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.

Dr. Harioam Dubey
Dr. Jyoti Gupta
(Dr. Manoj Jain)
(Dr. P.K. Verma)
(Aftab Baig)
(Bhasha Sharma)

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, 9thEdn., 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/

Dr. Hariom Dubey
Dr. Jyoti Gupta
(Dr. Manoj Jha)
Dr. C.K. Verma
(Aftab Baig)
(Bhasha Sharma)

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

Dr. Jyoti Gupta (Dr. Manoj Jain) (Dr. [illegible]) (Aftab Baig) (Bhaskar Shaw)

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. Hasim Purya

Dr. Jyoti Gupta

(Dr. Manoj Jha)

(Dr. C.K. Jha)

(Aftab Baig)

(Bhasha Sharma)

TECHNOCRATS INSTITUTE OF TECHNOLOGY

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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						Contact Hours			Total Credits	
Theory			Practical		Total Marks					
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

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.

Dr. Hariom Dubey
Dr. Jyoti Gupta
Dr. Manoj Jha
(DS-C-K Verma)
(Aftab Baig)

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. Harvir Dalal
Dr. Jyoti Gupta
(Dr. Manoj Jain)
(Dr. C.K. Verma)
(Aftab Baig)
(Bhasha Sharma)

TECHNOCRATS INSTITUTE OF TECHNOLOGY
(An Autonomous Institute Affiliated to RGPV, Bhopal)
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.

Dr. Tyoti Gupta
(Dr. Manoj Jha)
(Dr. C.K. Verma)
(Aftab Baig)
(Bhasha Sharma)

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.
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, 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/

Dr. Jyoti Gupta

(Dr. Manoj Jain)

(Dr. C.K Verma)

(Aftab Bajaj)

(Bhasha Sharma)

Course Outcomes:

CO1: Explore the fundamental concepts of vector calculus, Laplace transforms.
CO2: Apply theoretical concept of vector calculus, Laplace transforms and numerical methods and evaluate the problems arising in engineering discipline.
CO3: Analyze the solution of the modern engineering problems solved using appropriate techniques of vector calculus, Laplace transforms and numerical methods
CO4: Enhance your comprehensive understanding of vector calculus, Laplace transforms and numerical methods to effectively tackle and illustrate solutions to real-world problems.
CO5: Explore the fundamental concept of numerical methodand illustrate solutions to real-world problems.

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

Dr. Hasina Dubey.
Dr. Jyoti Gupta
(Dr. Manoj Jain)
(Dr. C.K. Verma)
(Aftab Baig)
(Bhasha Sharma)

TECHNOCRATS INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENTOF ENGINEERING CHEMISTRY

Semester/Year		1 &2 /I	Program		B.Tech. Common to all branches			
Subject Category	BSC	Subject Code:	BS-102	Subject Name	Engineering Chemistry & Sustainability			
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 Objectives:

1. Understanding of useful chemical concepts
2. Applying chemical principles to engineering problems
3. Developing experimental skills
4. Understanding sustainability issues
5. Promoting awareness of environmental issues

UNITS	Descriptions
Unit-1	**Water Chemistry and treatment:** Hardness & its units, Determination of hardness by EDTA method, Alkalinity & It's determination and related numerical problems. Boiler troubles (Sludge & Scale, Priming & Foaming, Boiler Corrosion, Caustic Embrittlement), Softening methods (Lime-Soda, Zeolite and Ion Exchange Methods) and related numerical problems.
Unit-2	**Lubricants and Corrosion:** Introduction & Functions of Lubricants, Mechanism of lubrication, Classification of lubricants, significance & determination of Viscosity and Viscosity Index, Flash & Fire Points, Cloud & Pour Points. Aniline Point, Acid Number, Saponification Number, Steam Emulsification Number. Corrosion: Causes, Types, Mechanisms & prevention.

Dr. Ranjana Dixit Tomar

Dr. Supti Das Sen

(Aftab Baig)

(Dr. Y. K. Agrawal)

(Bhasha Sharma)

Dr. Amit Dubey

Unit-3	**Polymer Chemistry:** Introduction, types of polymerisation, Classification, mechanism of polymerisation (Free radical & Ionic polymerization). Thermoplastic &Thermosetting polymers, Elementary idea of live polymers, Biodegradable polymers. Preparation, properties & uses of polymers - PVC, Polythene, Teflon, Nylon 6, Nylon 6:6, Phenol formaldehyde, Buna N, Buna S, Vulcanization of Rubber.

Unit-4	**Electrochemistry :** Quantitative aspects of Faraday's laws of electrolysis, applications of electrolysis in metallurgy and industry. Chemical cells, reversible and irreversible cells with examples. Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells. Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinine - hydroquinone, glass electrodes.
Unit-5	**Energy Science & Sustainability:** Introduction to energy resources, Energy sustainability & environment, Energy transformations, efficiency and storage, Fossil fuels (coal, oil, oil bearing shale and sands, coal gasification), Remedies and alternatives for fossil fuels – biomass, wind, solar, and hydrogen. **Sustainability**: Sustainable energy sources, reducing waste and adoption of sustainable technologies, Disaster management: floods, earthquake, cyclone and landslides. Climate change, global warming and acid rain.

Reference Books-

1. Chemistry in Engineering and Technology - Vol.1 &2 Kuriacose and Rajaram , McGraw Hill Education
2. Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
3. Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand & Company Ltd., Delhi.
4. Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
5. Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayade Sreedhar, New Age International Pvt. Ltd
6. Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna

List/Links of e-learning resource

1. https://libguides.lib.msu.edu/chemistry/teachonline
2. https://libguides.lib.msu.edu/c.php?g=917727&p=6613684
3. https://edu.rsc.org/resources
4. https://libraryguides.unh.edu/oer/chemistry
5. https://chemcollective.org/

Dr. Gupta Kaushal Dr. Ranjan Dr. (Dr. Amit Dubey) (Aftab Beig) (Dr. Y.K. Agarwal)

Suggestive list of experiments:

NOTE: At least 8 of the following core experiments must be performed during the session.

1. **Water testing**

(i) Determination of Total hardness by Complexometric titration method.

(ii) Determination of mixed alkalinity

a) OH & CO3

b) CO3 & HCO3

(iii) Chloride ion estimation by Argentometric method.

2. **Fuels & Lubricant testing:**

(i) Flash & fire points determination by

a) Pensky Martin Apparatus,

b) Abel's Apparatus

c) Cleveland's open cup Apparatus

(ii) Viscosity and Viscosity index determination by

a) Redwood viscometer No.1

b) Redwood viscometer No.2

(iii) Proximate analysis of coal

a) Moisture content

b) Ash content

c) Volatile matter content

d) Carbon residue

(iv) Steam emulsification No & Anline point determination

(v) Cloud and Pour point determination of lubricating oil

Course Outcomes:

CO1: Determine hardness and alkalinity of water.
CO2: Illustrate properties of lubricants and polymers with respect to their applications.

CO3: Interpret mechanism of different types of corrosion.

CO4: Determination of EMF of cell & pH using various electrodes.

CO5: Introduction to energy systems, renewable energy resources and environmental issues.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}
CO-1	3	1	2	2	2	-	1	-	-	-	-	2
CO-2	3	3	1	-	-	-	-	-	-	-	-	-
CO-3	3	2	1	2	-	-	-	-	-	-	-	-
CO-4	3	3	2	2	2	-	-	-	-	-	-	2
CO-5	3	1	-	-	-	-	-	-	-	-	-	-

Dr. Supti Kaushal

Dr. Ranjan Dutt Tom

(Aftab Baig)

(Dr. Y. K. Agrawal)

(Bhasha Sharma)

TECHNOCRATS INSTITUTE OF TECHNOLOGY

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DEPARTMENTOF ELECTRICAL & ELECTRONICS ENGINEERING

Semester/Year		I & II	Program		B.Tech				
Subject Category	ESC	Subject Code:	ES-103	Subject Name	Elements of Electrical & Electronics Engineering				
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	-	2	3

Course Objective:

To provide comprehensive idea in the field of Electrical& Electronics Engineering and to deliver the fundamental knowledge which will be useful in the engineering fields.

1. Familiarize with various laws and theorems to solve electric and electronic circuits
2. Provide an overview on working principle of machines
3. Excel the concepts of semiconductor devices and digital circuits

UNITs	Descriptions
UNIT 1	**Introduction to Electrical & Electronics Engineering** Active & passive elements, voltage & current sources, dependent and independent sources, Source Conversion, Kirchhoff's Law. Generation of alternating voltages, AC circuit terminologies, Phasor Representation of an alternating quantity, definition of average value, R.M.S. value, form factor and peak factor of AC quantity. Introduction to Semiconductors, Diodes, V-I characteristics, Diode Equation, Special diodes: Zener Diode, operation, V-I characteristics, Photo diode, working principle, LED symbol and principle. Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half-wave, full-wave and Bridge rectifiers. Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers.
Unit 2	**D.C.& A.C. Circuits** **D.C. Circuits:** Mesh and Nodal analysis. Star-Delta transformation, Superposition theorem, Thevenin's theorem, Norton's theorem. **Single phase AC circuits:** Behavior of AC circuit containing pure R, L, and C; Impedance and admittance concept; Concepts of active, reactive and apparent power, power factor, Analysis of R-L, R-C, R-L-C circuits. **Three phase AC Circuits:** Generation of three phase voltages, Advantages of three phase system, Phase sequence, Relationship between line and phase quantities for balanced star

Dr. M.S. DASH (Devendra Sharma) (Dr. S. Jain) (Prof S.C. Choube) Aftab Beig Vishvajeet Verma.

	and delta connected loads and Power measurement in three phase circuit.
Unit 3	**Transformer & Rotating Electrical Machines** **Transformer:** Concepts of M.M.F, flux, flux density, reluctance, permeability and field strength, their units and relationship. Comparison between electrical and magnetic circuits. Concept of self and mutual inductance, Classification, construction and working principle of transformer, E.M.F. equation, Equivalent circuits, phasor diagram, Voltage regulation, Losses and efficiency, Open circuit and short circuit test. **Rotating Electrical Machines**: Classification, construction, working principle and applications of DC machines, Three phase Induction machines and Synchronous machine.

Unit- 4	**Bipolar junction transistors** Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations, different configurations and modes of operation of BJT. Number Systems: Number systems & Their conversion used in Digital Electronics, Demorgan's theorem, Logic Gates.
Unit- 5	**Microprocessor Basics** 8085-Architecture, Operation, Pin configuration and Functions, Bus organization, control signal generation for external operations- fetch, IO/M, Read/Write, Machine cycles and Bus timings. Addressing mode, Instruction set, Overview/concept of peripheral interfacing devices

Course Outcomes:
CO1: Understand the basic terminology & definitions of Electrical and Electronics Engineering
CO2: Evaluate DC and AC circuit parameters using various laws and theorems
CO3: Select the electrical machines for different applications
CO4: Analyze the characteristics and applications of BJT.
CO5: Apply Microprocessor basics and digital circuits.

Reference Books-

1. V.N.Mittal andArvindMittal;"BasicElectricalEngineering"McGrawHill
2. VincentDelToro,"ElectricalEngineeringFundamentals",PHIsecondedition2011
3. Bolestaad:"Electronics DevicesandCircuitsTheory",PearsonEducationIndia
4. EdwardHughes,"ElectricalTechnology,",PearsonEducation
5. D.P.KothariandNagrath"TheoryandProblemsinelectricalEngineering",PHIedition2011
6. S.N. Singh, Basic Electrical Engineering, P.H.I.,2013
7. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
8. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press,2012
9. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
10. B.L. Theraja & A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication

List/Link self-learning resource

1. https://nptel.ac.in
2. http://www.digimat.in/nptel/courses/video/108105112/L01
3. https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/
4. https://www.electronics-tutorials.ws/
5. https://www.allaboutcircuits.com/textbook/
6. www.tinkercad.com/circuits
7. https://www.indiabix.com/

Suggestive list of experiments:

1. V.N.Mittal andArvindMittal;"BasicElectricalEngineering"McGrawHill
2. VincentDelToro,"ElectricalengineeringFundamentals",PHIsecondedition2011
3. Bolestaad:"Electronics DevicesandCircuitsTheory",PearsonEducationIndia
4. EdwardHughes,"ElectricalTechnology,",PearsonEducation
5. D.P.KothariandNagrath"TheoryandProblemsinelectricalEngineering",PHIedition2011
6. S.N. Singh, Basic Electrical Engineering, P.H.I.,2013
7. 3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
8. 4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press,2012
9. 5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
10. 6. B.L. Theraja & A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	2	-	1	-	-	-	-	-	-	-	1
CO-2	3	3	2	2	2	3	-	1	2	-	-	2
CO-3	3	2	2	2	3	3	2	1	3	2	2	2
CO-4	3	3		2	3	2	2	-	2	-	1	2
CO-5	3	3	2	2	3	2	2	-	2	-	2	2

TECHNOCRATS INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to RGPV Bhopal)

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

Semester/Year		I/II	Program		B.Tech
Subject Category	BSC	Subject Code:	104-B	Subject Name	Engineering Graphics & Modelling Through Autocad

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks	L	T	P	
ES	MS	Assignment/Quiz	ES	LW					
0	0	0	30	20	50	0	0	6	3

Course Objective:

The objective of this course is to familiarize prospective engineers with all phases of manufacturing and construction that require converting new ideas and design concepts into the fundamental graphic language of engineering drawings. Proficiency in Computer-Aided Design (CAD) is critical in many engineering disciplines—including civil, mechanical, electrical, architectural, and industrial fields—where CAD technicians and engineers play a vital role in the design and development of new products, systems, and structures. This course is designed to:

- Introduction to engineering design and its place in society
- Enable students to communicate engineering ideas effectively through clear, precise technical drawings and documentation.
- Train students to use modern engineering tools and techniques, with a focus on industry-standard CAD software for engineering graphics practice.
- Exposure to creating working drawings.Promote awareness of industry standards and best practices in engineering graphics to ensure quality, safety, and efficiency in design and manufacturing

UNITs	Descriptions
1	Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, Introduction to Computer Aided Drafting, Basic principles of engineering drawing, Standards and conventions, lettering and types of lines, Introduction to drafting software, standard tool bar/menus, navigational tools. Co-ordinate system and reference planes. Creation of 2 dimensional drawing environment. Selection of drawing size and scale. Sketching of 2D simple geomentries, editing and dimensioning of 2Dgeomentries
2	Orthographic Projections covering, Principles of Orthographic Projections- Conventions - Projections of Points and lines inclined to both planes; Projection of Planes – Types of planes, projection of planes, various positions of planes w.r.t reference palnes (Use First angle method of projection) Projections of planes inclined Planes – Auxiliary Planes. The entire above topic practice through AutoCAD.

Khedle.
(Dr. R. Khedle)
(Dr. Vimlesh Soni)
(Dr. Vipin Tripathi) NCTTTR
(Dr. Nitin Shirvastava)
[C. Shirvastava]

3	Types of solids, projection of solids in simple position, projection of solids with axis inclined to one reference plane and parallel to other. (Use First angle method of projection). The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids].Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

4	Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. The entire above topic practice through AutoCAD.
5	Theory of isometric projection, isometric view, isometric views from orthographic views for simple objects. Conversion of Isometric Views to Orthographic Views, Conventions. (Use First angle method of projection).Computer-aided design (CAD) software modelling, Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.

Course Outcomes:

CO1: Understand the engineering drawing standards and their usage

CO2: Interpret engineering drawings

CO3: Construct and dimension 2-D geometries using CAD software

CO4:: Improve coherent visualization skills

CO5: Understand the concepts of orthographic projections and isometric projections on traditional and modern methods.

(Dr. R. Wheedle)

(Dr Vimlesh Soni)

[C. Srivastava]

(Dr. Vipin Tripathi)

(Dr. Hitun Shrivastava)

Suggestive list of experiments: All Topics Should Prepare On Autocad Software

Reference Books-

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, CharotarPublishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics,Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, ScitechPublishers
5. (Corresponding set of) CAD Software Theory and User Manuals

List/Links of e-learning resource

1. *nptel/courses/video/112102304/L05.html*
2. *nptel/courses/video/105104148/L13.html*
3. *https://www.youtube.com/watch?v=EgKc9L7cbKc*
4. *https://www.youtube.com/watch?v=0IgOapAtauM*
5. *https://www.youtube.com/watch?v=QuR-VKis3jU*

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}
CO-1	2	2	2	2	0	1	2		1	2		2
CO-2	2	2	2	2		1	2	1	1	2		2
CO-3	2	2	2	2	2	1	2		1	2		2
CO-4	2	2	2	2		1	2	1	1	2		2
CO-5	2	2	2	2	2	1	2		1	2		2

(Dr. R. Vchedle) (Dr. Vimlesh Soni) [C. Srinivasulu]

(Dr. Vipin Tripathi) (Dr. Nitin Shrivastava)

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

Dr. Sushil Singh

Anjali Jain

(Aftab Baig)

(Dr. Indira Javed)

(Bhaskar Sarkar)

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

TECHNOCRATS INSTITUTE OF TECHNOLOGY

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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. Harivan Dubey
Dr. Jyoti Gupta
(Dr. Manoj Jain)
(Dr. C.K. Verma)
(Aftab Bagi)
(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. Verma)
(Aftab Baig)
(Bhasha Sharma)

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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				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
-	-	-	-	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

Unit-III	Formal Style, Causative, Conditions ーようにします, ～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 ーのに、ーそうです、ーらしい 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

(Dr. Indira Javed)

(Aftab Baig)

(Shaista Sharif)

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:

(Aftab Baig) (Dr. Indira Javed)