TECHNOCRATS INSTITUTE OF TECHNOLOGY
(An Autonomous Institute Affiliated to RGPV, Bhopal)
DEPARTMENTOF ENGINEERING MATHEMATICS

Semester/Year		II/I		Program		B Tech – CE ENGG.			
Subject Category	BSC	Subject Code:	BS-201 - CE	Subject Name		Engineering Mathematics Level - II			

MaximumMarksAllotted							Contact Hours			Total Credits
Theory			Practical		Total Marks					
ES	MS	Assignment/Quiz	ES	LW		L	T	P		
70	20	10	-	-	100	2	1	0		3

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in ordinary and partial differential equations, statisticaltechniques and vector calculus. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

1. To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.
2. To acquaint the student with mathematical tools available in statistics needed in variousfield of science and engineering.
3. To acquaint the student with mathematical tools available in vector calculus needed by various field of science and engineering.

UNITs	Descriptions
1	Unit – I Ordinary Differential Equations I: Differential Equations of First Order and FirstDegree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.
2	Unit – II Ordinary differential Equations II: Second order linear differential equations withvariable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

3	Unit – III Partial Differential Equations: Formulation of Partial Differential equations,Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

4	Unit – IVCentral moments, mean, variance, coefficients of skewness and kurtosis in terms of moments. Curve fitting by method of least squares, fitting of curves–Polynomial, exponential and power functions.
5	Unit – V Vector Calculus: Differentiation of Vectors, Scalar and vector point function,Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral,Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

Reference Books-

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. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill,2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2015

List/Linksof e-LearningResource

1. https://nptel.ac.in/courses/111/107/111107112/

2. https://nptel.ac.in/courses/111/104/111104092/

3. https://nptel.ac.in/courses/111/107/111107108/

4. https://nptel.ac.in/courses/111/107/111107108/

5. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ma07/

TECHNOCRATS INSTITUTE OF TECHNOLOGY
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DEPARTMENTOF ENGINEERING MATHEMATICS

Semester / Year		II / I		Program		B.Tech – CSE, IT, AIMI, AIDS, AI, DS & CY		
Subject Category	BS	Subject Code:		BS-201-CS	Subject Name	Engineering Mathematics Level –II (Discreate Structure)		
MaximumMarksAllotted						Contact Hours		Total Credits
Theory			Practical		Total Marks			
ES	MS	Assignment/Quiz	ES	LW		L	T	P
70	20	10				2	1	0	3

CourseObjective:

This course introduces fundamental concepts in discrete mathematics including set theory, logic, relations, functions, algebraic structures, and graph theory. It equips students with theorem-proving techniques and analytical tools such as mathematical induction, combinatory, and recurrence relations. The course also emphasizes applications in computer science through finite state machines.

UNITs	Descriptions
1.	Set Theory: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling Problem Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, pigeonhole principle.
2.	Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results.
3.	Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine.
4.	Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number.
5.	Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions.

ReferenceBooks-

1. C.L.Liu, "Elements of Discrete Mathematics" Tata Mc Graw-Hill Edition.
2. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", McGraw Hill.
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
4. Bisht, "Discrete Mathematics",Oxford University Press
5. Biswal,"Discrete Mathematics & Graph Theory", PHI

Course Outcomes:

1. **CO 1: Understand and apply** foundational concepts in set theory, relations, functions, and logic to model and analyze mathematical and computational problems.

2. **CO 2: Demonstrate proficiency** in theorem proving techniques such as mathematical induction and proof by contradiction for solving discrete mathematical problems.

3. **CO 3: Analyze algebraic structures** including groups, rings, and fields, and apply group theory concepts such as subgroups, cosets, and homomorphisms.

4. **CO 4: Apply graph theory concepts** to solve problems related to connectivity, shortest paths, coloring, and graph isomorphism.

5. **CO 5: Solve combinatorial problems** using recurrence relations, generating functions, and counting techniques such as permutations, combinations, and the pigeonhole principle.

Dr. Hariom Dubey

Dr. Jyoti Gupta

(Dr. Manoj Jha)

(Dr. C. K. Verma)

(Aftab Baig)

(Bhasha Sharma)

TECHNOCRATS INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF ENGG. MATHEMATICS (EC/EX)

Semester/Year		II / I		Program		B.Tech – EC/EX			
Subject Category	BS	Subject Code:	BS-201 EC/EX	Subject Name		Engineering Mathematics Level -II			
MaximumMarksAllotted									
Theory			Practical		Total Marks	Contact Hours			Total Credits
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	-	-	100	2	1	-	3

CourseObjective:

The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

➢ To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics

➢ To introduce effective mathematical tools for the solutions of ordinary and partial differential equations thatmodel physical processes.

➢ Tointroduce the tools of differentiation and integration of functions of complex variable that are used in varioustechniques dealing engineering problems.

➢ To introduce effective mathematical tools for the Numerical Solutions algebraic andtranscendental equations.

➢ To enable young technocrats to acquire mathematical knowledge to understand Laplacetransformation, Inverse Laplace transformation and Fourier Transform which are used invarious branches of engineering

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UNITs	Descriptions
1.	**Ordinary Differential Equations I:** Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations. Method of variation of parameters, Power series solutions, Bessel functions of the first kind and their properties.
2.	**Partial Differential Equations:** Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

3.	**Functions of Complex Variable :** Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursattheorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).
4.	**Transform Calculus:** Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform bydifferent methods, convolution theorem. Evaluation of integrals by Laplace transform, solvingODEs by Laplace Transform method, Fourier series: Half range sine and cosine series, Parseval's theorem. Fourier transforms and Z- Transform.
5.	**Numerical Methods:** Solution of Algebraic and Transcendental equation by N-R method, Numerical Integration by Simpsons Rules, Trapezoidal Rule. Solution of Ordinary Differential Equation by Ranga- Kutta Method.

ReferenceBooks-

Textbooks/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. 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, 11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
8. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005

Dr. Harian Dubey.

Dr. Jyoti Gupta

(Dr. Manoj Jha)

(Dr. C.K Ven)

(Aftab Baig)

(Bhasha Sharma)

TECHNOCRATS INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF ENGINEERING MATHEMATICS

Semester/Year		II/I		Program		B Tech – MECH. ENGG.			
Subject Category	BSC	**Subject Code:**	BS-201 ME	**Subject Name**		Engineering Mathematics Level - II			

Maximum Marks Allotted						Contact Hours			Total Credit s
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	-	-	100	2	1	0	3

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in Ordinary and partial differential equations, complex variables and vector calculus. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.
- To acquaint the student with mathematical tools available in vector calculus needed various field of science and engineering.

UNITs	Descriptions
1	**Ordinary Differential Equations I :** Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations.

2	**Ordinary differential Equations II :** Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions.
3	**Partial Differential Equations :** Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients Application in wave equation, Heat equation and Laplace equations.
4	**Functions of Complex Variable :** Functions of Complex Variables: Analytic Functions, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).
5	**Vector Calculus :** Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

Textbooks/Reference Books-

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.
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6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

List/Links of e-Learning Resource

1. https://nptel.ac.in/courses/111/107/111107112/
2. https://nptel.ac.in/courses/111/104/111104092/
3. https://nptel.ac.in/courses/111/107/111107108/
4. https://nptel.ac.in/courses/111/107/111107108/
5. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ma07/

TECHNOCRATS INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF ENGINEERING PHYSICS

Semester/Year		I & II / I		Program		B.Tech – ALL BRANCHES			
Subject Category	BSC	Subject Code:		BS-202	Subject Name	Engineering physics & Its applications			

Maximum Marks Allotted							Contact Hours			Total Credits
Theory			Practical		Total Marks					
ES	MS	Assignment/Quiz	ES	LW		L	T	P		
70	20	10	30	20	150	2	0	2		3

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus and linear algebra. It aims to equip the students to deal with advanced level of physics and applications that would be essential for their disciplines.

1. To introduce the concept of quantization of energy and wave-particle duality through quantum mechanical models and their engineering applications.

2. To enable students to determine the energy levels of microscopic particles using Schrödinger's equation and apply quantum principles to real systems like semiconductors and lasers.

3. To provide foundational understanding of the electrical behavior of semiconductors and functioning of p-n junction-based devices.

4. To develop the ability to apply equations of static equilibrium for solving planar force systems and analyzing pin-jointed trusses.

5. To enable students to analyze simply supported and cantilever beams to determine shear force and bending moment distributions under various loading conditions.

UNITs	Descriptions	Hrs.
1	**WAVE OPTICS AND ELECTROMAGNETIC PHENOMENON** Light as wave, Interference of light in Newton's Rings and Michelsons interferometer, diffraction at single slit, concept of polarization of light. Scalar	10

G Pandey
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(Dr. Rajnish Kurchania)

Aftab
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Dr. Sadhana Singh

(Shailendra Jain)

(Bhadra Sharma)

	and Vector field, idea of Gradient, Divergence, Curl, stokes and Gauss divergence theorem (without proof), Maxwell's Equations in vacuum, electromagnetic waves, poynting vector	
2	**QUANTUM THEORY** Origin of Quantum Theory, planck radiation law, de-Broglie's hypothesis for mattter wave , concept of phase and group velocities, Heisenberg 's uncertainty relation for position-momentum, energy -time, Schrodinger's equations, wave function: properties and significance, energy of a particle in one dimensional box.	10
3	**ELECTRONICS & LASER** Free electrons model of solids, kroning penny model (without derivation), distinction between conductor insulators and semiconductors on the basis of band theory of solids, intrinsic and extrinsic semi conductors, PN junction, zener breakdown, solar cell, Hall effect. Self emission, stimulated emission, Einstein's A and B coefficients, relation between A and B, active medium, population inversion, pumping, meta-stable state, optical resonator cavity ,Ruby Laser and Helium Neon Laser, applications of Laser.	10
4	**FORCES AND EQUILIBRIUM** Graphical and analytical treatment of concurrent, non concurrent and co-planner forces, free body 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.	8
5	**MOMENT OF INERTIA AND SIMPLE BEAMS** Centroid and centre of gravity, Moment of Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes, Analysis of cantilever & simply supported beams loaded with concentrated, distributed load and couple for support reactions, shear force and bending moment.	8

G Pandey
Dr. Gyanendra Pandey

CDr. Rajnish Kurchania

(Aftab Baig)

(Shailendra pin)

(Bhavna Sharma)

Dr. Sadhana Singh

ReferenceBooks-

SN	UNIT NAME	AUTHOR NAME
1	Quantum Mechanics	D.J. Griffiths and Ajoy Ghatak
2	Wave Optics	Ajoy Ghatak
3	Introduction to Solids	H. K. Malik
4	Lasers and Fiber Optics	O. Svelto
5	Electrostatics in vacuum	D.J. Griffiths
6	Engineering Mechanics	R.S. Kurmi
7	The Elements of Statics & Dynamics	S.L. Loney

Suggestive list of experiments:

1. To determine the dispersive power of prism.

2. To determine the λ of sodium light with the help of Newton's Ring.

3. Resolving Power of Telescope.

4. YDSE (Young's double slit Experiment).

5. To determine the frequency of AC mains supply.

6. V-I Characteristics of P-N junction diode.

7. To determine the λ of diode loses by single slit diffraction.

8. To determine the plank's constant with the help of photocell.

9. Hall's effect experiment.

10. Calibration of ammeter by using reference Zener diode.

11. To study the effect of temperature on reverse saturation current in P-N junction diode and to determine the energy band gap.

12. To determine the λ of sodium by using plane diffraction grating.

13. To determine the moment of inertia of fly wheel by falling weight method

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TECHNOCRATS INSTITUTE OF TECHNOLOGY

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B. Tech. First Year (I Semester)
Branch: Common to All Disciplines

Semester/Year		I/I		Program		B.Tech				
Subject Category	ES	Subject Code:	ES-203	Subject Name		Elements of Civil and Mechanical Engineering				
Maximum Marks Allotted							Contact Hours			Total Credits
Theory			Practical		Total Marks		L	T	P	
ES	MS	Assignment/Quiz	ES	LW						
70	20	10	30	20	150		2	0	2	3

Course Objective:

With the successful completion of the course, the student should have the capability to:

1. Explain properties on engineering materials.
2. Explain basic laws and concepts of fluid flow
3. Identify suitable building materials for construction.
4. Work with survey observations for fixing the position of points, and perform calculations for quantity.

UNITs	Descriptions	Hrs.
1	**Engineering Materials:-** Classification of engineering materials, Mechanical properties of materials, Hooke's law and modulus of elasticity, Tensile test- Stress-strain diagram of ductile and brittle materials, Hardness and Impact testing of materials. Classification, properties and applications of Cast iron and Carbon steels. Alloy steels and their applications.	6
2	**Basic concepts:-** Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, Heat and work transfer. First law of thermodynamics, First law applied to various systems and processes. Limitations of first law of thermodynamics. Second law of thermodynamics: heat engine, Refrigerator, heat pump, Carnot's cycle. Basic concepts of heat transfer: Modes of heat transfer, Fourier's law, Newton's law, Stefan –Boltzmann's law. Air-standard Otto, Diesel and Dual cycles, P-V & T-S diagrams and their efficiencies, working of four stroke & two stroke Petrol & Diesel engines. Working principle of compressor. Steam Engineering: Formation of steam, Steam properties, use of steam tables, Classification and working of Modern boilers, mountings and accessories of boilers, Thermal Efficiency and equivalent evaporation, natural and artificial draught.	14

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3	**Fluid Mechanics:** Fluids : Fluid properties, Newton's law of viscosity , Types of fluids , Pascal's law ,Hydrostatic Principle, Bernoulli's equation for incompressible fluids, Classification and working principle of Hydraulic machines, pumps, turbines.	8
4	**Building Materials & Construction:** Types, properties, test & use of common building materials like stones, bricks, cement, lime, timber and glass. Laboratory tests on concrete and brick (workability, compressive strength). Nominal proportion of concrete, preparation of concrete, compaction and curing of concrete. Elements of common building, types of building foundations (Isolated footing, conventional spread footings, combined footing, RCC footings), brick masonry walls, plastering and pointing. Common types of floors, roofs, doors, windows, lintels, staircases and their suitability .	8
5	**Surveying & Levelling:** Classification of survey, principles, linear and angular methods of measurement. Importance of survey stations, survey lines- ranging, bearing of survey lines, tape corrections, traversing with compass and level, adjustment of error in traversing. Introduction to Plane table surveying, **Leveling and Countering:** Leveling: Principles of leveling- booking and reducing levels (HI and Rise and Fall Method). Types of levelling cross sectioning. Digital and Auto Level, Errors in leveling. Contouring: characteristics, uses, computation of areas, volumes and quantity.	14

List of Experiments:
Students are required to perform minimum ten experiments from the following list by selecting minimum one experiment from each unit of syllabus.

1. Study of Universal Testing Machine.
2. To perform tensile testing on a MS specimen
3. Verification of Bernoulli's therom.
4. Study of various types of boilers.
5. Study of different types of Turbine.
6. Study of different IC Engines.
7. Study of different types of Boilers Mountings and accessories.
8. Study of electric and hybrid vehicles
9. To perform traverse surveying with prismatic compass, check for local attraction and
   Determine the corrected bearings and to balance the traverse by Bowditch's rule.
10. To perform leveling exercise by height of instrument and Rise and fall method.
11. To measure horizontal and vertical angles in the field by using Theodolite.
12. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
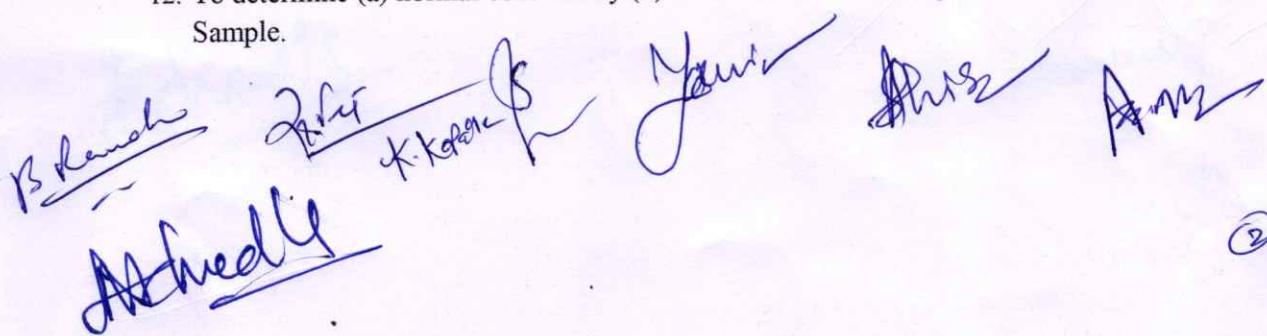
13. To determine the workability of fresh concrete of given proportions by Slump test

      or

      Compaction factor test.

14. To determine the Compressive Strength of brick sample.

15. To determine particle size distribution and fineness modulus of course and fine
Aggregate.

Reference Books:

1. Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age
2. **Nag P.K, Engineering Thermodynamics , TMH**
3. Ganesan , Internal Combustion Engines, TMH
4. Agrawal C M, Basic Mechanical Engineering, Wiley Publication.
5. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
6. Punmia, B.C., Surveying, Standard book depot.
7. Surveying by Duggal – Tata McGraw Hill New Delhi.
8. Building Construction by S.C. Rangwala- Charotar publications House, Anand.
9. Building Construction by Grucharan Singh- Standard Book House, New Delhi

CO	On successful completion of the course, the students will be able to –
CO1	Assess the engineering properties of ferrous materials.
CO2	Apply the laws of thermodynamics in steam engineering and study of reciprocating machines.
CO3	Apply elementary principles of fluid statics and dynamics.
CO4	Asses the use of suitable building material for construction of a common building.
CO5	Apply the concepts of surveying and levelling while computing the quantity of earth work in a project.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12
CO-1	2					2	2	2	1	2		
CO-2	2	2					1			1		2
CO-3	2	2							2	2		2
CO-4	2	2	2	2	-	-	-	-	3	3	-	2
CO-5	3	3	2	2	3	-	-	-	3	3	-	2

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TECHNOCRATS INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Semester/Year		II / I		Program		B.Tech (All Branches)			
Subject Category	ESC	Subject Code:		ES-205	Subject Name	Basic Computer Programming Level-2 and Data Structure			
Maximum Marks Allotted							Contact Hours		Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
-	-	-	30	20	50	-	-	6	3

Course Objective:

1. Understand advanced features of the C++ language.
2. Explore advanced language components like templates, exception handling, and STL.
3. Develop efficient, modular, and reusable code using OOP principles.
4. Apply object-oriented concepts such as classes, objects, inheritance, encapsulation, and polymorphism in data structure implementation.
5. Implement advanced data structures such as trees, heaps, graphs, hash tables, etc.
6. Analyse and apply searching and sorting techniques to real-world problems.
7. Use templates and generic programming to create reusable data structures.
8. Develop robust programs using exception handling for error management.
9. Understand how data structures support system software, databases, and application software development.

UNITs	Descriptions
I	**Review of C++ programming language**. Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Implementation aspects: Memory representation. Data structures operations and its cost estimation. Introduction to linear data structures- Arrays, Linked **List:** Representation of linked list in memory, different implementation of linked list. Circular linked list, doubly linked list, etc. Application of linked list: polynomial manipulation using linked list, etc.
II	**Stacks:** Stacks as ADT, Different implementation of stack, multiple stacks. Application of Stack: Conversion of infix to postfix notation using stack, evaluation of postfix expression, Recursion. Queues: Queues as ADT, Different implementation of queue, Circular queue, Concept of Dqueue and Priority Queue, Queue simulation, Application of queues.
III	**Tree:** Definitions - Height, depth, order, degree etc. Binary Search Tree - Operations, Traversal, Search. AVL Tree, Heap, Applications and comparison of various types of tree; Introduction to forest, multi-way Tree, B tree, B+ tree, B* tree and red-black tree.
IV	**Graphs**: Introduction, Classification of graph: Directed and Undirected graphs, etc, Representation, Graph Traversal: Depth First Search (DFS), Breadth First Search (BFS), Graph algorithm: Minimum Spanning Tree (MST)- Kruskal, Prim's algorithms. Dijkstra's shortest path algorithm; Comparison between different graph algorithms. Application of graphs.

V	**Sorting:** Introduction, Sort methods like: Bubble Sort, Quick sort. Selection sort, Heap sort, Insertion sort, Shell sort, Merge sort and Radix sort; comparison of various sorting techniques. **Searching:** Basic Search Techniques: Sequential search, Binary search, Comparison of search methods. Hashing & Indexing. **Case Study:** Application of various data structures in operating system, DBMS etc.

Course Outcomes:

CO1: Understand and apply advanced C++ features (OOP, templates, exception handling) for data structure implementation.

CO2: Implement and analyze linear data structures like arrays, linked lists, stacks, and queues.

CO3: Construct and apply tree structures such as BST, AVL, heaps, B-trees, etc., and evaluate their efficiency.

CO4: Analyze and apply graph algorithms including traversal, shortest paths, and MSTs for real-world problems.

CO5: Apply and compare sorting, searching, hashing, and indexing techniques in computing environments.

Reference Books-

1. AM Tanenbaum, Y Langsam& MJ Augustein, "Data structure using C and C++", Prentice Hall India.
2. Robert Kruse, Bruse Leung, "Data structures & Program Design in C", Pearson Education.
3. Aho, Hopcroft, Ullman, "Data Structures and Algorithms", Pearson Education.
4. N. Wirth, "Algorithms + Data Structure = Programs", Prentice Hall.
5. Jean – Paul Trembly , Paul Sorenson, "An Introduction to Structure with application", TMH.
6. Richard, GilbergBehrouz, Forouzan ,"Data structure – A Pseudocode Approach

List/Links of e-learning resource

CodeChef – Data Structures & Algorithms Practice

Link: https://www.codechef.com/practice/tags/datastructures

LeetCode   https://leetcode.com/explore/

- Practice problems grouped by data structures. Great for hands-on coding.

HackerRank – Data Structures Track

https://www.hackerrank.com/domains/tutorials/10-days-of-data-structures

- Covers arrays, linked lists, stacks, queues, trees, etc.

Suggestive list of experiments:

1. Implement linear and binary search on arrays.
2. Implement sorting algorithms: Bubble, Insertion, Selection, Merge, and Quick Sort.
3. Perform matrix operations: Addition, multiplication, and transpose.
4. Write a program to check for palindrome strings and perform string reversal.
5. Implement singly linked list with insertion, deletion, and traversal.
6. Implement doubly linked list and circular linked list operations.
7. Reverse a linked list (iterative and recursive approaches).
8. Merge two sorted linked lists into one.
9. Implement stack using arrays and linked lists.
10. Convert infix expression to postfix using stack.
11. Evaluate postfix expression using stack.
12. Implement queue using arrays and linked lists.
13. Implement circular queue and dequeue (double-ended queue).
14. Create a binary tree and perform traversals: Inorder, Preorder, Postorder.
15. Implement binary search tree (BST) with insert, search, and delete operations.
16. Find height of a binary tree and count leaf/non-leaf nodes.
17. Create an expression tree and evaluate it.
18. Implement a graph using adjacency matrix and list.
19. Implement BFS (Breadth-First Search) and DFS (Depth-First Search).
20. Implement Dijkstra's shortest path algorithm.
21. Detect cycles in an undirected graph using DFS.
22. Implement hash tables with linear probing and chaining.
23. Implement Heap and perform heap sort.
24. Implement disjoint sets using union-find.
25. Implement topological sort using DFS and Kahn's algorithm.

TECHNOCRATS INSTITUTE OF TECHNOLOGY

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DEPARTMENTOFHUMANITIES

Semester/Year		II / I		Program		B.Tech (All Branches)			
Subject Category	HSMC	Subject Code:		HS-206	Subject Name	Business Communication: Level-2			
MaximumMarksAllotted							Contact Hours		Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	30	20	150	2	-	2	3

CourseObjective:

1. To develop advanced grammar and rich vocabulary to frame correct sentences
2. To explain required professional and life skills to enhance a balanced personality
3. To define the process of writing, speaking and listening skills to enhance effective communication skills

UNITS	Descriptions
Unit-I: Advanced Grammar	Voice, Narration, Conditional Sentences, Sentence Improvement, Sentence Correction, Error detection, Close test- fill in the blanks, Sentence Structure
Unit-II: Essential Vocabulary & Usage	Idioms and Phrases, Situation Based Vocabulary, Corporate Jargon, Collocation, Dialect
Unit-III: Writing Skills	Basic Resume & Cover letter, Book Review, Formal letter, Paragraph Writing (150 words), Magazine & Newsletter, Blogs
Unit-IV: Behavioral Skills	Professional and Life Skills: Giving and receiving feedback and feedforward & its importance to communication, communication styles for different audiences (formal, informal, cross-cultural). Professional values, ethics and integrity (mindset & attitude)
Unit-V: Speaking & Listening	Presentation Skills, Public Speaking, Story retelling, Listening comprehension (at beginner level), Listen & Repeat, Speech, Recite and Resonate (read/listen & repeat), Story telling

(Aftab Baig)   (Dr. Indira Javed)   (Bhadra Sharma)

Reference Books-
Business Communication – Meenakshi Raman & Prakash Singh (Oxford University Press)
Effective Business Communication – Herta A. Murphy, Herbert W. Hildebrandt, Jane P. Thomas

List/Links of e-learning resource

(Dr. Snehal Nyk)

(Anjali Jain)

'Ahis'
(Aftab Baig)

Indira
(Dr. Indira Javed)

(Bhashashant)

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DEPARTMENT OF MATHEMATICS

Semester/Year		II/I		Program		B.Tech (All Branches)			
Subject Category	BSC	Subject Code:		BS-207	Subject Name	Critical Reasoning & Cognitive Ability: Level-2			
MaximumMarksAllotted							Contact Hours		Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	-	-	100	2	-	-	2

CourseObjective:

1. To categorize, apply and use thought process to distinguish between concepts of Quantitative methods
2. To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude
3. To critically evaluate problems.

UNITs	Descriptions
I	**PERCENTAGE** Definition and usefulness of percentage, inter-conversion of percentage and fraction with applications, concept of percentage increase and decrease, comparison using percentage, successive percentage change, word problems based on percentage: Question based on Income-Expenditure, Price and Consumption, constant product, Venn – diagram.
II	**AVERAGE** Definition and applications of average, properties of Average, Average of Natural numbers their squares and cubes, Average of terms in AP, GP, HP, weighted average, word problems based on average: concept of inclusion exclusion, replacement. Word problems based on weighted average
III	**QUADRATIC AND CUBIC EQUATIONS:** Formation of equations, Methods for Finding roots of equations, Nature of roots, Relation between roots and coefficient of equations, Application based word problems. Logarithm: Definition of logarithm, properties of logarithm, Base change property, Application based problems. Progression: Arithmetic progression-Definition, properties, Application based word problems. Geometric progression- Definition, properties, Application based word problems. Harmonic progression- Definition, properties, Application based word problems.

Dr. Haவிom Dubey

Dr. Jyoti Gupta

(Dr. Manoj JW)

K. Verm (Dr. C.K.Verm)

(Aftab Bag)

(Bhasha Sharma)

IV	**BLOOD RELATION:** Visual representation of family relationship using family tree, Generational hierarchy, pattern of questions: Puzzle based blood relation, Coded blood relation, Pointing form. **ANALOGY**: Synonyms/ Antonyms, Cause/Effect, Part/Whole, Function and object /Associated action, Numerical, Alphabetical or General Knowledge based relationships. **ORDER RANKING:** Finding a person's rank from either end, calculating total people in a row, find number of people between two individuals. Find maximum and minimum number of persons in a particular row.
V	**DIAGRAMMATIC REASONING:** Analyzing and identifying visual pattern, Shapes and sequences, Figure series, Figure Matrices, Figure classification (odd man out), Figure Analogies, Embedded figure Counting of figures: To identify and count Geometric shapes like Triangles, Rectangles, Squares and other polygons within a larger figure.

ReferenceBooks-
R.S.AGARWAL,ARUN SHARMA, M.TYRA
List/Linksofe-learningresource

Dr. Hoorm Dubey

Dr. Jyoti Gupta

(Dr.Manoj JW)

(C.K.Verm)

(Aftab Baig)

(Bhasha Sharma)

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B. Tech. First Year (I Semester)
Branch: Common to All Disciplines

Semester/Year		I/I		Program		B.Tech			
Subject Category		Subject Code:	109-B	Subject Name		Workshop			
Maximum Marks Allotted							Contact Hours		Total Credits
Theory				Practical		Total Marks			
ES	MS	Assignment/Quiz		ES	LW		L	T	P	
0	0	0		30	20	50	0	0	4	2

CourseObjective:

Manufacturing is fundamental to the development of any engineering product. The objective of this course is to provide engineering students with practical exposure to fundamental manufacturing processes through hands-on experience in various workshop practices. This includes operations in black smithy, carpentry, fitting, foundry, and welding shops. Students will learn the safe and effective use of hand tools, power tools, measuring instruments, and basic machines related to each trade.

Sr. No	Experiments
1	Black Smithy Shop Use of various smithy tools. Forging operations: Upsetting, Drawing down, Fullering, Swaging, Cutting down, Forge welding, Punching and drafting. Suggested Jobs: Forging of chisel. Forging of Screw Driver. Manufacturing Methods- casting, forming, machining, joining.
2	Carpentry Shop: Wood Working tools: Wood working machinery, joints & joinery. Various operations of planning using various carpentry planes sawing & marking of various carpentry joints. Suggested Jobs: Name Plate, Any of the Carpentry joint like mortise or tennon joint.
3	Fitting Shop: Study and use of Measuring instruments, Engineer steel rule, Surface gauges caliper, Height gauges, feeler gauges, micro meter. Different types of files, File cuts, File grades, Use of surface plate, Surface gauges drilling tapping Fitting operations: Chipping filling, Drilling and tapping.Suggested Jobs :Preparation of job piece by making use of filling, sawing and chipping , drilling and tapping operations.
4	Foundry: Pattern Making: Study of Pattern materials, pattern allowances and types of patterns. Core box and core print, .Use and care of tools used for making wooden patterns. Moulding: Properties of good mould & Core sand, Composition of Green, Dry and Loam sand. Methods used to prepare simple green and dry sand mould using single piece and split patterns.
5	Welding: Study and use of tools used for Brazing, Soldering, Gas & Arc welding. Preparing Lap & Butt joints using gas and arc welding methods, Study of TIG & MIG welding processes . Safety precautions.

(Dr. R. Ichedlu)   (Dr. Vimlesh Soni)   Dr. Vipul Tripathi (NITTTR)

(C. Shrivastava)
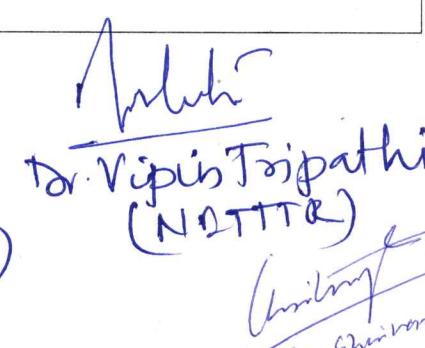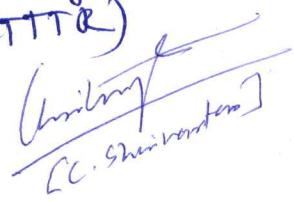
Course Outcomes:

CO1: Understand and perform primary forging operations such as upsetting, drawing, and swaging and also Know about blacksmithy tools.

CO2: Practical knowledge of various carpentry operations and tools used in shop and also able to create lap joint of wooden material in carpentry shop

CO3: Understanding use measuring instruments and perform fitting operations like filing, sawing, drilling, and tapping on metal pieces.

CO4: Develop mould cavity in green sand of given pattern.

CO5: Demonstrate different welding operations in the welding shop.

ReferenceBooks-

1. Bawa HS; Workshop Practice, TMH

2. Rao PN; Manufacturing Technology- Vol.1& 2, TMH

3. John KC; Mechanical workshop practice; PHI

4. Hazara Choudhary; Workshop Practices -, Vol. I & II.

5. Jain. R.K. Production Technology

List/Linksofe-learningresource

1. https://www.youtube.com/watch?v=dTfjf69vMJU

2. https://www.youtube.com/watch?v=FwK8UAipEV4

3. https://www.youtube.com/watch?v=z_ggHbN3NtU

4. http://www.digimat.in/nptel/courses/video/112107078/L40.html

5. www.digimat.in/nptel/courses/video/112106179/L01.html

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(Dr. Nitin Shrivastava)

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DEPARTMENTOFHUMANITIES

Semester/Year		II / I		Program		B.Tech (All Branches)			
Subject Category	HSMC	Subject Code:		HS-209 (J)	Subject Name	Foreign Language Level - 2 (Japanese)			

MaximumMarksAllotted							Contact Hours			Total Credits
Theory			Practical		Total Marks		L	T	P	
ES	MS	Assignment/Quiz	ES	LW						
-	-	-	-	50	50		-	-	4	2

CourseObjective:
1. To develop basic grammar and vocabulary to frame correct sentences 2. To explain basic behavioral skills to enhance an impactful personality 3. To define the process of speaking and listening skills to build up good confidence level

UNITS	Descriptions
UNIT-I	Experience, Trying, Giving Advice た-form (〜たことがあります) 〜たり〜たりします 〜くなります／になります Giving advice with 〜ほうがいい Kanji: 体, 心, 好, 知, 書, 学 Listening: Experience sharing + story listening Assessment: Listening quiz + short speech
UNIT-II	Commands, Passive, Volitional Imperative and prohibitive forms Passive form: 〜れます Volitional form: 〜ましょう, 〜と思っています Kanji: 勉, 強, 動, 運, 使, 作 Listening: Instructions, commands Assessment: Grammar test + listening

(A.Y. Sushil Nigam)   (Aftab Baig)   Indira (Dr. Indira Javed)   (Bhavna Sharma)

Unit-III	Formal Style, Causative, Conditions 〜ようにします, 〜ようになります Causative: 〜させます 〜と、〜ば、〜たら conditional forms Kanji: 会, 社, 仕, 事, 場, 所 Listening: Workplace, instructions Assessment: Pair dialogue using conditionals Assessment: Dialogue practice + kanji quiz
Unit-IV	Honorifics, Passive-Causative, Expressions Honorific/humble forms Passive causative: 〜させられます Giving/Receiving (くれる/もらう/あげる) Kanji: 勤, 銀, 医, 者, 病, 院 Listening: Formal conversation, requests Assessment: Role play in keigo Assessment: Group speaking activity
Unit-V	Review + Practice of All Grammar 〜のに、〜そうです、〜らしい Final revision of verb forms Reading comprehension + writing Kanji: Final mixed review (100–120 total) Listening: JLPT N5/N4 practice tracks Final Exam: Full grammar + kanji + listening test Assessment: Short written task + presentation

(Pr. Sushil Nigam)

(Aftab Baig)

Indira
(Dr. Indira Javed)

(Bhastar Sharma)
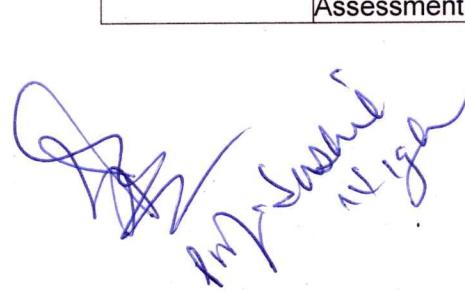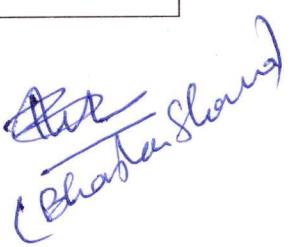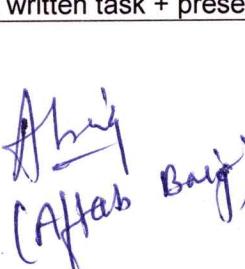
Reference Books-
Minna no Nihongo 1 and 2 (Main Course Book)
Kanji and Genki plus and Gokakudekiru and Renshuu Book for other characters, unseen passage and new Kanji .

List/Links of e-learning resource

Suggestive list of experiments:

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(Bhasha Sharma)