Ujjain Engineering College, Ujjain

B.TECH I SEMESTER **W.e.f. July, 2018**

COURSE CONTENTS

MA 1301	Mathematics-I	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	3	1	0	4	70	22

Prerequisite: Higher secondary level mathematics.

Course Objective: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT 1: Calculus: (6 lectures, 2 tutorials) [Weightage 10 marks]
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT 2: Calculus: (6 lectures, 2 tutorials) [Weightage 10 marks]
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and Minima.

UNIT 3: Sequences and series: (10 lectures, 3 tutorials) [Weightage 18 marks]
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT 4: Multivariable Calculus (Differentiation): (8 lectures, 3 tutorials) [Weightage 14 marks]
Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.

UNIT 5: Matrices (10 lectures, 3 tutorials) [Weightage 18 marks]
Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Suggested Text/Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson Education
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. R. K. Jain, S. R. K. Iyenger, Advanced Engineering Mathematics, Narosa Publications.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Course Outcomes (COs)

CO1	The students will be able to apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
CO2	The students will be able to apply differential calculus to find TSE of functions, to find limits of Indeterminate form and to find maxima and minima of functions.
CO3	The students will be able to understand the concepts of sequence and series, and determine limits of sequences and convergence and approximate sums of series, and will be able to Find the Fourier series representation of a function of one variable.
CO4	The students will be able to understand the theory of multivariable differentiation and will be able to apply it to find maxima and minima, Gradient, Curl and Divergence of functions.
CO5	The students will be able to understand the essential tools of matrices including eigen values, eigen vectors and diagonalization.

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B.TECH. I/II SEMESTER **W.e.f. July, 2018**

COURSE CONTENTS

PH 1301	Physics	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	3	1	1	5	70	22

Course Outcomes (COs): On completion of the course, the students will be able to:

- Appreciate the concept which leads to the origin & evolution of quantum mechanics.
- Comprehend the Schrodinger equation and apply the same for solving the problems of one dimensional motion of particles.
- Identify and solve the problems of wave optics and verify the same using various optical instruments.
- Get acquainted with the basic concept of Crystal structure and nuclear physics
- Explain the working principle of LASER and Optical fiber and perform experiments using LASER source.

Unit I

Quantum Physics-I: Introduction and Origin of Quantum hypothesis, Compton effect, de Broglie's hypothesis of matter wave & its experimental verification. Group velocity, Phase velocity, Particle Velocity & their relationship. Heisenberg' 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 and simple harmonic oscillator)

Unit III
Wave
Optics:

Interference: 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 polarized light, Brewster's law, Double refraction, Nicol prism, quarter & half wave plate. Production and detection of plane, circularly & elliptically polarized light.

Unit IV

Cristal Structure and Nuclear Physics:

Cristal 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 (Linear Particle accelerator, Cyclotron, Synchrocyclotron Synchrotron and Betatron). Mass spectrograph (Bainbridge and Aston).

UNIT V

Laser and Fiber Optics:

Laser : Stimulated and spontaneous emission, Einstein's theory of matter radiation interaction and A & B Coefficients, active medium, Amplification of light by Population inversion, Pumping Schemes, Optical resonator cavity. Different types of Laser: gas laser (He-Ne and CO_2), solid state laser (Ruby and Nd-YAG). Applications of Laser in Science, Engineering & Medicine.

Fundamental idea about optical fiber, types of fibers, propagation of light through step index fiber (Ray theory), acceptance angle & cone, numerical aperture, V-number, pulse dispersion, attenuation, losses & various uses, applications of Optical Fiber.

Contd….2…

Reference Books:

1. A Text Book of Engineering Physics by Navneet Gupta and S. K. Tiwary- Dhanpat Rai & Co
2. Engineering physics by M.N. Avadhanulu and P.G. Kshirsagar. S. Chand & Co.
3. Introduction to atomic and nuclear physics- Harvey E. White- East-West Press, New Delhi.
4. Optics and atomic physics – Satyaprakash, Ratan Prakashan mandir Meeruth
5. Quantum Mechanics by Satyaprakash and C . K. Singh- Kedar Nath and Ram Nath and Co.
6. Concepts of Modern Physics by Arthur Beiser - Tata Mcgraw Hill (TMH)
7. Engineering Physics by A. S. Vasudeva - Tata Mcgraw Hill (TMH)
8. Solid State Physics by Adrianus J. Dekker – Macmillan India Ltd.
9. An Introduction to LASERS Theory and Applications by M. N. Avadhaunulu – S. Chand and Co.
10. Optics by Ajay Ghatak- Tata Mcgraw Hill (TMH)
11. Elements of nuclear Physics by R.P.S. Yadav and M.L. Pandya
12. Solid State Physics by R. L. Singhal

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 surface tension of a liquid (water) by Jaegers method.

(3) To compare the illuminating power of two given sources (Electric filament bulb) with the help of Lummer – Brodhum Photometer and study of variation of illuminating power of given source with applied voltage.

(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_1, F_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 study and verify Algebraic theorem.

(13) To study the effect of temperature on the reverse saturation current in junction diode and hence to determine the forbidden energy gap.

(14) Experiments related to laser, optical fibre and solid state Physics

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										
CO2	3	3										1
CO3	3	3		2				3	3			
CO4	3	2										2
CO5	3	1						3	3			2

Ujjain Engineering College, Ujjain

B.TECH I/II SEMESTER **W.e.f. July, 2018**

COURSE CONTENTS

ME 1302	Basic Mechanical Engineering	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	2	1	2	4	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 table.

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 cost iron, mild steel, stainless steel, stress, strain, Hooke's law, stress-strain diagram for ductile and brittle material.

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.

Books Recommended:

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

Ujjain Engineering College, Ujjain							
B.TECH I/II SEMESTER w.e.f. July, 2018							
COURSE CONTENTS							
CE1301	**Basic Civil Engineering & Engineering Mechanics**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	3 Hours	2	1	2	4	70	22

Basic Civil Engineering

Course Objective :
To illustrate the fundamental concepts of civil engineering and engineering mechanics to students.

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.

Course Outcomes :

After the course student should be able to :

CO 1 Understand and familiarize with the basic building materials and construction elements and its properties.
CO 2 Demonstrate the basic equipments used in surveying.
CO 3 Apply the basic principles of surveying for computation of area and volume.
CO 4 Illustrate the system of forces and plot free body diagram for analyzing different members.
CO 5 Compute center of gravity and moment of inertia for various structural members under different loading conditions.

Contd….2…..

Reference Books:

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.

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.
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.

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B.TECH I/II SEMESTER						W.e.f. July, 2018	
COURSE CONTENTS							
CS 1301	**Programming for Problem Solving**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	3 Hours	2	1	4	5	70	22

Unit 1

Introduction to Programming :

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode 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.

Unit 2

Arithmetic expressions and precedence

Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching

Unit 3

Arrays : Arrays (1-D, 2-D), Character arrays and Strings

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 4

Iteration and loops

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 5

Structure: Structures, Defining structures and Array of Structures

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling.

Course Outcomes :

The student will learn :

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

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Suggested Text Books :

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, 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:
Lab1: 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: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays 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 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes :

1. To formulate the algorithms for simple problems.
2. To translate given algorithms to a working and correct program.
3. To be able to correct syntax errors as reported by the compilers.
4. To be able to identify and correct logical errors encountered at run time.
5. To be able to write iterative as well as recursive programs.
6. To be able to represent data in arrays, strings and structures and manipulate them through a program.
7. To be able to declare pointers of different types and use them in defining self-referential structures.
8. To be able to create, read and write to and from simple text files.