B.E. V TH SE,ESTER EXAMINATION SCHEME

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Max. Marks Sessional IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
ME501	Design of Machine Elements	3	1	-	4	3	80	10	10	100	40	-	-	-	-
ME502	Metrology & Quality Control	3	1	-	3	3	80	10	10	100	40	-	-	-	-
ME503	Industrial Economics & Enterprenuership Development	3	1	-	4	3	80	10	10	100	40	-	-	-	-
ME504	Mechanical Measurement	3	1	-	3	3	80	10	10	100	40	-	-	-	-
ME505	Heat Transfer	3	1	-	3	3	80	10	10	100	40	-	-	-	-
Laboratory															
ME506	Heat Transfer	-	-	3	2	-	-	-	-	-	-	25	25	50	25

Gondwana University, Gadchiroli

Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): FIFTH SEMESTER ME501: DESIGN OF MACHINE ELEMENTS (Theory)

CREDITS: 04

Teaching Scheme
Tutorial: 1 Hour/Week

Examination Scheme Lectures: 3 Hours/Week
University Assessment: 80 Marks
College Assessment: 20 Marks

Duration of Paper: 03 Hours

UNIT – I **[12 Hrs.]**

Definition of design, types of design, design process, (i.e, various phases in design) feasibility, preliminary design alternatives, General consideration in Machine Design. Manufacturing considerations in design.

Mechanical properties, Applications and designations as per ISI and their equivalence with other standards of engineering materials, selection of material.

Factor of safety, Statistical methods in determining factor of safety. Theories of failure, modes of failure, compound stresses, eccentric axial loading, variable stresses in machine parts, stress concentration & stress raisers, notch sensitivity, stress concentration factor, methods for reducing stress concentration factor. Goodmans criteria, Soderberg criteria, Gerber`s criteria, fatigue design for finite & infinite life of the parts subjected to variable loads.

Design of Cotter Joint & Knuckle Joint.

UNIT – II **[12 Hrs.]**

Design of Riveted joint for Boiler shell, Design of Lozenge joint (Uniform Straight joint), eccentrically loaded riveted joint.

Welded Joint: Design of single transverse, double transverse, parallel fillet, combination fillet, butt joint, eccentrically loaded welded joints.

Bolted joint: Design of bolted fasteners, bolts of uniform strength, bolted joints under eccentric loading.

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UNIT – III **[12 Hrs.]**

Design of power screw:

Derivation of Expression for deflection and shear stress in helical spring, design of helical spring, design of leaf spring.

Design of lever: Hand lever, Foot lever, and Bell crank lever

UNIT – IV **[12 Hrs.]**

Classification of thin & thick cylindrical pressure vessels, Stresses in thin & thick cylindrical pressure vessels when it is subjected to internal pressure, expression for circumferential & longitudinal stresses, design of pressure vessel, heads & cover plate.

Design of transmission shafts on the basis of strength, rigidity & critical speed. ASME code for shaft design. Design of Stepped shaft, Axle, Splined shaft, Keys.

Design of Shrink & Press Fit Joints

BOOKS RECOMMENDED:

1. Design of Machine Element – V. B. Bhandari.
2. Machine Design – Sharma and Agrawal
3. Mechanical Engineering Design – J. E. Shigley.
4. Machine Design – Khurmi & Gupta
5. Design Data for Machine Elements – B. D. Shiwalkar

ME502: METROLOGY & QUALITY CONTROL (Theory)

CREDITS: 03

Teaching Scheme Lectures: 3 Hours/Week
Hour/Week

Examination Scheme
Duration of Paper: 03 Hours Tutorial: 1
University Assessment: 80 Marks
College Assessment: 20 Marks

UNIT – I **[9 Hrs.]**

Classification of operations – Basic qualifying process, critical product, critical secondary, auxiliary, supporting operations.

Tolerance analysis of limit & fits. Types of fits, shaft basis system, hole basis system, Selective assembly, allowances, IS specifications. Design of Limit gauges.

UNIT – II **[9 Hrs.]**

Metrology :- Standards of measurements, simple gauging instruments for linear and angular measurement, comparators – Mechanical, Electrical, Pneumatic, Optical, Measurement of straightness and flatness. Measurement of thread, measurement of gear tooth profile.

UNIT – III **[9 Hrs.]**

Quality Control :- Definition, function, objectives, characteristics. Quality, Quality of design, quality of conformance, process control charts and process capability. Statistical quality control.

UNIT – IV **[9 Hrs.]**

Acceptance sampling techniques, O. C. Curves, sampling plans, Inspection :- Types and objectives.(No analytical treatment)
Introduction to ISO 9000, BIS 14000 series, TQM concepts, Quality assurance, Quality audit, Quality circles.

UNIT – V **[9 Hrs.]**

Jigs and Fixtures : Introduction, Difference between jigs and fixtures, uses, principles of jigs and fixtures design. Materials, principles of location, methods of location. Clamping requirements, types of clamps, jig bushes, drilling jigs, milling fixtures, classification of fixtures.

BOOKS RECOMMENDED:

1. Metrology – R. K. Jain.
2. Metrology – I. C. Gupta.
3. Quality Control Handbook – Juran
4. Statistical Quality Control – Grant.
5. Total Quality Management – Zaire
6. Production Engineering – P. C. Sharma.
7. Statistical Quality Control – Mahajan.

ME 503: INDUSTRIAL ECONOMICS & ENTREPRENEURSHIP DEVELOPMENT (Theory)

CREDITS: 04

Teaching Scheme Lectures: 3 Hours/Week
Hour/Week

Examination Scheme
Duration of Paper: 03 Hours Tutorial: 1
University Assessment: 80 Marks
College Assessment: 20 Marks

UNIT – I **[9 Hrs.]**

Industrial Economics : Basic concepts, demand analysis, types of demand, determinants of demand, methods of demand forecasting, supply, law of diminishing marginal utility, elasticity of demand.

UNIT – II **[9 Hrs.]**

Factors of production, production function, firm and industry, laws of return, cost concepts, fix variable, average, marginal and total cost, break even analysis, depreciation cost, taxation system, types of taxes.

UNIT – III **[9 Hrs.]**

Optimum size of unit, optimum firm, industrial combinations, causes for the growth of combinations, forms of combinations in India, Various competitive situations, perfect, monopoly, monopolistic, oligopoly. Price determination under these situations, Impact of globalization on Indian economy.

UNIT – IV **[9 Hrs.]**

Concept of entrepreneurship, definition, competencies of entrepreneurs, entrepreneurial functions, achievement, motivation, types of enterprises. Procedure to set up small scale industrial unit, advantages and limitation of SSI. Market survey and factors governing product selection. Project report preparation, technical, financial & marketing analysis of project.

UNIT – V **[9 Hrs.]**

Factors governing the selection of site, plant and machinery. Role of consultancy organizations, role of District Industries Center, State Industrial Development Corporations, Banks and Financial Institutions, latest SSI intensive schemes (To be confirmed from DIC time to time). Determination of working capital requirement.

BOOKS RECOMMENDED:

1. Managerial Economics – V. N. Gupta.
2. Managerial Economics – G. S. Gupta.
3. Indian Industrial Economy – K. V. Sivaya, V. B. M. Das.
4. Entrepreneurship Development – Khanka.
5. Dynamics of Entrepreneurial development – Vasant Desai

ME504: MECHANICAL MEASUREMENT (Theory)

CREDITS: 03

Teaching Scheme
Lectures: 3 Hours/Week
Tutorial: 1 Hour/Week

Examination Scheme
Duration of Paper: 03 Hours
University Assessment: 80 Marks
College Assessment: 20 Marks

UNIT – I **[9 Hrs.]**

Purpose, structure and elements of measuring system. Static characteristics of measurement system elements including systematic, statistical characteristic, generalized model of system element and calibration . Measurement error, error probability density function, error reduction.

UNIT – II **[9 Hrs.]**

Dynamic Characteristics of Measurement System, First and Second Order Instruments, Transfer Function G(S), Step, Ramp And Frequency Response, Dynamic Errors. Signals and Noise in Measurement System including Deterministic and Random Signals, Noise, Interference, Noise Sources and Couplings, Reduction of Noise.

UNIT – III **[9 Hrs.]**

Introduction to Transducers Elements, Classification, Principle, Sensing Elements, Signal Conditioning Elements, Construction, Range & Working of Instruments for Measurement of Linear & Angular Displacement and Speed.

UNIT – IV **[9 Hrs.]**

Classification, Principle, Sensing Elements, Signal Conditioning Elements, Construction, Range & Working of Instruments for Measurement of Strain, Weight, Force, Torque, Power, Pressure, Vacuum, Sound.

UNIT – V **[9 Hrs.]**

Classification, Principle, Sensing Elements, Signal Conditioning Elements, Construction, Range and Working Instruments for Measurement of Temperature, Level & Flow.

BOOKS RECOMMENDED:

1. Principles of Measurement Systems – John P. Bentley, Pearson Education Asia.
2. Principles of Measurement Systems – Nakra Chaudhary
3. Principles of Measurement Systems – Beckwith Buck
4. Principles of Measurement Systems – Doeblin
5. Mechanical Measurement and Industrial Instrumentation - A.K.Sawhney
6. Mechanical Measurement and Industrial Instrumentation - D.S.Kumar
7. Mechanical Measurement and Industrial Instrumentation - R.K.Rajput

ME505: HEAT TRANSFER (Theory)

CREDITS: 03

Teaching Scheme
Lectures: 3 Hours/Week
Tutorial: 1 Hour/Week

Examination Scheme
Duration of Paper: 03 Hours
University Assessment: 80 Marks
College Assessment: 20 Marks

UNIT – I **[9 Hrs.]**

Introduction, basic modes of heat transfer, conduction, convection and radiation. Laws of heat transfer and conservation of energy requirement. General heat conduction equation in Cartesian, cylindrical & spherical co-ordinates. Thermal conductivity and diffusivity. One dimensional steady state conduction equation for the plane wall, cylinder and sphere. Thermal resistance of composite structures, contact resistance, overall heat transfer coefficient, critical thickness of insulation.

UNIT – II **[9 Hrs.]**

Conduction with internal heat generation for plane wall, cylinder and sphere. Extended surfaces, Types of Fins. Fins of uniform cross sectional area, Temperature distribution and heat transfer rate, fin efficiency and effectiveness. Error in temperature measurement. Steady state heat transfer, lumped heat capacity analysis, Heisler charts. Biot Number, Fourier Number and their significance.

UNIT – III **[9 Hrs.]**

Forced convection, Physical significance of non-dimensional parameters. Concept of velocity & thermal boundary layer thickness, Local and average heat transfer coefficients. Empirical co-relations for external, internal flow, laminar & turbulent flow through conduits.
Free or natural convection. Grashoff number, Rayleigh number. Horizontal and vertical plate. Empirical co-relations for cylinders and spheres. Heat transfer with phase change, pool boiling curve & regimes of pool boiling. Film & Drop wise condensation, Laminar film condensation on vertical surface, Film condensation on horizontal tubes, Introduction to heat pipe.

UNIT – IV **[9 Hrs.]**

Radiation, nature of thermal radiation, black body radiation, radiation intensity, laws of radiation– Kirchhoff's, Planks, Weins displacement, Stefan Boltzmann & Lamberts Co-sine law. Emissivity, Absorbtivity, Transmissivity, Reflectivity, Radiosity, Emissive power, irradiation. Radiation network, radiation exchange between surfaces, idea of shape factor & reciprocity theorem, radiation between parallel plates, cylinder & spheres. Radiation shields, effect of radiation on temperature measurement.

UNIT – V **[9 Hrs.]**

Heat Exchanger :- Classification, Overall heat transfer coefficient, Fouling factor, LMTD method of heat exchange analysis for parallel, counter & cross flow arrangement. Effectiveness NTU method, heat exchanger analysis by NTU method, design aspects of heat exchangers. Introduction to compact heat exchanger.

BOOKS RECOMMENDED:

1. Introduction to heat Transfer – Incropera & Dewitt J. Wiley
2. Elements of Heat Transfer – M. N. Ozisik
3. Heat Transfer – S. P. Sukhatme
4. Heat and Mass Transfer – Domkundwar, Dhanpat Rai
5. Heat Transfer – Dr. D.S.Kumar

ME506: HEAT TRANSFER (Laboratory)

CREDITS: 02

Teaching Scheme
Practical: 3 Hours/Week

Examination Scheme
University Assessment: 25 Marks
College Assessment: 25 Marks

LIST OF PRACTICALS

Minimum Eight experiments out of following should be performed

1. Study of different methods of temperature measurements with special emphasis on thermocouples.
2. Study of different thermal properties of matter with special Emphasis on thermal conductivity of various materials.
3. Determination of thermal conductivity of metal bar
4. Determination of thermal conductivity of insulating material in the powder form.
5. Determination of thermal conductivity of liquids.
6. Determination of thermal conductivity by guarded plate heater method.
7. Determination of temperature distribution and heat transfer plate from a fin under (A) Free convection & (B) Forced convection condition.
8. Determination of forced convection heat transfer coefficient for fluid flow through a closed conduit.
9. Determination of forced convection heat transfer coefficient for air fluid flow over a vertical surface.
10. Determination of critical heat flux in saturated pool boiling.
11. Determination of condensation heat transfer in film wise & drop wise modes.
12. Study of various types of heat exchangers.
13. Determination of emissivity of non black surfaces.
14. Determination of Stefan-Boltzmann constant.
15. Study of heat pipes.

A Journal/Report on practicals conducted shall be submitted by each student. University Practical examination shall be on viva-voce of 10 marks and practical performance or objective test of 15 marks.

ME507: MECHANICAL MEASUREMENT AND METROLOGY (Laboratory)

CREDITS: 02

Teaching Scheme
Practical: 3 Hours/Week

Examination Scheme
University Assessment: 25 Marks
College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight experiments out of following should be performed.

1. Study of first order and second order instruments.
2. Study of displacement measurement using LVDT
3. Study of Load measurement using load Cell
4. Study of torque measurement using torque Cell
5. Study of Strain measurement using strain gauges and digital strain indicator.
6. Study of speed measurement using
   a) Photo electric pick up b) Magnetic pick up c) Stroboscope
7. Calibration of pressure gauge by
   a) Dead weight pressure tester b) Pressure cell
8. Study temperature measurement using thermocouple, thermisters and RTD
9. Study of comparators (mechanical type, electric type, electronic type)
10. Study of surface roughness indicators
11. Study of straightness and flatness by Autocollimeter, Profile projector and monochromatic light interference method.
12. Study linear measuring instruments (precision and non precision types)
13. Study of limits, fits and tolerances
14. Study of machine selection and process planning

A Journal/Report on practicals conducted shall be submitted by each student. University Practical examination shall be on viva-voce of 10 marks and practical performance or objective test of 15 marks.

ME508: COMPUTER APPLICATIONS (Laboratory)

CREDITS: 03

Teaching Scheme	**Examination Scheme**
Practical: 2 Hours/Week	University Assessment: 50 Marks
Tutorial: 1 Hour/Week	College Assessment: 50 Marks

Course Objectives and Outcomes: Use of Computers for solving complex numerical problems requires the knowledge of programming learnt in the previous course. Engineering problems are quite complex and it may not be possible to find their analytical solutions. Hence it is required to resort to computer oriented numerical methods for solving them. The objective is to use programming knowledge for development of application programs for solution of various numerical methods & also in area of Mechanical engineering. This course is expected to provide some practical hands-on experience of programming for numerical methods, problems in Mechanical engineering & also exposure to Mathematical Software/s.

Review of Computer Programming: Variables, Data types, Declarations, Operators, Expressions, Input Output Operations, Formatted I/O, Hierarchy of Operations, Decision Making the While, The For, The Do While Loops, Nesting of loops, Switch, Functions, Arrays.

Review of Numerical Methods for solution of Linear Equations, Interpolation, differentiation, Integration and differential equations.

Exposure to software's like MATLAB / MATHCAD / SCI LAB / MATHEMATICA or any other relevant commercial softwares/ freewares

LIST OF PRACTICAL

Minimum Eight to Ten practical from the following groups A, B & C covering each group.

A) Development of Programmes in C / C++ for following.

1. Factorial of a number using functions
2. Sorting of Vectors
3. Addition of Matrices
4. Transpose of Matrix
5. Multiplication of Matrices
6. Gauss Elimination method
7. Iterative Methods -Gauss Jacobi Iterative Method\
8. The Gauss-Seidel Iteration Method
9. Euler Method
10. Predictor Corrector Method
11. Runge Kutta Method
12. Taylor's Series
13. Regula Falsi Method
14. Newton Raphson's Method
15. Least Square Fit Method

B) Development of programmes in C / C++ to solve the problems in Mechanics, Fluid Mechanics, Kinematics of Machines, Engineering Thermodynamics, Hydraulic Machines, Mechanics of Materials, Design of Machine Elements, Heat Transfer or in other areas of Mechanical Engineering.

C) Application of Mathematical Software/s for solution of problems for the above mentioned groups.

A Journal/Report on practicals conducted shall be submitted by each student. University Practical examination shall be on viva-voce of 20 marks and practical performance of 30 marks.

BOOKS RECOMMENDED:

1. E. Balaguruswami - Programming in ANSI - Tata Mcgraw Hill Publishing Co. Ltd
2. Kerningham and Ritchie – The C Programming Language – Prentice -Hall
3. Y.P. Kanetkar - Let Us C - Jones & Bartlett Learning;
4. B. S. Grewal – Higher Engineering Mathematics : Khanna Publishers
5. User's/Command/Tutorial Guide of Relevant Mathematical Software

ME509: SEMINAR

CREDITS: 01

Teaching Scheme
Lectures: 2 Hours/Week

Examination Scheme
College Assessment: 50 Marks

This is an individual student activity. Seminar should be based on any relevant advanced technical topic. Report should be based on the information collected from Handbooks, Journals, Conference proceedings & reference books. Seminar report should be submitted & seminar should be delivered on reported work.

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