

Introduction, Electronic devices and circuits, Amplifiers, Converters, Digital Electronics.

Microprocessors

Block diagram of microcomputer, Architecture of Intel 8085, Importance of Data, Address and Control buses, Instruction formats, Addressing modes and types of instructions in Intel 8085, Instruction set of 8085. Memory Devices, RAM, ROM Types, Microprocessor interfacing with memory chips. LAN and CAN Network basics

UNIT II

Microcontrollers

Comparison of microprocessor & microcontrollers, survey of 4,8,16 & 32 bit microcontrollers. Architecture of 8051:Block Diagram, oscillator & clock, Program Counter, registers, Flags, Internal memory, stack & stack pointer, special function register, Input/Output Pins, Ports and Circuits, External memory, Counters & Timers, Serial Data input/output interrupts. DC Motor and Stepper motor controls.

Chassis Control system

Electronic management of chassis system, Cruise control systems. Electronic suspension system, antilock braking controls system, traction control system, and vehicle stability control system. Electronic Steering control. Body controls and Security

UNIT III

Electronic fuel control system

Introduction, components, Open loop and closed loop control systems, intake manifold pressures, mass air flow rate sensor, Throttle body injection and multi port or point fuel injection, Fuel injection system, Injector operations, Injection system controls.

Digital engine control system

Motivation for electronic engine control, concept, parameters, variables, Engine mapping, control strategy, Electronic engine management components, layout. Engine cranking and warm up control, Acceleration enrichment, Deceleration leaning and idle speed control. EGR control, Variable valve timing control, Electronic Ignition control, Electronic spark timing control. Exhaust emission control engineering, Integrated engine control system.

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UNIT IV

Transmission control systems:

Electronic transmission management: components, layout. Electronic control of automatic transmissions, valve actuating control system, two-wheel drive control, four-wheel drive control, all wheel drive auto control system. Electric vehicle drive controls: Electronic control of hybrid and electric vehicles. Digital controllers for drive-motor, motor-generator, battery and fuel cell.

Body control systems: Remote central locking, Key less entry, Automatic Air conditioning systems. Security systems: immobilizer, and warning systems. Telematics, GPS Systems, Electronic control system diagnostics.

Text Books:

1. William B.Riddens, "Understanding Automotive Electronics ", 5th Edition, Butterworth, Heinemann Woburn, 1998.
2. William L Hüsselbee, " Automotive Computers and Control System: Fundamentals and Service ". Hartcourt Brace Professional Publications.
3. Thomas H Denton, "Automobile Electrical and Electronic Systems", SAE Publication.
4. Bosch Automotive Handbook, Latest Edition, SAE Publication
5. Bechtold., " Understanding Automotive Electronic ", SAE Publication
6. Ronald K Jurgen, "Automotive Microcontrollers" SAE Publications
7. Ronald K Jurgen, " Passenger Safety and Convenience Systems" SAE Publications
8. T.Mellard, " Automotive Electronics ".

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B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Auto Fuel and Lubricant
MEA 408E

L	T	P	Total
3	1		4

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam	: 3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

Unit-I

Manufacture of Fuels:

Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process.

Properties and Testing of Fuels:

Thermo-chemistry of fuels, properties and testing of fuels, Lubricant relative density, calorific value, fire point distillation, vapour pressure, flash point, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, viscosity index etc. B.I.S specification for diesel, petrol, biodiesel and CNG

Unit-II

Alternative Fuels:

Use of alternate fuels in engines-LPG, CNG. Need of Alternate Fuels, availability & their properties, general use of alcohols, LPG, CNG, LNG, hydrogen, ammonia, vegetable oils, biodiesel and biogas. Merits and Demerits of alternate fuels. Introduction to alternate energy sources like electric vehicle, hybrid, fuel cell & solar car.

Unit-III

Fuel rating:

Cetane rating, fuel requirements. Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications of fuels SI Engines – flame.

Additives and Combustion:

propagation and mechanism of combustion, normal combustion, knocking, octane rating, fuel requirements. CI Engine, mechanism of combustion, diesel knock.

Unit-IV

Lubricants: Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants Classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants.

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Theory of Lubrication: Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

TEXT BOOKS

1. V.Ganesan, "Internal Combustion Engines" Tata McGraw-Hill Publishing Co. Newdelhi
2. M.L.Mathur and P.Sharma "A course in internal combustion engines", Dhanpatrai Publications
3. Raymond.C.Gunther – Lubrication – Chilton Book Co., - 1971.
4. Obert.E.F "Internal Combustion Engineering and Air Pollution", International book Co., 1988.

REFERENCES

1. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.
2. Francis, W – Fuels and Fuel Technology, Vol. I & II
3. Hobson, G.D. & Pohl.W- Modern Petroleum Technology
4. A.R.Lansdown – Lubrication – A practical guide to lubricant selection – Pergamon press – 1982.
5. Raymond.C.Gunther – Lubrication – Chilton Book Co., - 1971.

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**B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Measurement and Instrumentation Lab
MEA 410E**

L	T	P	Total
	-	2	2

Sessional	: 50 Marks
Practical	: 25 Marks
Total	: 75 Marks
Duration of Exam	: 3 Hrs.

List of Experiments:-

1. Measurement with the help of vernier caliper and micrometer
2. Measurement of an angle with the help of sine bar
3. Measurement of surface roughness
4. Measurement of speed and torque of a shaft
5. Measurement of acceleration and vibrations
6. Calibration of a pressure guage with the help of a dead weight guage tester
7. Measurement of temperature using RTD / thermocouple
8. Determination of frequency & phase angle using C.R.O.
9. Measurement of Inductance by Maxwell's Bridge.
10. Measurement of flow rate and quantity

Note: Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.

B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Project-II
ME 410 E

L	T	P/D	Total
-	-	9	9

Sessional : 100Marks
Practical : 100 Marks
Total : 200 Marks

Duration of Exam: 3 Hrs.

The student is expected to finish the remaining portion of the project

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B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Seminar
ME 411 E

P/D	Total
2	2

Sessional: 25 marks

Student will give a talk on some technical topics.

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