UJJAIN ENGINEERING COLLEGE, UJJAIN. (MP) – 456 010

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
CE-1402	Applied Mechanics	3	1	2	4 + 1	70	22

UNIT - I :

Forces and Equilibrium : Graphical and Analytical Treatment of Concurrent and non-concurrent, Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts : Frictional force in equilibrium problems.

UNIT - II :

Moments : Concepts of Moments, Varignon's theorem, Principle of Moments, Applications of Moments to Simple Mechanism, Parallel Forces, Concept of Couples.

Laws of Motion:- Concept of Momentum, Newton's law of Motion, Conservation of momentum, impulse and impulsive forces.

Virtual Work power and Energy

UNIT - III :

Centre of Gravity and moment of Inertia : Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes.

UNIT - IV :

Analysis of plane Trusses : Method of joints, Method of Sections.

UNIT - V :

Simple Machines - Concept of Machine Mechanical Advantages, Velocity, Ratio and efficiency of a machine, their relationship, law of machine simple Machines (Lever, Wheel and Axles Pulleys, Which Crabs).

References :-

1. Global Positioning System Principles and application- Gopi, TMH.
2. R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
3. A. Boresi & Schmidt- Engineering Mechines- statics dynamics, Thomson' Books.
4. R.K. Rajput, Engineering Mechanics S.Chand & Co.

List of Experiments :-

(1) To verify the law of Triangle of forces and Lami's theorem.
(2) To verify the law of parallelogram of forces.
(3) To verify law of polygon of forces.
(4) To find the support reactions of a given truss and verify analytically.
(5) To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
(6) To determine the moment of inertia of fly wheel by falling weight method.
(7) To verify bending moment at a given section of a simply supported beam

1 Hour Lecture (L) = 1 Credit 1 Hour Tutorial (T) = 1 Credit 2 Hours Practical (P) = 1 Credit

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SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
CE-1403	Fundamental of Civil Engineering	2	1	2	3 + 1	70	22

UNIT - I :

Building Materials : Engineering Properties, Selection, Uses, Application and laboratory tests of Different Materials: Stones, bricks, cement, concrete and mortar. Work ability, Strength properties of Concrete. Nominal proportion of Concrete preparation of concrete, compaction, curing.

UNIT - II :

Building Elements & Construction : Foundation, footings, brick masonry walls, plastering and pointing, floors, roofs Doors, windows - Types, their utility defects and remedial measures.

UNIT - III :

Chain Survey : Instruments Used in Chain Survey, Types of Chain, Method of Chain Survey, Direct and Indirect Ranging, Errors in Chain, Numerical Problems

UNIT - IV :

Compass Survey : Prismatic and Surveyor's Compass, Bearing - True Bearing, Magnetic Bearing & Arbitrary Bearing, Local Attraction & its Method, Numerical Problem.

UNIT - V :

Levelling : Definition, Technical Terminology, Types of Level - Dumpy Level Auto Level ect. Method of Levelling Numerical Problems.

References :-

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
5. S.P,Timoshenko, Mechanics of stricture, East West press Pvt.Ltd.
6. Surveying by Duggal – Tata McGraw Hill New Delhi.
7. Building Construction by S.C. Rangwala- Charotar publications House, Anand.
8. Building Construction by Grucharan Singh- Standard Book House, New Delhi.
9. Global Positioning System Principles and application- Gopi, TMH

List of Experiments :-

List of suggestive core Experiments: Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting experiments from each unit of syllabus.

(1) To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.
(2) To perform leveling exercise by height of instrument of Rise and fall method.
(3) To measure horizontal and vertical angles in the field by using Theodolite.
(4) To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
(5) To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
(6) To determine the Compressive Strength of brick.
(7) To determine particle size distribution and fineness modulus of course and fine Aggregate.

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SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
CS-1401	C / C++ Programming for Problem Solving	2	1	4	3 + 2	70	22

UNIT - I :

Introduction to Programming :

Representation of Algorithm : Flowchart / Pseudo code with examples. From algorithms to programs : Source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code. Arithmetic expressions and operators precedence. Conditional, Branching and Loop statements. Solving the problems of sum of series like sine, cosine.

UNIT - II :

Array and Function :

Array : One dimensional Array (solve the problems like sum of n numbers, standard derivation), Two dimensional Array (solve the problems like addition and multiplication of two matrices).

Function : Built-in and user defined functions, Parameter passing in functions, call by value and call by reference parameters, Passing array to function.

UNIT - III :

Structure and Pointers

Structure : Defining structures and Array of structures, Passing structure to function.

Pointers : Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list.

UNIT - IV :

Object Oriented Programming

Concept of Object Oriented, Merits of Object-Oriented Technology. Class : Instance members and member functions. Concepts of object initialization, constructors, constructor overloading. Default copy constructor, Access modifiers.

UNIT - V :

Inheritance and Polymorphism

Inheritance : Concept of inheritance, Class relationships : Inheritance and its types, merits and Demerits of inheritance, Base class and Derived class, Public and Private Inheritance, Association inheritance.

Polymorphism : Concept of polymorphism, Compile time and Run time polymorphism, Operator overloading : Overloading unary operator, overloading binary operator, functions overloading, Abstract classes.

Suggested Text Books :-

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. E. Balaguruswamy, Programming in ANSI, Tata McGraw-Hill.

Contd. … 2

Suggested Reference Books :-

1. Brain W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. **Laboratory-Programming for Problem Solving [L:0, T:0, P:4 (2 Credits)]**
   (The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given).

Laboratory-Programming for Problem Solving [L:0, T:0, P:4 (2 Credits)] :

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given :-

(1) **Tutorial-1 :** Problem solving using computers :
Lab-1 : Familiarization with programming environment.

(2) **Tutorial-2 :** Variable types and type conversions :
Lab-2 : Simple computational problems using arithmetic expressions.

(3) **Tutorial-3 :** Branching and logical expressions :
Lab-3 : Problems involving if-then-else structures.

(4) **Tutorial-4 :** Loops, while and for loops :
Lab-4 : Iterative problems e.g. sum of series.

(5) **Tutorial-5 :** ID Arrays : searching, sorting :
Lab-5 : ID Array manipulation.

(6) **Tutorial-6 :** 2D arrays and Strings :
Lab-6 : Matrix problems, String operations.

(7) **Tutorial-7 :** Functions, call by value :
Lab-7 : Simple functions.

(8) **Tutorial-8&9 :** Numerical methods (Root finding, numerical differentiation, numerical integration) :
Lab-8&9 : Programming for solving Numerical methods problems.

(9) **Tutorial-10 :** Recursion, structure of recursive calls :
Lab-10 : Recursive function.

(10) **Tutorial-11 :** Pointers, structures and dynamic memory allocation :
Lab-11 : Pointers and structures.

(11) **Tutorial-12 :** File handling :
Lab-12 : File operations.

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SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
MA-2403	Mathematics - II	3	1	0	4 + 0	70	22

Course Objective : *The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.*

UNIT - I : *(8 lectures, 3 tutorials) [Weightage 14 marks]*

Multivariable Calculus (Integration) : Multiple Integration Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications : areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Simple applications involving cubes sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT - II : *(8 lectures, 3 tutorials) [Weightage 14 marks]*

First Order Ordinary Differential Equations : Exact, linear and Bemoulli's equations, Euler's equations, Equations not of first degree : equations solvable for p equations solvable for y, equations solvable for x and Clairaut's type. Second order linear diff. equations with constants coefficients Cauchy-Euler equation

UNIT - III : *(8 lectures, 3 tutorials) [Weightage 14 marks]*

Ordinary Differential Equations of Higher Orders : Second order linear differential equations with variable coefficients, Different methods of solution including the method of variation of parameters; Power series solutions; Legendre polynomials, function and different properties, Bessel functions of the first kind and their properties.

UNIT - IV : *(8 lectures, 3 tutorials) [Weightage 14 marks]*

Numerical Methods – I : Difference operators. Errors and Approximations, Interpolation, Inverse interpolation, Numerical differentiation, Numerical Integration Newton-Cotes formula, Simpson's and Weddel's rule and Gauss Legendre open quadrature formula. Solution of algebraic and transcendental equation Regula-Falsi, Newton-Raphson, Iterative, Graffe's root squaring methods.

UNIT - V : *(8 lectures, 3 tutorials) [Weightage 14 marks]*

Numerical Methods – II : Solutions of simultaneous algebraic equations, Solutions of ordinary differential equations (Taylor's Series, Picand's Method, Euler's method, Modified Euler's method, Runge-Kutta Method, Predictor-Corrector Method), Solution of Partial differential equation, Difference scheme, Solution of parabolic, hyperbolic and elliptic equations.

References :-

1. G.B. Thomas and R.L. Finney Calculus and Analytic geometry 9th Edition, Pearson Reprint, 2002.
2. Erwin Kryszig Advanced Engineering Mathematics th Edition, John Wiley & Sons, 2006.
3. R.K. Jain, S.R.K. Iyenger Advanced Engineering Mathematics, Narsa Publications.
4. W.E. Bayce & R.C. DiPrima, Elementary Differential Equations & Boundary Value Problems, 9th Edn., Wiley India. 2009.
5. S.L. Ross Differential Equations, 3rd Ed. Wiley India, 1984.
6. E.A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
7. E.L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition 2010.

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Assessment Policy

Sr. No.	Particulars	Marks	Policy
1	Mid Semester Exam (MST)	20	At least two mid semester tests will be conducted of 20 marks each. The final Mid Semester Marks shall be the average of the two higher mid semester marks.
2	**Quizzes, Assignments, Tutorials and Regularity**		
(i)	Quizzes	04	Two quizzes will be conducted of 2 (two) marks each.
(ii)	Assignments	04	Two assignments will be conducted of 2 (two) marks each.
(iii)	Tutorials and Regularity	02	Every Thursday/Friday a tutorial sheet will be given to the students. Students have to submit, solution of these tutorial sheets on the next Monday. Marks for regularity will be awarded only if the student attend more than or equal to 75%.
3	End Semester Examination	70	Question Paper for end semester examination will have **05 (Five)** question, one question from each module (unit). Internal choices will be given.

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SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
ME-1401	Basic Mechanical Engineering	2	1	2	3 + 1	70	22

UNIT - I :

Thermodynamics : Basic concepts, properties, equilibrium state, zeroth, first and second law of thermodynamics, energy, enthalpy and entropy, ideal gas laws, analysis of thermodynamic processes, two phase system, formation of steam, properties of steam, use of steam tables.

UNIT - II :

Steam Boilers : Introduction, classification, functions of boiler mountings and accessories, working of Cochran boiler, Lancashire boiler, Locomotive boiler and Babcock-Wilcox boiler, boiler performance, efficiency, equivalent evaporation, types of draught, calculation for chimney height.

UNIT - III :

I.C. Engines: Classification of I.C. engines, Otto cycle, Diesel cycle, working of two stroke petrol engine, two stroke diesel engine, working of four stroke petrol engine and four stroke diesel engine.

UNIT - IV :

Engineering Materials : Classification of engineering materials, mechanical properties of materials, compositions, characteristics application of cast iron, mild steel, stainless steel, stress, strain, Hooke's law, stress-strain diagram for ductile and brittle materials.

UNIT - V :

Foundry and Welding: Introduction, pattern, pattern materials, types of pattern, pattern allowances, mould materials, types and properties of moulding sand.

Welding: Introduction, types of welding, gas welding, gas welding equipments, types of flames, A.C. and D.C. arc welding, metal inert gas arc welding, carbon arc welding.

References :-

1. Basic Mechanical Engineering by Nag, Tripathi and Panwar; McGraw Hill.
2. Basic Mechanical Engineering by R.K. Rajput; Laxmi Publications.
3. Workshop Practice by Hajra and Choudhury (Vol-I); Media Promoters.
4. Workshop Technology by Chapman (Vol-I); CBS Publishers.

List of Experiments :-

(1) To study the Cochran boiler.
(2) To study the locomotive boiler.
(3) To study the Lancashire Boiler.
(4) To study the Babcock and Wilcox.
(5) To study the different boiler mountings and accessories.
(6) To study the four-stroke petrol engine.
(7) To study the four-stroke diesel engine.
(8) To study two-stroke petrol engines.
(9) To study two-stroke diesel engines.
(10) To study tensile test of mild steel specimen.

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SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
ME-1404	Workshop and Model Making Techniques	0	0	2	0 + 1	30	

Objective : *It will allow students to learn how to built projects using advances technologies :*

Unit-I

FDP 3D Printer : Laser cutting, CNC routing, Water cutting and 3D printing to realize the 3D models.

Unit-II

Laser Cut and Engraving Machine : Laser cut metal, Acrylic and plastic structural model in various shapes and design.

Unit-III

3D scanner and Vacuum Forming : Scanning 3D objects and creating model of 3D object.

Unit-IV

Band Saw : Cutting out small joints / trusses / structural models from raw wood.

Unit-V

Bench Drilling Machine : Drilling wood, Steel etc.

1 Hour Lecture (L) = 1 Credit 1 Hour Tutorial (T) = 1 Credit 2 Hours Practical (P) = 1 Credit