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

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

July-2023

SUBJECT		Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title	L	T	P			
CE-1401	Basic Civil Engg. & Engg. Mechanics	2	1	2	3 + 1	70	22

Basic Civil Engineering

UNIT - I :

Building Materials & Construction : Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials : Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

UNIT - II :

Surveying & Positioning : Introduction to surveying Instruments – levels, thedolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

UNIT - III :

Mapping & Sensing : Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations, Introduction of remote sensing and its applications.

Engineering Mechanics

UNIT - IV :

Forces and Equilibrium : Graphical and Analytical Treatment of Concurrent and nonconcurrent Co-planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts : Analysis of plane Trusses : Method of joints, Method of Sections. Frictional force in equilibrium problems.

UNIT - V :

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. Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

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.
10. R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
11. A. Boresi & Schmidt- Engineering Mechines- statics dynamics, Thomson' Books.
12. R.K. Rajput, Engineering Mechanics S.Chand & Co.

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List of 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.
(8) To verify the law of Triangle of forces and Lami's theorem.
(9) To verify the law of parallelogram of forces.
(10) To verify law of polygon of forces.
(11) To find the support reactions of a given truss and verify analytically.
(12) To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
(13) To determine the moment of inertia of fly wheel by falling weight method.
(14) To verify bending moment at a given section of a simply supported beam.

1 Hour Lecturer (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			
CS-1401	C / C++ Programming for Problem Solving	2	1	4	3 + 2 = 5	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), Variable and memory locations, Syntax and Logical Errors in compilation, object and executable codes. Arithmetic expressions and operator 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 deviation), Two dimensional Array (solve the problems like addition and multiplication of two matrices).
Function: Build-in and user defined functions, Parameter passing in functions, call by value and call by reference parameters, Passing arrays to functions.

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:

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSIC, Tata McGraw-Hill

Suggested Reference Books:

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

(ii) Laboratory-Programming for Problem Solving [L:0;T:0;P:4(2credits)]

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Tutorial 1: Problem solving using computers:
Lab 1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3 : Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g sum of series
Tutorial 5: 1DArrays: searching, sorting:
Lab 5: 1DArray manipulation
Tutorial 6: 2Darrays and Strings
Lab 6 : Matrix problems ,String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8&9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8and9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab1 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
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-2401	Mathematics – II	3	1	0	4 + 0	70	22

UNIT - I :

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 :

First Order Ordinary Differential Equations : Exact, linear and Bernoulli'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 :

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 :

Complex Variable – Differentiation : Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT - V :

Complex Variable – Integration : Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula(without proof), Liouville's theorem and Maximum-Modulus theorem (without proof);Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

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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References :-

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. R.K. Jain, S.R.K. Iyenger, Advanced Engineering Mathematics, Narosa Publications.
4. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and 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. J.W. Brown and R.V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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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			
PH-1401	Physics	3	1	2	4 + 1	70	22

UNIT - I :

Quantum Physics-I : Introduction and Origin of quantum hypothesis, Compton effect, de Broglie's hypothesis of matter wave and its experimental verification (Davisson - Germer Experiment). Group velocity, phase velocity, particle velocity and their relationship. Heisenberg's uncertainty principle with elementary proof, its application to Gamma ray microscope and single slit experiment.

UNIT - II :

Quantum Physics-II : Wave function and its physical interpretation, Equation of motion of matter waves, operators, time independent and time dependent Schrödinger wave equation, Born interpretation, Application of Schrödinger equation to one dimensional problems (particle in a box and potential step).

UNIT - III :

Wave Optics :
Interference : Interference, condition for interference of light, Fresnel's biprism, Interference in thin films, Newton's ring experiment and Michelson's interferometer.
Diffraction : Fraunhoffer diffraction at single slit, double slit and N-slit (Diffraction grating). Rayleigh criterion, resolving power of telescope and prism.
Polarization : Concept of polarization of light, Brewster's law, double refraction, Nicol prism, quarter and half wave plate. Production and detection of plane, circularly elliptically polarized light.

UNIT - IV :

Crystal Structure and Nuclear Physics :
Crystal Structure : Amorphous and crystalline solids, fundamental elements of symmetry, seven systems, cubic lattice, unit cell, Bravais space lattice, number of atoms per unit cell, coordination number, atomic radius, packing density, crystal planes, Miller indices, lattice parameter of cubic crystals, lattice interval between crystal planes, Reciprocal lattice.
Nuclear Physics : Particle accelerator, construction and working principle of Linear Particle accelerator, Cyclotron, Synchrocyclotron Synchrotron and Betatron, mass spectrograph, Aston and Bainbridge.

UNIT - V :

Laser and Fiber Optics :
Laser : The basic process of laser**,** Einstein's theory of matter and radiation interaction and A & B Coefficients, active medium, amplification of light by population inversion, pumping Schemes, Optical cavity resonator. Classification of Lasers, Construction working of He-Ne, CO_2, Ruby and Nd : YAG Laser. Properties and applications of Laser in Science, Engineering and in Medical field.
Optical Fiber : Fundamental idea about optical fiber, types of fiber, propagation of light through optical fiber (Ray theory), acceptance angle and acceptance cone, numerical aperture, V-number, losses in fiber, pulse dispersion, attenuation, applications of optical fiber.

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Assessment Policy

Sr. No.	Particulars	Marks	Policy
1	Mid Semester Exam	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	Quiz Assignment and Regularity (QAR)	10	To be evaluated on the basis of performance in assignment, quizzes and attendance in theory classes. At least two assignment and quizzes will be conducted.
3	Lab Quiz Assignment and Regularity (QAR)	20	To be evaluated on the basis of performance, using hands on training boards, design of experimental setup and attendance in laboratory classes Student have to perform at least **05 (five)** experiment in a semester.
4	End Semester Exam (Theory)	70	Question Paper for end semester examination will have **05 (Five)** question, one question from each module (unit). Internal choices will be given.
5	End Semester Exam (Practical)	30	To be evaluated on the basis of performance of allotted 01 (one) experiment out of total experiment performed during the semester and viva-voce.

References :-

1. Engineering Physics by M.N. Avadhanulu and P.G. Kshirsagar S. Chand and Co. Ltd.
2. Introduction to Atomic and Nuclear Physics- Harvey E. White- East-West Press, New Delhi.
3. Engineering Physics by H.K. Malik and A.K. Singh, McGraw Hill Education.
4. A Text Book of Engineering Physics by Navneet Gupta and S.K. Tiwary- Dhanpat Rai and Co.
5. Optics and Atomic Physics – Satyaprakash, Ratan Prakashan Mandir Meeruth.
6. Fundamental of Optics by Francis A. Jenkins and Harvey E. White, McGraw Hill Education.
7. Quantum Mechanics Concepts and Applications by Nouredine Zettili, John Wiley and Sons.
8. Concepts of Modern Physics by Arthur Beiser, Tata Mcgraw Hill (TMH).
9. Solid State Physics by S.O. Pillai, New Age International Publication.
10. Optics by Ajay Ghatak- Tata Mcgraw Hill (TMH).
11. Lasers - Theory and Applications by K. Thyagarajan and A.K. Ghatak, Macmilan India Ltd, New Delhi.
12. Unified Physics-(B. Sc II and III) by R.P. Goyal, Shiv Lal Agrawal and Co.
13. B.Sc Practical Physics by C.L. Arora, S. Chand and Co. Ltd.
14. Pragati Practical Physics by S.L. Gupta and V. Kumar, Pragati Prakashan, Meerut.

List of Experiments :-

(1) To determine the wavelength of prominent lines (Violet and Green) of Mercury light with the help of plane diffraction grating and Spectrometer.
(2) To determine the wavelength of Laser light using millimetre scale.
(3) To measure the grating constant (grating element) of a plane diffraction grating using diode Laser.
(4) To determine radius of curvature of Plano – Convex lens by measuring the diameter of Newton's ring.
(5) To determine the frequency of an alternating current mains with the help of Sonometer using non-magnetic wire.
(6) To determine the refractive index (μ) and dispersive power (ω) of the material of the Prism for violet and red color of mercury light with the help of Spectrometer.
(7) To determine the focal length of a combination of two convergent lenses separated by a distance "X", with the help of Nodal slide assembly and verify the relation

$$\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{X}{F_1 F_2}$$

Where, F_1F_2 = Focal lengths of given lenses,
F = Focal length of the combination,
X = Separation between the two lenses.

(8) To determine the refractive index of a given liquid (Water) with the help of the plane Mirror, Convex lens and Spherometer.
(9) To determine Brewster's angle for a glass surface and hence determine refractive index of glass using Gallium Arsenide Diode Laser.
(10) To determine the resolving power of telescope.
(11) To study the OR, AND, NAND gate and verify the truth table.
(12) To determine the wavelength of monochromatic source of light (sodium vapor) with the help of Fresnel's Biprism.

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(13) To study the effect of temperature on the reverse saturation current in junction diode and hence to determine the forbidden energy gap.
(14) To study and plot the forward and reverse bias (Breakdown) characteristics of a Zener diode.
(15) To determine Planck's constant by light emitting diode (LED).
(16) To verify the de-Broglie equation for electrons.
(17) To determine the energy band gap of semiconductor (Germanium) using four probe method.
(18) To determine the wavelength of monochromatic light by Michelson's interferometer.
(19) To determine the refractive indices μ_o and μ_e of Quartz prism for ordinary and extra-ordinary light using the spectrometer.
(20) Experiments related to laser, optical fibre and solid state Physics.

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