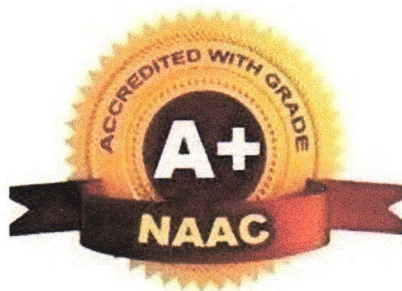




TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108



Bachelor of Technology SoE and Syllabus 2026

(Department of Basic Science and Humanities)

Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

- M1- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.
- M2- To provide facilities and services to meet the challenges of Industry and Society.
- M3- To facilitate socially responsive research, innovation and Entrepreneurship.
- M4- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.



Tulsiramji Gaikwad - Patil College of Engineering and Technology

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Scheme of Instruction for B.Tech First Year (UG) Programme Group-B (AE/CE/ME/BT) Scheme 2026-27

Scheme 2020-21																
SN	Sem	Type	BoS/Dept	Sub. Code	Subject	T/ P	Contact Hours				Cr edi ts	% Weightage				ESE Duration Hours
							L	P	SL	Hrs		CT/ IA	C A	ESE	TOTAL	
FIRST SEMESTER (GROUP-B)																
1	1	BSC	S&H	BSH51101/ BSH51104	Linear Algebra and Calculus/ Mathematical Foundation for Biotechnology	T	4	0	2	6	4	30	10	60	100	3
2	1	BSC	S&H	BSH51105	Chemical Process in Engineering	T	3	0	2	5	3	30	10	60	100	3
3	1	BSC	S&H	BSH51106	Chemical Process in Engineering-Lab	P	0	2	-	2	1	25	-	25	50	-
4	1	ESC	CE BT	BCE51101/ BBT51101	Engineering Mechanics/ Fundamental of Biotechnology	T	3	0	2	5	3	30	10	60	100	3
5	1	IKS	S&H	BSH51107	Indian Ancient Technology	T	2	0	2	4	2	18	2	30	50	1
6	1	ESC	CE	BCE51102	Environment Sustainability – Lab	P	0	2	-	2	1	50	-	-	50	-
7	1	ESC	CSE	BCS51103	Fundamentals of Python Programming-Lab	P	0	2	-	2	1	25	-	25	50	-
8	1	AEC	S&H	BSH51108	Basics of Career Development	P	0	4	-	4	2	50	-	-	50	-
9	1	VSEC	ME BT	BME51101/ BBT51102	Engineering Workshop/ Cell & Molecular Biology -Lab	P	0	4	-	4	2	25	-	25	50	-
10	1	CC	S&H	BSH51X01-12	Liberal Learning Module I	P	0	4	-	4	2	50	-	-	50	-
TOTAL FIRST SEM							12	18	08	38	21	333	32	285	650	10
SECOND SEMESTER (GROUP-B)																
1	2	BSC	S&H	BSH51201/ BSH51206	Differential Equation and Statistics/ Applied Mathematics for Biotechnology	T	4	0	2	6	4	30	10	60	100	3
2	2	BSC	S&H	BSH51207	Solid State Physics & Optics	T	3	0	2	5	3	30	10	60	100	3
3	2	BSC	S&H	BSH51208	Solid State Physics & Optics-Lab	P	0	2	-	2	1	25	-	25	50	-
4	2	ESC	EE	BEE51201	Principle of Electrical Engineering	T	3	0	2	5	3	30	10	60	100	3
5	2	ESC	EE	BEE51202	Principle of Electrical Engineering -Lab	P	0	2	-	2	1	25	-	25	50	-
6	2	ESC	ME BT	BME51201/ BBT51201	Engineering & Computer Graphics/ Cell Biology	T	2	0	2	4	1	18	2	30	50	2
7	2	ESC	AIML	BAIML51201	Fundamental of Generative AI-Lab	P	0	4	-	4	2	25	-	25	50	-
8	2	VESC	ME BT	BME51202/ BBT51202	IDEA Lab with Machine Learning/ Biotechnology Workshop-Lab	P	0	4	-	4	2	50	-	-	50	-
9	2	PCC	CE	BCE51201	Computer Aided Drawing-Lab	P	0	4	-	4	2	50	-	-	50	-
10	2	CC	S&H	BSH51Y01-12	Liberal Learning Courses II- Lab	P	0	4	-	4	2	50	-	-	50	-
TOTAL SECOND SEM							12	20	8	40	21	333	32	285	650	11
Course Category		BSC/ ESC (Basic Science Course/ Engineering Science Course.)		PCC (Programme Core courses)	Multidisciplinary courses	VSEC (Skill Course)	Social Science & management AEC (Ability Enhancement Course)		IKS (Indian Knowledge System)		Experiential Learning Courses		CC (Co- Curricular Courses)			
Credits SEM-I		08 / 05		--	--	02	02		2		--		02			
Credits SEM-II		08 / 07		02	--	02	--		-		--		02			
Cumulative Sum		16 / 12		02	--	04	02		02		--		04			

PROGRESSIVE TOTAL CREDITS: 21+21=42

				July, 2026	5.00	Applicable for AY 2026-27 Onwards
Chairperson	Dean Academics	Vice Principal	Principal/Director (Administration)	Date of Release	Version	



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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-B (AE/CE/ME)

Semester-I | Linear Algebra & Calculus: BSH51101

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	4 Hrs./week	CT-I	12 Marks	-	-
Practical (P)	-	CT-II	12 Marks	-	-
Total Credits	4 (Th) = 4	CT-III	6 Marks	-	-
Duration of ESE:3Hrs		CA	10 Marks	-	-
		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Pre-Requisites: NA

Course Objectives:

- 1 To identify algebraic problems from practical areas and obtain the solution in certain cases.
- 2 To expose students to understand the basic importance of Differential Calculus and Integral Calculus.
- 3 To understand different solution techniques of solving Beta and Gama Function and also understand solution of simultaneous equation by matrix method.
- 4 To apply your understanding of the concepts, formulas, and problem-solving procedures.
- 5 To analyze and apply properties of sequences and series, including their convergence and sums, in mathematical and real-world problems.

Unit I	Matrices: Introduction to rank of a matrix; Rank nullity theorem, Eigen values and Eigen vectors, Consistency of a system of equations, Cayley Hamilton Theorem, Sylvester 's theorem
	Activity 1: Perform basic operations of matrices by Sage math Activity 2: Illustrate Eigen values and Eigen Vectors by Sage math
Unit II	Differential Calculus: Indeterminate Forms L'Hôpital Rule, Taylor 's and Maclaurin 's series (for one variable), Maxima and Minima, Successive differentiation, Rolle 's theorem, Lagrange 's mean value theorem, Cauchy 's mean value theorem
	Activity 1: To Learn Calculus with Sage Math Activity 2: Differential Calculus and its Application by Sage math
Unit III	Integral Calculus: Introduction to Gamma Function & Properties of Gamma Function, Introduction to Beta Function & Properties of Beta Function, Relation between Beta & Gamma Function, Leibnitz 's rule for differentiation under integral sign, Tracing of Cartesian and Polar curves
	Activity 1: To trace the curve with Scilab Activity 2: To trace the curve with Maple
Unit IV	Calculus of Function of several variables: Differentiability of function of several variables, Partial Derivatives, Euler 's theorem on homogeneous function, Implicit function, Jacobian and their applications, Chain Rule
	Activity 1: To solve partial derivative by Sage math
Unit V	Sequence & Series: Sequence, types of sequence, test of convergence of sequences, Cauchy sequence, infinite series, power series, Alternating series, tests of convergence and absolute convergence of series.
	Activity 1: Find the missing term based on logic or arithmetic rules

Chairperson

Text Books	
T.1	Higher Engineering Mathematics by Bali Lyenger (Laxmi Prakashan) 9 th Edition
T.2	Advance Engineering Mathematics by Ervin Kreyszig 's 9 th Edition
T.3	H. K. Dass, Advanced Engineering Mathematics, S. Chand, Reprint, 2014.
T.4	Outline Series, McGraw Hills, 4th Edition, 2016.
T.5	P.N. Wartikar and J.N. Wartikar, Applied Mathematics, 4th Edition, Vidyarthi Griha Prakashan.
T.6	GB Thomas and R.L. Finney, Calculus and Analytic geometry 9 th edition, Pearson, Reprint 2002.
Reference Books	
R.1	Gilbert Strang: Linear Algebra and Its Applications (Paperback), Nelson Engineering (2007)
R.2	Advanced Engineering Mathematics by Erwin Kreyszig 's (Wiley India) 9 th edition
R.3	A textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publication, Reprint 2010
R.4	Higher Engineering Mathematics by B. S. Grewal, Khanna Publisher 35 th edition.
Useful Links	
1	https://archive.nptel.ac.in/courses/111/108/111108157/
2	https://archive.nptel.ac.in/courses/111/104/111104144/
3	https://archive.nptel.ac.in/courses/111/104/111104092/

CO	Course Outcomes	CL	Class Sessions
CO1	Implement the concept of matrices to check existence of solution of system of linear Simultaneous equation.	3	9
CO2	Apply the concept of maxima, minima and successive differentiation in analysis of engineering problems.	3	9
CO3	Solve improper integrals using beta, gamma functions	3	9
CO4	Use of Partial differentiation to Solve Jacobian and Chain Rule	3	9
CO5	Utilize the concepts of sequences and series to address problems across mathematical and scientific domains	3	9


Chairperson



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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-B (BT)

Semester-I Mathematical Foundation for Biotechnology (BSH51104)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	4Hrs/week	CT-I	12 Marks	-	-
Practical(P)		CT-II	12 Marks	-	-
Total Credits	4(Th)=4	CT-III	6 Marks	-	-
Duration of ESE:3Hrs		CA	10 Marks	-	-
		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Pre-Requisites: AICTE Bridge Course, Basic of Mathematics

Course Objectives:

1. To identify algebraic problems from practical areas and obtain the solution in certain cases.
2. To expose students to understand the basic importance of Differential Calculus and Integral Calculus.
3. To understand different solution techniques of solving Beta and Gama Function and also understand solution of simultaneous equation by matrix method.
4. To apply your understanding of the concepts, formulas, and problem-solving procedures.

Course Contents

Unit I	Trigonometry: Basics of trigonometry, Relation between the polar co-ordinates and the cartesian co-ordinates, Solving a triangle, The sine rule, The cosine rule, The projection Rule, Application of the Sine rule, Cosine rule and Projection rule.
	Activity 1: Graphical representation of basic Trigonometric functions using Scilab. Activity 2: Investigating Trigonometric ratios with real-life measurements.
Unit II	Differentiation: Derivatives of Composite function, derivatives of Inverse function, Logarithmic differentiation, derivatives of Implicit function, derivatives of parametric function, Higher order Derivatives Application of Derivatives (Rolle's theorem and LMVT, Maxima and Minima).
	Activity 1: Computational evaluation of derivatives using Sage math for symbolic and numeric differentiation.
Unit III	Integration: Definition and Properties, Methods – Integration by Substitution, Integration by Parts, Integration by Partial Fraction, Definite Integration- Fundamental theorem of Integral calculus, reduction formulae
	Activity 1: Calculate definite integrals within specified limits using Sage Math. Activity 2: Graphical visualization of integration using Scilab
Unit IV	Differential Calculus: Functions of one and several variables, Partial derivative, Chain Rule, Total derivative, Jacobians, Maxima and Minima of function of two variables, Taylor's theorem
	Activity 1: Plot Biological growth functions (linear, exponential, logistic) using Sage math
Unit V	Probability & Statistics: Probability: Discrete Random Variable, Continuous Random Variable, Probability Distribution function, Probability density function, Binomial Distribution, Uniform Distribution, Poisson's Theorem, Moment Generating Function.
	Statistics: Mean, median, mode and standard deviation, Skewness & Kurtosis, Fitting of Curve Straight line, Parabola, Exponential Curves, Correlation & Regression, Rank Correlation
	Activity 1. Evaluate random variable by using Sage math. Activity 2. Determine mean, mode & median by sage math. Activity 3. Fit the straight line, Parabola and exponential curves by using Scilab

Chairperson

Text Books	
T.1	Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).
T.2	H.K.Das, Engineering Mathematics, S.Chand Publishers
T.3	Outline Series, McGraw Hills, 4th Edition, 2016.
T.4	P.N.Wartikar and J.N.Wartikar. Applied Mathematics, 4th Edition, Vidyarthi Griha Prakashan.
T.5	GB Thomas and R.L. Finney, Calculus and Analytic geometry 9 th edition, Pearson, Reprint2002.

Reference Books

R.1	Shanti Narayanan, Differential Calculus, S. Chand & Co., New Delhi, (2005)
R.2	Shanti Narayanan, Integral Calculus, S. Chand & Co., New Delhi, (2005).
R.3	John Bird, Basic Engineering Mathematics (5th ed.), Elsevier Ltd, (2010).
R.4	Gilbert Strang: Linear Algebra and Its Applications (Paperback), Nelson Engineering (2007)
R.5	A textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publication, Reprint 2010

Useful Links

1	https://archive.nptel.ac.in/courses/111/108/111108157/
2	https://archive.nptel.ac.in/courses/111/104/111104144/
3	https://archive.nptel.ac.in/courses/111/104/111104092/

CO	Course Outcomes	CL	Class Sessions
CO1	Use trigonometry to solve problems, understand functions, and apply it to real- life situations involving angles and patterns.	3	9
CO2	Find the derivative of the given function and to find the maxima / minima of the given function.	3	9
CO3	Integrate the given function by using the methods of integration and to find area under the given curve	3	9
CO4	Apply differential calculus to solve optimization problems in biotechnology	3	9
CO5	Apply probability and statistical methods to analyze real world phenomena	3	9



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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-B (AE/CE/ME/BT)

Semester-I Chemical Process in Engineering: BSH51105

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	3Hrs/week	CT-I	12 Marks	-	-
Practical(P)	2Hrs/week	CT-II	12 Marks	-	-
Total Credits	3(Th)+1(P)=4	CT-III	6 Marks	-	-
Duration of ESE:3Hrs		CA	10 Marks	CA	25 Marks
		ESE	60 Marks	ESE	25 Marks
		Total Marks	100 Marks	-	50 Marks

Pre-Requisites: AICTE Bridge Course, Energy sources, Water technology, Engineering material, Thermodynamic

Course Objectives:

1. To gain the knowledge of Energy sources and their application.
2. To identify different types of corrosion and its controls.
3. To enable to students to upgrade the existing knowledge of water technology.
4. To gain the knowledge on basics of Thermodynamics and Battery Technology.
5. To enlighten the students to the basic process of engineering materials.

Course Contents

Unit I	Energy Sources: Introduction of energy, Introduction of fuels, Conventional and non-conventional energy sources, Calorific value determination of solid, liquid and Gases fuel, Analysis of solid fuels, Fractional distillation of crude petroleum oil, CNG, Bio-Diesel, Lubricant and types of Lubrication, Rocket: Propulsion and Propellant. Class activity: Creative poster making on any one non-conventional energy source.
Unit II	Corrosion and its Control: Introduction, Types of corrosion: Dry and Wet corrosion, Mechanism of dry and wet corrosion, Factor affecting corrosion: Nature of metal and nature of environment, Types of wet corrosion, Pitting, waterline, stress and galvanic corrosion, Methods of corrosion control- Cathodic protection by Sacrificial anode, PB ration. Class activity: MCQ based quiz on types of corrosion
Unit III	Water pollution and Softening processes: Introduction, Sources of pollution, Hardness, Domestic water treatment, Softening process (Zeolite process and Ion Exchange Process) Boiler trouble due to scale and sludge, Desalination of water by Reverse osmosis. Class activity: Crossword Puzzle on the basis of softening process of water
Unit IV	Thermodynamics & Battery Technology: Basics of thermodynamics, Laws of thermodynamics, Concept of Internal Energy, Introduction of batteries, Types of Batteries with construction, working and their applications (Carbon-Zn, Ni-Cd, Lead Acid battery) H ₂ -O ₂ Fuel cell and its applications. Class activity: Open Book test on recent battery trends.
Unit V	Engineering Materials: Cement: Introduction, raw materials, manufacturing of cement by wet process and dry process, properties of cement: setting and hardening, heat of hydration. Composite materials and its types, Nano materials and Application in electronics devices, agricultural and medicinal sector. Class activity: Case study for Types of Cement, composition and its application in construction.

Chairperson

Text Books	
T.1	Engineering Chemistry by S.S. Dara, 10th Edition. S. Chand & Co
T.2	Engineering Chemistry Dr. Avinash Bharti, V.K. Walekar, 1st Edition. Tech Max.
T.3	Textbook of Engineering Chemistry: P.C Jain & Monica Jain, 15th Edition. Dhanpatrai publication Ltd
Reference Books	
R.1	Applied Chemistry: Narkhede & Bhake, 1st Edition. Das Ganu Prakashan.
R.2	Engineering Chemistry Dr. Avinash Bharti, V.K. Walekar, 1st Edition. Tech Max
R.3	Textbook of Engineering Chemistry: P.C Jain & Monica Jain, 15th Edition. Dhanpatrai publication Ltd
Useful Links	
1	https://nptel.ac.in/courses/103/103/103103206/
2	https://nptel.ac.in/courses/103/108/103108162/
3	https://nptel.ac.in/courses/104/105/104105124/

LIST OF EXPERIMENTS (Energy and Battery Technology: BSH51106)		
1	Determination of Moisture Content or Volatile Matter & Ash Content of Coal sample.	CO1
2	Determination of Flash Point of given Oil by Pensky Marten's or Abel's Apparatus.	CO1
3	Determination of rate of corrosion by acids and by increasing temperature.	CO2
4	Determination of Electrode Potential by Galvanic Cell.	CO2
5	Determination of Hardness of Water Sample by Complexometric Method.	CO3
6	Determination of Calcium Ion & Magnesium Ion Separately.	CO3
7	Estimation of amount of zinc liberated during electrolysis.	CO4
8	Determination of current by using salt water battery.	CO4
9	Determination of pH of given Solution.	CO5
10	Determination of Heat of Hydration of Given Material.	CO5

Text Books	
T.1	Experiments and Calculations in Engineering Chemistry by S. Chand
T.2	Practical Engineering Chemistry: By S.N. Narkhede, Dr. R.T. Jadhav, Dr. A.B. Bhake
Reference Books	
R.1	A textbook on experiment and calculation By S.S. Dara
R.2	Inorganic Quantitative analysis, Vogel
Useful Links	
1	https://nptel.ac.in/courses/108/104/10810412345/
2	http://nptel.ac.in/courses/117/101/2546/

CO	Course Outcomes	CL	Class Sessions
CO1	Understand the basics of Energy sources and its properties and application	2	9
CO2	Predict Causes of corrosion, its Consequence and methods of protections	3	9
CO3	Differentiate water pollution and its softening process.	3	9
CO4	Illustrate Bulk Properties and Process of thermodynamics and types of battery.	3	9
CO5	Interpret types and applications engineering materials.	3	9



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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-B (AE/CE/ME)

Semester-I Engineering Mechanics: BCE51101

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	3Hrs/week	CT-I	12 Marks	-	-
Practical(P)	-	CT-II	12 Marks	-	-
Total Credits	3(Th)=3	CT-III	6 Marks	-	-
		CA	10 Marks	-	-
Duration of ESE:3 Hrs		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Pre-Requisites: NA

Course Objectives:

1. To understand and analyze the effect of forces and moment on the body and force system.
2. To demonstrate concept of equilibrium and condition of equilibrium.
3. To estimate concept of moment of inertia and apply on rectangular, square, circular and composite section.
4. To apply kinematics of linear motion, Work energy principle.
5. To analyze D'Alembert's principle and apply on connected bodies, method of momentum.

Course Contents

Unit I	Force Systems and Principles of Static Equilibrium: Fundamentals of Force Systems and Statics: Definition of Statics & Dynamics, Force and Its Characteristics, Classification of Force Systems, Principles of Statics, Law of moments, Resultant and general force system, Moment of a Force about a Point and Axis, couple moment as free vector. Resolution of forces.
	Activity 1: Game Pedagogy: Crosswords, Puzzles: Arrange the words Across and Down for Statics Mechanics Activity 2: Open Book Test
Unit II	Equilibrium of Force system: Equilibrium of Force Systems, Free Body Diagrams (FBDs), Resultant and Equilibrium of concurrent and non-concurrent forces, Equilibrium of parallel force systems in space. Equilibrium of Three Forces in a Plane and Space. Truss and beams – type of trusses, type of beams, type of load and type of end supports.
	Activity 1: Model-Making Activity: Develop a model representing a concurrent/ non-concurrent force system. Activity 2: Power Point Presentation
Unit III	Centroid and Moment of Inertia of Plane Areas: Definition of Centroid and Center of Gravity, centroid of simple figures, centroid of composite structures. Moment of inertia of plane sections from first principles, theorems of moment of inertia (Parallel Axis Theorem, Perpendicular Axis Theorem), principle Axes and principle Moments of Inertia, Mohr's Circle for Moment of Inertia
	Activity 1: Model-Making Activity: Develop a model representing a concurrent/ non-concurrent force system. Activity 2: Power Point Presentation

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Unit IV	Kinematics: Motion, Laws, and Applications: Definition and scope of kinematics, Rectilinear Motion of Particles, Newton's Laws of Motion, Newton's motion Law, Projectile Motion, Relative Motion Analysis, Motion Curves and Graphical Analysis.
	Activity 1: Pendulum with Adjustable Mass (triangle, square, irregular shapes) Activity 2: Balancing Shapes Experiment
Unit V	Principles of Dynamic Motion: Impact, Inertia, and Work-Energy: Impulse and Momentum Principles, Linear impulse momentums, consideration for system of particles, elastic impact of two bodies, direct central impact. Principle work energy method Alembert's Principle, Inertia force and concept of dynamic equilibrium.
	Activity 1: Real Time Problem Activity: Kinematics and Dynamic Motion Activity 2: Open Book Test

Text Books	
T.1	Engineering Mechanics, S. S. Bhavikatti, New Age International Pvt. Ltd., 6 th Edition.
T.2	Engineering Mechanics, R. K. Bansal and Sanjay Bansal, Jain Bros. Publishers, Delhi, 4 th Edition.
T.3	Textbook of Applied Mechanics I, Ramamrutham. S., Dhanpat Rai Publications, 1987 Engineering Mechanics (Statics and Dynamics), Palanichamy, M. S., and Nagan, S., 3 rd Edition.
Reference Books	
R.1	Vector Mechanics for Engineers Vol.-I and II, F. P. Beer and E. R. Johnston, Tata Mc- Graw Hill Publication 9 th Edition.
R.2	Engineering Mechanics, Irving H. Shames, Prentice Hall of India, New Delhi, 4 th Edition.
R.3	Engineering Mechanics, Timoshenko and Goodier
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103109/
2	https://nptel.ac.in/courses/112/106/112106286/

CO	Course Outcomes	CL	Class Session
CO1	Understand the fundamental concepts of statics including types of force systems, force characteristics, and principles of equilibrium.	2	9
CO2	Illustrate Resultant and Equilibrium of concurrent and parallel forces	3	9
CO3	Demonstrate the centroid of composite figures and moment of inertia of plane sections	3	9
CO4	Illustrate the Kinematics of rectilinear motion, motion curves, Newton's motion Law, and relative velocity.	3	9
CO5	Apply the system of particles, elastic impact of two bodies, direct central impact. Principle work energy.	3	9



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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-B (BT)

Semester-I | Fundamentals of Biotechnology (BBT51101)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	3 Hrs/week	CT-I	12 Marks	-	-
Practical (P)	-	CT-II	12 Marks	-	-
Total Credits	3 (Th)	CT-III	6 Marks	-	-
Duration of ESE: 3 Hrs		CA	10 Marks	-	-
		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Course Objective:

1	To explore the various branches of biotechnology, including plant, animal, marine, agriculture, healthcare, industrial, pharmaceutical, and environmental biotechnology.
2	To understand the principles and applications of biotechnology in environmental management, biodegradation, bioremediation and Bio mining.
3	To analyze the role of enzymes used in textile industry, breweries and food supplements.
4	To obtain the biotechnological applications in food processing.
5	To evaluate the applications of biotechnology in human health and livestock improvement.

Course Contents

Unit 1	Scope and Introduction to Biotechnology: Introduction to Biotechnology, Definition of Biotechnology. Traditional and Modern Biotechnology. Overview of Branches of Biotechnology: Plant, Animal Biotechnology, Marine Biotechnology, Agriculture, Healthcare, Industrial Biotechnology, Pharmaceutical Biotechnology and Environmental Biotechnology.
Unit 2	Environment: Applications of Biotechnology in environment aspects: waste management, biodegradation of heavy metals, removing oil spills, air and soil pollution, bioremediation, bio mining.
Unit 3	Industry: Enzymes for textile industry, breweries and food supplements, single cell protein, vitamins, food processing cheese, yoghurt making.
Unit 4	Food Biotechnology: Overview of Biotechnological applications in enhancement of Food Quality, Quality Factors in Preprocessed Food, Microbial role in food products (Yeast and Bacterial based process and products).
Unit 5	Human Health and livestock: Applications in Human Health: Antibiotic production, Molecular diagnostics, vaccines and vaccine delivery, recombinant therapeutics, gene therapy, forensics. Applications in livestock improvement: transgenic animals, Increased milk production, artificial insemination, Invitro fertilization.

Chairperson

Text Books	
1	Crueger Wand Crueger, A. 2000. Biotechnology: A textbook of Industrial Microbiology. 2 nd edition. Panima Publishing Co. New Delhi.
2	Eckert, W.G. and Wrightin, R.K. 1997. Introduction to Forensic Sciences. 2 nd Edition, CRC Press.
3	McGregor, C.W.; Membrane separation in Biotechnology; Marcel Dekker, Inc, New York.

Reference Books	
1	Hans-Joachim Jordening and Jeset Winter, 200s. Environmental Biotechnology Concepts and Applications
2	Microbiology: Michael J. Pelczar Jr., E. C. S Chan, Noel R. Krieg
3	Patel, A.H.1996.Industrial Microbiology.1 st edition, Macmillian India limited.

Useful Links	
1	https://nptel.ac.in/courses/102103045
2	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBTA1304.pdf
3	https://onlinecourses.nptel.ac.in/noc21_bt41/preview

CO	Course Outcomes	CL	Class Session
CO1	Explain the significance of various branches of biotechnology.	2	9
CO2	Explore the knowledge about environmental aspects and role of enzymes in the biotechnology.	2	9
CO3	Competent to apply the knowledge gained in fermentation technology.	3	9
CO4	Compare the knowledge gained in food processing.	4	9
CO5	Analyze the basic Biotechnology knowledge in Human Health and livestock improvement.	4	9



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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-B (AE/CE/ME/BT)

Semester-I Indian Ancient Technology: BSH51107

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	2 Hrs/week	CT-I	5 Marks	-	-
Practical (P)	-	CT-II	5 Marks	-	-
Total Credits	2 (Th)	CT-III	4 Marks	-	-
Duration of ESE: 2Hrs		CA	6 Marks	-	-
		ESE	30 Marks	-	-
		Total Marks	50 Marks	-	-

Pre-Requisites:

Course Objectives:

1. To understand the foundational concepts and key developments in ancient Indian technology.
2. To summarize ancient Indian innovations in metallurgy, architecture, agriculture, and medicine.
3. To paraphrase the ecological and societal impact of these technologies and their relevance today.

Course Contents

Unit-I	Foundations of Indian Ancient Technology: Definition and scope, Sources: archaeological, literary (Vedas, epics, treatises), Chronological overview (Indus Valley to Gupta period and beyond)
	Activity 1: Group presentation on selected ancient technology or scientist. Activity 2: Quiz format with speed challenges.
Unit-II	Technological Innovations & Metallurgy: Wootz steel and its global influence, Iron Pillar of Delhi and corrosion resistance, Zinc smelting at Zawar mines, Bronze and copper tools in the Harappan civilization.
	Activity 1: Poster creation on sustainability in ancient Indian technology. Activity 2: Group discussion on Why did the Iron Pillar resist rust for over 1600 years?
Unit-III	Science, Medicine & Sustainability: Astronomy and ancient scientific instruments, Ayurveda and ancient surgical techniques, Ecological practices and sustainable technology, Revival and modern applications of ancient technology.
	Activity 1: Discussion on integrating traditional technologies in modern practices. Activity 2: Prepare a chart of Tridosha (Vata, Pitta, Kapha) and match herbs to body types.

Text Books :-

T.1	Aspects of Science and Technology in Ancient India Edited by Arun Kumar Jha and Seema Sahay
T.2	The Ancient Engineers by L. Sprague de Camp
T.3	The Golden Road: How Ancient India Transformed the World by William Dalrymple

Reference Books:-

R.1	"The Wonder That Was India" – A. L. Basham
R.2	"Iron and Steel in Ancient India" – B. R. Pant
R.3	"Indian Medicine in the Classical Age" - P. Kutumbiah

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Useful Links:-

1.	https://onlinecourses.nptel.ac.in/noc20_ae10/preview
2.	https://archive.nptel.ac.in/courses/101/104/101104065/
3.	https://hits.digimat.in/nptel/courses/video/101104065/L08.html

CO	Course Outcomes	CL	Class Sessions
CO1	State major ancient Indian technologies and their principles.	1	9
CO2	Describe the processes and applications of metallurgy, architecture, and agriculture in ancient India.	1	8
CO3	Explain the sustainability and modern relevance of ancient Indian technologies.	2	8

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Department of Basic Sciences and Humanities

Program: B. Tech First Year (AE/CE/ME/BT)

Semester-I Environment Sustainability-Lab: BCE51102

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	-	-	-	-	-
Practical (P)	2 Hrs./week	-	-	-	-
Total Credits	1	-	-	IA	50 Marks
		-	-	ESE	-
		-	-	Total	50 Marks

Pre-Requisites: NA

Course Objectives:

1. Develop skills to assess and manage water resources sustainably.
2. Apply techniques to control soil erosion and waste recycling.
3. Analyze environmental impacts of air and energy systems.
4. Design sustainable infrastructure using permeable materials and green roofs.
5. Evaluate carbon footprints and promote eco-friendly civil engineering practices.

Course Contents

Sr. No.	Name of Experiment	CO
1.	Assess the quality of water samples from different sources	CO1
2.	Construct and evaluate a small-scale rainwater harvesting system	CO1
3.	Study soil erosion and evaluate control measures	CO2
4.	Demonstrate the composting process for organic waste	CO2
5.	Measure air pollution levels in different locations	CO3
6.	Assess energy consumption in a classroom	CO3
7.	Evaluate water infiltration in permeable pavements	CO4
8.	Assess the recyclability of construction waste	CO4
9.	Estimate personal carbon footprints	CO5
10.	Evaluate the benefits of green roofs	CO5

Text Books

T.1	Peavy, H. S., Rowe, D. R., & Tchobanoglous, G. (2017). Environmental Engineering, McGraw-Hill Education
T.2	Davis, M. L., & Cornwell, D. A. (2014). Introduction to Environmental Engineering (5th ed.), McGraw- Hill Education
T.3	Masters, G. M., & Ela, W. P. (2014). Introduction to Environmental Engineering and Science (3rd ed.), Pearson
T.4	Sharma, H. D., & Reddy, K. R. (2004). Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, Wiley
T.5	Newman, J., & Choo, B. S. (2003). Advanced Concrete Technology: Constituent Materials, Elsevier

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Reference Books

R.1	Sachs, J. D., & Ban, K. (2015). The Age of Sustainable Development. Columbia University Press
R.2	Kubba, S. (2010). LEED Practices, Certification, and Accreditation Handbook. Elsevier
R.3	Rittmann, B. E., & McCarty, P. L. (2001). Environmental Biotechnology: Principles and Applications. McGraw-Hill
R.4	LaGrega, M. D., Buckingham, P. L., & Evans, J. C. (1994). Hazardous Waste Management. McGraw-Hill
R.5	Thibodeaux, L. J. (1996). Environmental Chemodynamics: Movement of Chemicals in Air, Water, and Soil (2nd ed.). Wiley Interscience.

Useful Links

1	https://archive.nptel.ac.in/courses/127/105/127105018/
2	https://onlinecourses.nptel.ac.in/noc19_ce40/preview
3	https://archive.nptel.ac.in/courses/127/106/127106004/
4	https://onlinecourses.nptel.ac.in/noc19_ce32/preview
5	https://onlinecourses.nptel.ac.in/noc22_ch33/preview

CO	Course Outcomes	CL	Lab Session
CO1	Apply methods to assess water quality and design rainwater harvesting systems.	2	4
CO2	Implement erosion control and manage organic waste sustainably.	2	4
CO3	Evaluate air quality data and develop strategies to optimize classroom energy use.	3	4
CO4	Assess permeable pavements and formulate plans for recycling construction waste.	3	4
CO5	Analyze carbon footprints and design green roof models for environmental benefits.	3	4



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Department of Basic Sciences and Humanities

Program: B. Tech First Year (AE/ME/CE/BT)

Semester-I Fundamental of Python Programming (BCS51103)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	-	-	-	-	-
Practical (P)	2 Hrs./week	-	-	-	-
Total Credits	1	-	-	IA	25 Marks
-	-	-	-	ESE	25 Marks
-	-	-	-	Total	50 Marks

Pre-Requisites:

Course Objectives:

1. To introduce the basics of Python programming, including syntax, variables, data types, and simple input/output operations.
2. To develop understanding of data structures and control statements for solving basic programming problems using decision-making and loops.
3. To introduce modular programming using functions, basic file handling, and fundamental concepts of object-oriented programming.

Course Contents

Unit-I	Introduction to Python, features, installation, syntax and structure, variables, identifiers, data types (int, float, string, boolean), input/output, type conversion, operators (arithmetic, relational, logical, assignment).
Unit-II	Conditional statements (if, if-else, elif), loops (for, while), loop control statements (break, continue, pass), data structures (list, tuple, set, dictionary), string operations.
Unit-III	Functions (definition, arguments, return values), scope of variables, modules, file handling (read/write), basics of OOP (classes, objects, constructors, attributes, methods).

Text Books :- operations

T.1	Programming and Problem Solving with Python by Reema Thareja
T.2	Python Crash Course by Eric Matthes

Reference Books:-

R.1	Core Python Programming by Wesley J. Chun
R.2	Think Python by Allen B. Downey
R.3	Learning Python by Mark Lutz

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Sr. No.	List of Experiment	
1	Write a Python program to display "Hello World" and perform basic input/output operations.	CO1
2	Write a program to perform arithmetic operations using operators.	CO1
3	Write a program to check whether a number is even or odd using if-else.	CO2
4	Write a program to find the largest of three numbers using nested if.	CO2
5	Write a program to print multiplication table using a loop.	CO2
6	Write a program using for loop and while loop to demonstrate iteration.	CO2
7	Write a program to perform basic operations on lists (append, remove, sort).	CO2
8	Write a program to perform string operations (length, reverse, slicing).	CO2
9	Write a function to calculate factorial of a number.	CO3
10	Write a program to read and write data into a file.	CO3

CO	Course Outcomes	CL	Class Session
CO1	Understand the fundamentals of Python programming and develop basic programs using variables, data types, and operators.	1	4
CO2	Apply control structures and basic data structures to solve programming problems and perform data manipulation.	2	4
CO3	Develop modular programs, handle files, and understand basic object-oriented programming concepts.	3	4



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Department of Basic Sciences and Humanities

Program: B. Tech First Year (AE/CE/ME/BT)

SEMESTER-I Basics of Career Development - BSH51108

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	-	-	-	-	-
Practical (P)	2 Hrs./week	-	-	-	-
Total Credits	1	-	-	IA	25 Marks
-	-	-	-	ESE	25 Marks
-	-	-	-	Total	50 Marks

Pre-Requisites: -

Course Objectives: -

1. To develop career etiquette, self-presentation, and professional behavior.
2. To demonstrate effective communication and workplace etiquette.
3. To apply functional grammar and professional writing skills.
4. To develop personality, self-confidence, and interpersonal skills.
5. To demonstrate presentation, group discussion, and public speaking skills.

Course Contents

Unit-I	Introduction to Career Etiquette: Greeting Etiquette, Body Language, Professional Grooming, Self-Awareness, Personal Identity, Family Values, Self-Presentation, Career Vision, Goal Setting, and Presentation Skills.
Unit-II	Fundamentals of Communication: Communication Process, Elements of Communication, Types of Communication, Verbal and Non-Verbal Communication, Listening Skills, Interpersonal Communication, Communication Barriers, Feedback, and Effective Communication Strategies.
Unit-III	Functional Grammar and Written Communication- Sentence Formation, Functional Grammar, Tenses, Subject-Verb Agreement, Articles, Prepositions, Error Correction, Writing Process, Applications, Official Letters, Report Writing, and Writing Formats.
Unit-IV	Workplace Etiquette and Personality Development- Workplace Etiquette, Digital Etiquette, Email Etiquette, Meeting Etiquette, Workplace Behavior, Self-Confidence, Emotional Intelligence, Interpersonal Skills, Teamwork, Leadership, and Personality Development.
Unit-V	Professional Communication and Presentation Skills – Newspaper Reading, Listening Skills, Observation Skills, Vocabulary Development, Public Speaking, Group Discussion, Presentation Skills, Audience Interaction, Seminar Presentation, and Career Readiness.

Text Books: -

- | | |
|-----|--|
| T1. | Sanjay Kumar & Pushp Lata, Communication Skills , Oxford University Press, New Delhi. |
| T2. | Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice , Oxford University Press, New Delhi. |
| T3. | Ashraf Rizvi, Effective Technical Communication , McGraw Hill Education, New Delhi. |

Reference Books: -

- | | |
|-----|---|
| R1. | Stephen R. Covey, The 7 Habits of Highly Effective People , Simon & Schuster. |
| R2. | Dale Carnegie, How to Win Friends and Influence People , Simon & Schuster. |
| R3. | Norman Lewis, Word Power Made Easy , Goyal Publishers & Distributors Pvt. Ltd. |

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Useful Links: -

1.	https://www.grammarly.com/blog/
2.	https://www.bbc.co.uk/learningenglish

Sr. No.	LIST OF EXPERIMENTS (Basics of Career Development - BSH51108)	CO
1	Understanding Essential Etiquette and Its Applications.	CO1
2	Demonstration of Self-presentation skills in day-to-day life.	CO1
3	Exploring the Fundamentals and Types of Communication for Career Development	CO2
4	Developing General Communication Skills for Effective Personal and Professional Interaction	CO2
5	Using Functional Grammar for Effective Oral and Written Communication	CO3
6	Developing Writing Skills through Applications, Official Letters, and Report Writing	CO3
7	Understanding Workplace Etiquette and Appropriate Professional Behavior.	CO4
8	Exploring the Foundations of Personality Development for Career Growth	CO4
9	Enhancing Communication Skills through Reading, Listening, Observation, and Media Analysis	CO5
10	Building Confidence through Group Discussions and Presentations	CO5

CO	Course Outcomes	CL	Class Sessions
CO1	Identify the principles of essential etiquette, self-awareness, self-presentation, and career planning.	1	4
CO2	Outline the fundamentals of communication and effective communication strategies.	1	4
CO3	Understand the concepts of functional grammar and written communication for professional documentation.	2	4
CO4	Explain the importance of workplace etiquette, personality development, and interpersonal skills for professional growth.	2	4
CO5	Apply communication and presentation skills effectively in group discussions, public speaking, and career-related interactions.	3	4


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Department of Basic Sciences and Humanities

Program: B. Tech First Year (AE/CE/ME)

Semester-I Engineering Workshop: BME51101

Teaching Scheme		Examination Scheme(Th)		Examination Scheme(P)	
Theory (Th)	-	-	-	-	-
Practical (P)	2 Hrs./week	-	-	-	-
Total Credits	1	-	-	IA	25 Marks
-	-	-	-	ESE	25 Marks
-	-	-	-	Total	50 Marks

Course Objectives:

1. To understand different manufacturing processes which are commonly employed in the industry.
2. To give hands on training and practice to students for use of various tools, devices, equipment and machines.
3. To analyze different types of welding process with the help of welding simulation package

List of Experiment

1	Fitting: Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling and tapping. Job-1: Fitting to size, male-female fitting with drilling and tapping.	CO1
2	Carpentry: Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods. Job-2: L Joint / T Joint / Cross joint	CO2
3	Welding: Use and setting of tools and equipment for edge preparation for welding jobs and Arc welding for different job. Job-3: Lap welding of two plates / butt welding of plates.	CO3
4	Welding Simulation: introduction to welding, types of welding process, types of joints, materials, application of different types of welding. Job-4: Job on Simulation Package Software	CO4
5	Fasteners: Types of fastening process, Screw threads, nut & bolt. Demonstration of thread forming/machining and its measurement.	CO5

Text Books

- | | |
|-----|---|
| T.1 | —Elements of Workshop Technology I: Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai. |
| T.2 | —Manufacturing Technology – II: Gowri P., Hariharan and A. Suresh Babu, Pearson Education, 2008. |

Reference Books

- | | |
|-----|--|
| R.1 | —Process and Materials of Manufacture I: Roy A. and Lindberg, 4 th Edition, Prentice Hall India 1998. |
| R.2 | —Elements of Workshop Technology I: S K Hajra, Choudhury, A K Hajra, Choudhury, & Nirjhar Roy, Vol. I & II. |
| R.3 | —A Course in Workshop Technology I: B S Raghuwanshi, Vol. 1 & II. |

Useful Links

- | | |
|---|---|
| 1 | https://nptel.ac.in/courses/112/103/112103305/ |
| 2 | https://nptel.ac.in/courses/112/107/112107145/ |
| 3 | https://nptel.ac.in/courses/112/107/112107144/ |
| 4 | https://nptel.ac.in/courses/112/103/112103306/ |

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CO	Course Outcomes	CL	Class Session
CO1	Identify marking tools, hand tools, measuring instruments and to work to prescribed dimensions/tolerances on mating of two metal parts.	1	4
CO2	Understand carpentry tools for wooden joints, Simple exercise using jack plane.	2	4
CO3	Apply the joint by Arc welding, Simple butt and Lap welded joints.	3	4
CO4	Demonstrate advance welding process on simulation package to obtain practical skills in the various trades.	3	4
CO5	Differentiate types of fasteners and evaluate their suitability for specific mechanical or structural uses.	3	4


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Department of Basic Sciences and Humanities

Program: B.Tech First Year Group-B (BT)

Semester-I Cell And Molecular Biology - Lab (BBT51102)

Teaching Scheme

Lectures	-
Tutorial	-
Practical	4Hr / Week

Practical Credit: 2

Examination Scheme

IA	25 Marks
ESE	25 Marks
Total	50 Marks

Course Objectives

The Objectives of this course is:

1. To understand basic methods of cell staining and microscopic observation.
2. To study different techniques of molecular biology for estimation of Different biomolecules.

Sr. No.	Experiments	CO
1	Observation and study of cell and tissue under compound microscope	CO-1
2	Staining techniques for plant and animal cell.	CO-1
3	Microscopic observation of root hairs and stomata	CO-2
4	Demonstration of various phases of mitosis in onion roots.	CO-2
5	Demonstration of southern Blotting	CO-3
6	Paper chromatography technique for separation of amino acids.	CO-3
7	Agarose gel electrophoresis of Nucleic acid.	CO-4
8	Estimation of DNA by colorimetric method	CO-4
9	Estimation of RNA by colorimetric method	CO-5
10	Demonstration of Thin layer chromatography and SDS-PAGE.	CO-5

Text Books

- T.1 Molecular Biology of the Cell, Bruce Alberts, Alexander D. Johnson, Julian Lewis, et al., 6th Edition, 2014
- T.2 Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox, 8th Edition, 2021

Reference Books

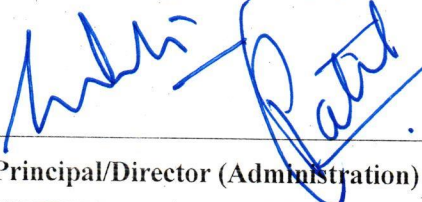
- R.1 Biological Science, D.J. Taylor, N.P.O. Green, G.W. Stout, 3rd Edition, 1997.
- R.2 Principles and Techniques of Biochemistry and Molecular Biology, Keith Wilson and John Walker, 7th Edition, 2010.

Useful Links

1. <https://www.youtube.com/watch?v=CSrUm-EgTK4>
2. <https://www.youtube.com/watch?v=w2wAYViQBXM>
3. <https://www.youtube.com/watch?v=hdmQaAycafc>

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CO	Course Outcomes	CL	Hours
CO1	Describe the structure and organization of plant and animal cells and tissues using compound microscopy.	2	4
CO2	Demonstrate the identification of microscopic features.	3	4
CO3	Perform molecular biology techniques including Southern blotting, agarose gel electrophoresis.	3	4
CO4	Examine the principles and analyze the results of chromatographic techniques.	4	4
CO5	Analyze practical skills and analyze data obtained from microscopy, staining, electrophoresis, and nucleic acid quantification techniques.	4	4

				July, 2026	5.00	Applicable for AY 2026-27 Onwards
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Department of Basic Sciences and Humanities

Program: B.Tech First Year (AE/CE/ME)

Semester-II Differential Equation & statistics: (BSH51201)

Teaching Scheme

Examination Scheme (Th)

Examination Scheme(P)

Theory (Th)	4 Hrs./week	CT-I	12 Marks	-	-
Practical (P)	-	CT-II	12 Marks	-	-
Total Credits	4 (Th) = 4	CT-III	6 Marks	-	-
Duration of ESE:3Hrs		CA	10 Marks	-	-
		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Pre-Requisites: NA

Course Objectives:

- 1 To utilize consistency of system of equations.
- 2 To make students acquainted with advance techniques to evaluate integrals.
- 3 To Identify the type of a given differential equation and select and apply the appropriate analytical Technique for finding the solution of first order and selected higher order ordinary differential equations.
- 4 To gain Statistical knowledge that helps to use the proper methods to collect the data, employ the Correct analyses and find the result.
- 5 To introduce students to Discrete and Continuous Random Variables concepts and their use in real world phenomena.

Course Contents

Unit I	Differential Equation: Order and Degree of D.E, Linear and Exact Differential Equations, First order & First degree D.E. solvable for p, Equations solvable for y, Equations solvable for x, Application: Newton 's law of cooling, Data Analysis through Programming. Activity 1. Mathematically Verification of Newton's law of Cooling Practically. Activity 2. To solve Linear Differential Equation by Sage math.
Unit II	Higher Order Differential Equation: Higher order linear D.E. with constant coefficient, Method of variations of Parameters, Cauchy's form, Legendre's Linear Equations. Application of second order differential equation to R-L-C CIRCUIT, Heat Equations. Activity 1. Perform basic operations of Differential equation by Sage math. Activity 2. To solve higher Order Differential Equation by using Sage math
Unit III	Multivariable Calculus (Integration): Double Integration (Cartesian and polar coordinates), Change of Order of Integration, Elementary Triple Integration, And Application: Area by double integration and volume by triple integration. Activity 1. Application of integration by using Sage math Activity 2. Evaluation of Integration by using Sage math.
Unit IV	Probability: Conditional Probability, Discrete Random Variable, Continuous Random Variable, Probability Distribution function, Probability density function, Binomial Distribution, Uniform Distribution, Poisson 's Theorem, Moment Generating Function (Discrete random Variable and Continuous Random variable). Activity 1. Mathematical model based on Probability. Activity 2. To Evaluate Random variable by using Sage math.

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Unit V	Statistics: Measures of central tendency: Skewness and Kurtosis, Coefficient of variation, Moments, fitting of straight line, Fitting of parabola and exponential curves, Lines of regression and correlation, Rank correlation.
	Activity 1. To Determine mean, mode & median by sage math.
	Activity 2. To Fit the straight line , Parabola and Exponential curves by using Scilab.

Text Books

T.1	Higher Engineering Mathematics by Bali Lyenger (Laxmi Prakashan) 9 th Edition
T.2	Advance Engineering Mathematics by Ervin Kreyszig's 9 th Edition
T.3	H. K. Dass, Advanced Engineering Mathematics, S. Chand, Reprint, 2014.
T.4	Outline Series, McGraw Hills, 4th Edition, 2016.
T.5	P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi GrihaPrakashan.
T.6	GB Thomas and R.L. Finney, Calculus and Analytic geometry 9 th edition, Pearson, Reprint2002.

Reference Books

R.1	—Advanced Engineering Mathematics by Erwin Kreyszig's (Wiley India) 9 th edition
R.2	A textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publication, Reprint 2010
R.3	Higher Engineering Mathematics by B. S. Grewal, Khanna Publisher 35 th edition.

Useful Links

1	https://onlinecourses.nptel.ac.in/noc23_ma61/preview
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview

CO	Course Outcomes	CL	Class Sessions
CO1	Implement appropriate methods to solve first order differential equation and apply it to find solution of engineering problems.	3	9
CO2	Execute appropriate methods to solve higher order differential equation	3	9
CO3	Utilize fundamental theorems to compute integrals of both single-variable and multivariable functions.	3	9
CO4	Apply Probability concepts to interpret real-world Phenomena.	3	9
CO5	Inspect scientific data, use proper curve fitting and find correlation, regression of variables.	3	9



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Department of Basic Sciences and Humanities



Program: B. Tech First Year Group-B (BT)

Semester-II Applied Mathematics for Biotechnology (BSH51206)

Teaching Scheme

Examination Scheme (Th)

Examination Scheme(P)

Theory (Th)	4 Hrs./week	CT-I	12 Marks	-	-
Practical (P)	-	CT-II	12 Marks	-	-
Total Credits	4 (Th) = 4	CT-III	6 Marks	-	-
Duration of ESE: 3Hrs		CA	10 Marks	-	-
		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Pre-Requisites: NA

Course Objectives:

- 1 To identify algebraic problems from practical areas and obtain the solution in certain cases.
- 2 To expose students to understand the basic importance of Differential Calculus.
- 3 To uion of simultaneous equation by matrix method.
- 4 To apply your understanding of the concepts, formulas, and problem-solving procedures.

Unit I

Matrices: Basics on Matrices, Adjoint of matrix, Inverse of a matrix, Trace, Rank of a matrix, Rank Nullity Theorem, System of linear equations, Consistency of a system of Equation, Eigen values and Eigen vectors for order, Cayley Hamilton Theorem.

Activity 1: Perform basic operations of matrices by Sage math

Activity 2: Illustrate Eigen values and Eigen Vectors by Sage math

Unit II

Differential Calculus: Indeterminate Forms L'Hôpital Rule, Taylor's and Maclaurin's series (for one variable), Maxima and Minima, Successive differentiation, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem

Activity 1: To Learn Calculus with Sage Math

Activity 2: Differential Calculus and its Application by Sage math

Unit III

Integral Calculus: Introduction to Gamma Function & Properties of Gamma Function, Introduction to Beta Function & Properties of Beta Function, Relation between Beta & Gamma Function, Leibnitz's rule for differentiation under integral sign, Tracing of Cartesian and Polar curves

Activity 1: To trace the curve with Scilab Activity

Activity 2: To trace the curve with Maple

Multiple Integration: Double Integration- Cartesian and Polar, Change the order of Integration, Change into Polar Form, Triple Integration.

Activity 1: Application of integration by using Sage math

Activity 2: Evaluation of Integration by using Sage math.

Differential Equation: Review of first order differential equations, Linear and Exact differential equations, Application- Newtons Law Cooling, Second and higher order differential equations, Variation of parameters method, Cauchy-Legendre's Linear equation

Activity 1: Mathematical verification of Newton's Law of Cooling practically. Activity

Activity 2: To solve Linear Differential Equation by Sage math.

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Text Books

T.1	Higher Engineering Mathematics by Bali Lyenger (Laxmi Prakashan) 9 th Edition
T.2	Advance Engineering Mathematics by Ervin Kreyszig's 9 th Edition
T.3	H. K. Dass, Advanced Engineering Mathematics, S. Chand, Reprint, 2014.
T.4	Outline Series, McGraw Hills, 4th Edition, 2016.
T.5	P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi Griha Prakashan.
T.6	G B Thomas and R.L. Finney, Calculus and Analytic geometry 9 th edition, Pearson, Reprint2002.

Reference Books

R.1	GilbertStrang: Linear Algebra and Its Applications (Paperback), Nelson Engineering (2007)
R.2	"Advanced Engineering Mathematics" by Erwin Kreyszig's (Wiley India) 9 th edition
R.3	A textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publication, Reprint 2010
R.4	Higher Engineering Mathematics by B. S. Grewal, Khanna Publisher 35 th edition.

CO	Course Outcomes	CL	Class Sessions
CO1	Use Matrix method to solve linear system of equations, evaluate eigen values - eigen vectors and its applications.	3	9
CO2	Apply the concept of maxima, minima and successive differentiation in analysis of engineering problems.	3	9
CO3	Solve improper integrals using beta, gamma functions	3	9
CO4	Utilize fundamental theorems to compute integrals of both single-variable and multivariable functions.	3	9
CO5	Apply appropriate methods to solve first order and higher order differential equations and apply it to find solution of engineering problems.	3	9



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Department of Basic Sciences and Humanities

Program: B.Tech First Year (AE/CE/ME/BT)

Semester-II Solid state Physics & Optics: (BSH51207)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	3Hrs/week	CT-I	12 Marks	-	-
Practical(P)	2Hrs/week	CT-II	12 Marks	-	-
Total Credits	3(Th)+1(P)=4	CT-III	6 Marks	-	-
Duration of ESE:3Hrs		CA	10Marks	CA	25 Marks
		ESE	60Marks	ESE	25 Marks
		Total Marks	100Marks	-	50 Marks

Pre-Requisites: AICTE Bridge Course, Basics of Physics.

Course Objectives:

- 1 To show the strong conceptual understanding of Crystallography with their types and application in various engineering field.
- 2 To interpret the motion of charged particle in electric field, magnetic field and cross configured field through Bethe 's law, Cathode ray tube (CRT) and Cathode ray Oscilloscope (CRO).
- 3 To analyze the concept of cut in voltage, voltage regulator and current gain in PN junction diode, Zener diode and transistor respectively.
- 4 To compare the interference in parallel and wedge-shaped thin film and their application in engineering field.
- 5 To explain the characteristics, properties of optical fiber and laser with their application in engineering and medical field.

Course Contents

Unit I	Crystallography: Introduction, Classification of Crystal structure, Simple Cubic cell, Body Centered cubic cell, Face Centered cubic cell (SC, BCC, FCC), Elements of crystal, Unit cell and their types. Characteristics of Unit cell, Effective number of atoms per unit cell, atomic radius, nearest neighbor distance, coordination number, atomic packing factor, void space, density; Crystallographic planes and Miller indices, Bragg's law of diffraction and its equation.
	Activity 1: Model making of different structure (SC, BCC, FCC) Activity 2: Open Book Test
Unit II	Electron Ballistics & Electron Optics: Introduction of electric and magnetic field, Uniform Electric Field parallel to electron motion, Uniform Electric Field perpendicular to electron motion, Uniform Magnetic Field parallel to electron motion, Uniform Magnetic Field perpendicular to electron motion, Electric and Magnetic fields in cross configuration, Bethe's law, Devices: Cathode Ray tube, CRO, Block Diagram, Function & working of each block.
	Activity 1: Game Pedagogy - Crossword Puzzle of Electron Ballistics & Electron Optics. Activity 2: Poster Presentation
Unit III	Semiconductor Physics: Introduction, Intrinsic semiconductors and Extrinsic Semiconductor, PN-Junction diode, Hall effect & voltage, Hall coefficient, its application, Zener diode, LED, Transistor (CB, CC& CE mode)
	Activity 1: Circuit model making of Pn Junction Diode/ light emitting diode/ Zener diode/Transistor Activity 2: Case Study on Semiconductor Material Application.

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Unit IV	Interference in thin film: Introduction, thin film, Plane Parallel thin film, Wedge shaped thin film, Newton rings and its application, Antireflection coating.
	Activity 1: PPT on classification of Parallel thin film and Wedge-shaped thin film with their application.
	Activity 2: Preparation of Video clips / Build model
Unit V	Laser: Introduction of Laser and its characteristics, Interaction of radiation with matter, Meta stable state, Active Medium, Condition of Light amplification, Population Inversion, pumping, Three and four level laser, Ruby laser, Properties and engineering applications
	Activity 1: Context based learning & document making based activity.
	Activity 2: Multiple choice questions on LASER
Text Books	
T.1	Avadhanulu, M.N., & Kshirsagar, P.G. (8th Revised Edition). A Textbook of Engineering Physics. S. Chand Publication. New Delhi.
T.2	Subrahmanyam, N., Brij Lal, & Avadhanulu, M.N. (23rd Revised and Enlarged Edition, 2006). A Textbook of Optics. S. Chand Publication. New Delhi.
T.3	Mehta, V.K., & Mehta, Rohit. (Multicolour Illustrative and Thoroughly Revised Tenth Edition, 2006). Principles of Electronics. S. Chand Publication. New Delhi.
Reference Books	
R.1	Modern Physics: Theraja B.L., Reprint 2 nd Edition, S. Chand & CO, New Delhi.
R.2	Solid State Physics: Dekker J., Reprint 1 st Edition, Mc Millan India Ltd, Mumbai.
Useful Links	
1	https://nptel.ac.in/courses/115/102/115102124/
2	https://nptel.ac.in/courses/115/106/115106128/
3	https://nptel.ac.in/courses/104/101/104101130/

LIST OF EXPERIMENTS (Solid State Physics & Optics Lab-BSH51208)		
1	Determination of lattice constant and atomic packing fraction of simple cubic structure.	CO1
2	Determination of e/m ratio of an electron by Thomson method.	CO2
3	Determine the Cut in Voltage and Dynamic Resistance of P-N Junction Diode in Forward and Reverse Biased.	CO3
4	Determine the Break Down Voltage and Dynamic Resistance of Zener Diode	CO3
5	Determine the ripple factor and rectification efficiency by Half Wave and Full Wave Rectifier using CRO.	CO3
6	Determination of Dynamic Resistance and Current Gain of Transistor in Common Base Mode.	CO3
7	Determination of Dynamic Resistance and Current Gain of Transistor in Common Emitter	CO3
8	Calculate the Wavelength of Sodium Light By Using Newton rings experiment.	CO4
9	Determination of Fringe width by using Wedge shaped thin film.	CO4
10	Determination of divergence of laser beam.	CO5

Text Books	
T.1	Experiments in Engineering Physics: M.N. Avadhanulu, A. A.Dani, 2 nd Edition S. Chand (G/L) & Company Ltd, New Delhi.
T.2	A textbook of Practical Physics: Samir Kumar Ghosh, 1 st Edition, New Central Book Agency, Kolkata.
Reference Books	
R.1	Engineering Physics: Dattu Joshi, Tata Mc Graw Hill Education, New Delhi.
R.2	A text book of Engineering physics: Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar, S. Chand Publication.



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Useful Links

- | | |
|---|---|
| 1 | https://nptel.ac.in/courses/115/106/115106128/ |
| 2 | https://nptel.ac.in/courses/104/101/104101130/ |

CO	Course Outcomes	CL	Class Sessions
CO1	Interpret the Crystal geometry, the behavior of solids and different characteristics of cubic crystal structure.	2	9
CO2	Illustrate the concept of motion of charged particle in electric field, magnetic field and cross configured field.	3	9
CO3	Explain p n junction diode, Zener diode, Light emitting diode and transistor with their application in engineering field.	4	9
CO4	Analyze the concept of interference in parallel and wedge shaped thin film and their application in engineering field.	4	9
CO5	Explain the characteristics of laser and their application in engineering.	4	9

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Department of Basic Sciences and Humanities

Program: B.Tech First Year (AE/CE/ME/BT)

Semester-II Principle of Electrical Engineering: (BEE51201)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	3Hrs/week	CT-I	12 Marks	-	-
Practical(P)	2Hrs/week	CT-II	12 Marks	-	-
Total Credits	3(Th)+1(P)=4	CT-III	6 Marks		
Duration of ESE:3Hrs		CA	10Marks	CA	25 Marks
		ESE	60Marks	ESE	25 Marks
		Total Marks	100Marks	-	50 Marks

Pre-Requisites: NA.

Course Objectives:

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

Course Contents

Unit I	Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation Superposition Theorem.
Unit II	Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections
Unit III	Magnetic materials, BH characteristics, series and parallel magnetic circuits, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Autotransformer and three-phase transformer connection
Unit IV	Introduction to Power Generation Thermal Hydro, Nuclear, Wind, Solar with Block Schematic Presentation Only. Single line diagram for Generation Transmission, Distribution through different Voltage levels. Low voltage distribution system Overhead Underground Single Phase Three Phase. Basic operation of UPS Invertors Block schematic representation.
Unit V	Protective Devices: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. Illuminance: Lamps- fluorescent, CFL, LED. Electrical measuring instruments principle and applications energy meter, megger, tong tester.

Text Books

- | | |
|-----|--|
| T.1 | D. P. Kothari and I. J. Nagrath, —Basic Electrical EngineeringI, Tata McGraw Hill, 2010. |
| T.2 | D. C. Kulshreshtha, —Basic Electrical EngineeringI, McGraw Hill, 2009. |
| T.3 | L. S. Bobrow, —Fundamentals of Electrical EngineeringI, Oxford University Press, 2011. |

Reference Books

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|-----|--|
| R.1 | E. Hughes, —Electrical and Electronics TechnologyI, Pearson, 2010. |
| R.2 | Vincent Del Toro, —Electrical Engineering FundamentalsI, Prentice Hall India, 1989 |

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Useful Links	
1	https://digimat.in/nptel/courses/video/108105112/L01.html
2	https://archive.nptel.ac.in/courses/108/105/108105112/
3	https://archive.nptel.ac.in/courses/108/105/108105053/

LIST OF EXPERIMENTS(Principle of Electrical Engineering Lab: BEE51202)		
1	Verification of Kirchhoff's laws (KVL & KCL) for given network.	CO1
2	Verification of Superposition theorem for given network.	CO2
3	Determination of resistance and inductance of choke coil	CO2
4	Execute RLC series circuit operation and to plot Phasor diagram for it.	CO3
5	Determination of Permeability & Saturation point for given magnetic material	CO3
6	Detection of core losses and copper losses by performing open circuit test and short circuit test on single phase transformer	CO3
7	Perform direct loading test on single-phase transformer to determine its efficiency & voltage regulation.	CO3
8	Investigate the performance and efficiency of a UPS and an inverter in providing backup power during utility power interruptions.	CO4
9	Explore the construction and working principles of a separately excited DC motor, including the role of field windings and armature.	CO4
10	Explore the principles of insulation resistance measurement with a megger and clamp-on current measurement with a tong tester.	CO5

Text Books

T.1	A Text Book of Electrical Technology: B. L. Thareja and A. K. Thareja, S. Chand Publication (Volume I, II & III). 2011
T.2	Rashid M.H., —Power Electronics: Circuits Devices and Applications, 3rd Edition, Pearson, 2011.

Reference Books

R.1	E. Hughes, —Electrical and Electronics Technology, Pearson, 2010.
R.2	D. C. Kulshreshtha, —Basic Electrical Engineering, McGraw Hill, 2009.

Useful Links

1	https://nptel.ac.in/courses/117/106/117106034/
2	https://nptel.ac.in/courses/108108076/
3	https://nptel.ac.in/courses/108105062/

CO	Course Outcomes	CL	Class Sessions
CO 1	Describe Kirchhoff's current and voltage laws to analyze and solve complex DC electrical circuits.	2	9
CO 2	Interpret single-phase and three-phase AC circuits, calculate power parameters, and make informed decisions regarding their applications.	2	9
CO 3	Illustrate and optimizing transformers and magnetic circuits with a focus on factors such as material characteristics, losses, and connection configurations.	3	9
CO 4	Construct various electric machines, including three-phase induction motors, separately excited DC motors, and synchronous generators.	3	9
CO 5	Analyze the types of wires and cables commonly used in electrical installations, considering their specifications and applications.	4	9


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Department of Basic Sciences and Humanities

Program: B.Tech First Year (AE/CE/ME)

Semester-II Engineering & Computer Graphics: BME51201

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	2Hrs/week	CT-I	5 Marks	-	-
Practical(P)	-	CT-II	5 Marks	-	-
Total Credits	2 (Th)	CT-III	4 Marks	-	-
Duration of ESE: 2Hrs		CA	6 Marks	-	-
		ESE	30 Marks	-	-
		Total Marks	50 Marks	-	-

Pre-Requisites: Basics of drawing such as dimensions, scale, angle, projection

Course Objectives:

- 1 To apply fundamental engineering drawing conventions, including BIS standards, line types, and dimensioning techniques, and construct various engineering curves to solve practical problems.
- 2 To analyze and generate orthographic projections of points, lines, planes, and basic solids in first-angle projection, demonstrating an understanding of spatial relationships.
- 3 To Create orthographic and sectional views of machine parts and convert them into accurate isometric drawings.

Unit I

Fundamentals of Engineering Drawing & Curves: Introduction to Engineering Drawing: Importance and scope in engineering disciplines, Introduction to BIS (Bureau of Indian Standards) drawing conventions, Drawing Instruments and Sheet Layout: Types and uses of drawing instruments (drawing board, T-square, set squares, compass, dividers, etc.), Standard sheet sizes (A-series), sheet layout, title block
Types of Lines and Dimensioning:
Classification of lines as per BIS – visible, hidden, center, construction, and section lines Methods and conventions of dimensioning – unidirectional and aligned methods Engineering Curves: Construction and applications of conic sections: Ellipse, Parabola, Hyperbola
Special curves: Cycloid, Involute (of a circle), Logarithmic Spiral and Archimedean Spiral Practical applications of curves in engineering components

Activity 1: Hands-on sketching exercise—constructing different types of lines and applying dimensioning standards on practice templates.

Activity 2: Problem-solving session—construction of various engineering curves using geometrical methods and templates.

Unit II

Principles of Orthographic Projection:

Theory and terminology of projection, First angle vs. third angle projection methods (emphasis on first angle), Projection of Points and Lines: Projections of points located in different quadrants, Projections of lines inclined to one or both reference planes (horizontal and vertical planes), Projection of Planes: Projection of plane figures (circle, triangle, square, rectangle, pentagon, hexagon, etc.) inclined to both H.P. and V.P.

Projection of Solids:

Projection of standard 3D solids (cube, prism, pyramid, cylinder, cone) Axis inclined to one reference plane and parallel to the other

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	Activity 1: Group activity—projection of a line and plane with various inclinations using AutoCAD or manual drafting. Activity 2: Visualization quiz—identifying true length, angle, and shape from given orthographic views.
Unit III	Orthographic Projections of Machine Components: Generation of multiview (front, top, side) orthographic drawings from pictorial representations, Use of first angle projection method, Application of sectional views for clarity in representation Isometric Drawing: Understanding isometric axes and planes, Creation and use of the isometric scale, Conversion of orthographic views into isometric views or projections, Interpretation of 2D technical drawings into 3D representations Activity 1: Lab session—generation of multiview orthographic projections of simple machine components using manual drafting and then replicating in CAD software. Activity 2: Practical exercise—Development of isometric views from given orthographic projections using isometric grid paper and CAD tools.
Textbooks	
T.1	Elementary Engineering Drawing - N.D. Bhatt, Charotar Publishing house, Anand, India.
T.2	Engineering Drawing - D. A. Johle, 1 st Edition, 2017, Tata McGraw-Hill Publishing Co. Ltd.
T.3	Engineering Graphics with an introduction to AUTOCAD - A. R. Bapat, 6th reprint Edition, 2012, Allied Publishers, New Delhi.
T.4	Engineering Graphics with AutoCAD - D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, Revised Edition, 2010, PHI Publication.
T.5	Engineering Drawing - R.K. Dhawan, 1st Edition, 2012, S Chand Publications
T.6	Engineering Drawing, M.B. Shah, B.C. Rana, 2nd Edition, 2009, Pearson Publication
Reference Books	
R.1	Engineering Graphics by P.J.Shah, Revised edition 2014, S Chand and Company Ltd., New Delhi, India.
R.2	Engineering Drawing by BasantAgarwal and C.M. Agarwal, 2 nd edition 2015, Tata Magraw Hill Publication Company Ltd., and New Delhi, India.
R.3	Fundamentals of Engineering Drawing - Luzadder Warren J, Duff John, 11th Edition, 2012, PHI Publications.
R.4	Machine Drawing -N.D. Bhatt, 46 th Edition, 2014, Charotar Publishing house, Anand, India.
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019
2	https://nptel.ac.in/courses/112/102/112102304/
3	https://nptel.ac.in/courses/112/105/112105294/

CO	Course Outcomes		Class Sessions
CO1	Apply BIS standards and drafting techniques to construct technical drawings and engineering curves using appropriate instruments.	3	8
CO2	Analyze and produce orthographic projections of points, lines, planes, and solids based on their spatial orientation with reference planes.		8
CO3	Categorize multiview orthographic and isometric drawings of simple machine components by interpreting 2D and 3D views using manual or CAD tools.		9


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Department of Basic Sciences and Humanities

Program: B.Tech First Year Group-B(BT)

Semester-II Cell Biology (BBT51201)

Teaching Scheme		Examination Scheme(Th)		Examination Scheme(P)	
Theory (Th)	2Hrs/week	CT-I	5 Marks	-	-
Practical(P)	-	CT-II	5 Marks	-	-
Total Credits	2 (Th)	CT-III	4 Marks	-	-
Duration of ESE: 2Hrs		CA	6 Marks	-	-
		ESE	30 Marks	-	-
		Total Marks	50 Marks	-	-

Pre-Requisites: NA

Course Objectives:

- To understand basic structure and function of cell and cellular organization in different organism.
- To study different cell organelles and understand importance of cell organelles in different cell types.

Course Contents

Unit I	Basic of cell biology Definition of cell and tissue, discovery of cell, History of cell and contribution of different scientist- contribution of Robert hooke, Jan Evangelista purkyne, Matthias Jacob schleiden and Theodor Schwann, cell as basic unit of living organisms, cell theory.
Unit II	Cell structure and Organization Structure and organization of prokaryotic cell(Bacterial cell) and eukaryotic cell(algae,Fungii and Protozoa) and their general characters, structure and function of Animal and plant cells, Acellular organization in Virus, Classification of cell based on Cell shape, cell size , C/N ratio and Cell number.
Unit III	Cell organelles Concept of cell organelles, Organization of cellular organelles, Structure and function of Cytoplasm, Nucleus , Plasma membrane, Cell wall (Plant Cell), Golgi complex, Endoplasmic reticulum, Ribosomes, Lysosomes, Mitochondria and chloroplast.

Text Books

- T.1 Cell Biology C.B Pawar, 2005,Himalaya Publishing House
- T.2 Cell Biology ,Varma and Agrawal,2005, S.Chand Publication Delhi

Reference Books

- R.1 Cell and Molecular Biology, Gerals Karp, 2007, Jon willey and son, Pvt limited,
- R.2 Cell, B Lewin,2007,Jones and Bartlett publisher, London

Useful Links

- <https://www.asbmb.org/education/online-teaching/online-lab-work>
- <http://biomodel.uah.es/en/lab/inicio.htm>

CO	Course Outcomes	CL	Class Session
CO1	Understand basic structure of cells in living organism, including their discovery.	2	8
CO2	Demonstrate the knowledge about organization of cells in prokaryotic and eukaryotic organism and importance of cell in organism.	3	9
CO3	Use structure and function of different cell organelles and its importance in cell functioning.	2	8

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Department of Basic Sciences and Humanities

Program: B. Tech First Year Group-AE/CE/ME/BT)

Semester-I Fundamental of Generative-AI-Lab (BAIML51201)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	-	-	-	-	-
Practical (P)	2 Hrs/week	-	-	-	-
Total Credits	1(P)	-	-	IA	50 Marks
		-	-	ESE	-
		-	-	Total Marks	50 Marks

Pre-Requisites: NA

Course Objectives:

1. **Understand** the fundamental concepts, applications, and popular tools of Generative AI.
2. **Demonstrate** the use of prompt engineering techniques and Generative AI tools for creating text, images, code, presentations, and chatbots.
3. **Apply** Generative AI technologies to solve simple real-world problems while practicing ethical and responsible use of AI.

Course Contents

Unit I	Fundamentals of Generative AI: Introduction to Artificial Intelligence, Machine Learning, Deep Learning and Generative AI, Evolution of Generative AI, Large Language Models (LLMs): Basic Concepts, Transformer Architecture, Applications of Generative AI in Engineering, Education, Healthcare and Industry, Overview of Popular AI Tools, Introduction to Prompt Engineering, Types of Prompts:
Unit II	Generative AI Applications: Advanced Prompt Engineering: Few-shot Prompting, Chain-of-Thought Prompting, Context-based Prompting AI-assisted Content Generation, Text Summarization, Translation using AI, AI-assisted Code Generation, AI-based Image Generation, AI-assisted Presentation Creation, AI for Data Analysis and Visualization
Unit III	AI Applications, Ethics and Mini Project: Introduction to AI APIs and No-Code AI Platforms, Building Simple AI Chatbots, AI Productivity Tools, Responsible AI, AI Ethics, AI Bias and Hallucinations, Privacy, Security and Copyright Issues, Prompt Optimization, Future Trends in Generative AI, Mini Project Development and Demonstration

Text Books

T.1	Introduction to Artificial Intelligence , Cengage Learning, 2021.
T.2	Artificial Intelligence Basics: A Non-Technical Introduction , Apress, 2nd Edition.
T.3	Artificial Intelligence: Principles and Applications , PHI Learning, 2nd Edition, 2024.
Reference Books	
R.1	Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.
R.2	Generative AI For Dummies , Wiley, 2024
R.3	AI for Everyone: A Beginner's Handbook for Artificial Intelligence , Pearson, 2025

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Useful Links	
L.1	ChatGPT: ChatGPT (OpenAI)
L.2	Google AI: Google AI Studio
L.3	Google Colab: Google Colab
L.4	Hugging Face: Hugging Face
L.5	NPTEL Courses: NPTEL Online Courses

LIST OF EXPERIMENTS		
1	Identify the fundamental concepts, applications, and tools of Generative AI.	CO1
2	Recognize the capabilities of conversational AI using ChatGPT or similar Large Language Models (LLMs).	CO1
3	Describe basic prompt engineering techniques using simple and role-based prompts.	CO1
4	Explain advanced prompt engineering techniques including Chain-of-Thought and Few-shot prompting.	CO2
5	Interpret AI-generated outputs for content summarization, translation, and document analysis.	CO2
6	Apply AI-assisted code generation using GitHub Copilot or ChatGPT to solve programming problems.	CO3
7	Generate images using AI tools such as DALL·E, Adobe Firefly, or similar platforms.	CO3
8	Create presentations using AI-powered presentation generation tools.	CO3
9	Develop a simple chatbot using no-code AI platforms.	CO3
10	Implement a mini project using Generative AI tools to solve a real-world problem.	CO3

CO	Course Outcomes	CL	Class Sessions
CO1	Remember the fundamental concepts, terminology, popular tools, prompt engineering basics, and applications of Generative AI.	1	10
CO2	Understand advanced prompt engineering techniques and the applications of Generative AI for content generation, summarization, translation, document analysis, and code generation.	2	10
CO3	Apply Generative AI tools to create images, presentations, chatbots, and AI-enabled solutions while demonstrating responsible and ethical use of Generative AI.	3	10



Chairperson



TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



Department of Basic Sciences and Humanities

Program: B.Tech First Year (AE/CE/ME/BT)

Semester-II Computer Aided Drawing-Lab: BCE41201

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	-	-	-	-	-
Practical (P)	2 Hrs/week	-	-	-	-
Total Credits	1(P)	-	-	IA	50 Marks
		-	-	ESE	-
		-	-	Total Marks	50 Marks

Pre-Requisites: NA

Course Objectives:

1. To understand the principles and importance of core building services such as water supply, lighting, ventilation, and waste management.
2. To gain insights into environmental comfort systems including ventilation, acoustics, thermal insulation, and HVAC design.
3. To explore modern building safety and automation systems including fire safety measures and smart controls.

Course Contents

Unit I	Building Services – Water, Waste, and Lighting Systems, Introduction to Building Services, Classification & Selection, Water supply and wastewater systems: planning, pipe sizing, venting, plumbing, Natural and artificial lighting systems: design principles, luminaries, illumination.
Unit II	Ventilation, Acoustics & Thermal Comfort: Importance and methods of natural and mechanical ventilation, Acoustics in buildings: sound properties, noise control, insulation techniques, Thermal insulation: heat transfer, insulating materials, comfort control.
Unit III	Air Conditioning, Fire Safety & Building Automation: Basics of HVAC and types of air conditioning systems, Fire safety systems: detection, alarms, fire-fighting equipment, Introduction to Building Automation: sensors, building management systems.

Text Books

T.1	Subhash C Sharma & Gurucharan Singh (2005), —Civil Engineering DrawingI, Standard Publishers
T.2	Sham Tickoo Swapna D (2009), —AUTOCAD for Engineers and DesignersII, Pearson Education
T.3	Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria & Sons
T.4	Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd. New Asian

Reference Books

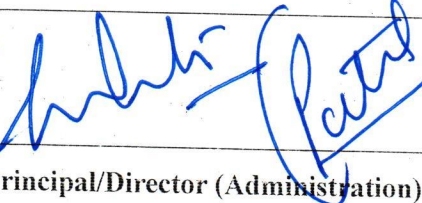
R.1	Engineering Graphics by P.J.Shah, Revised edition 2014, S Chand and Company ltd., New Delhi, India.
R.2	Engineering Drawing by Basant Agarwal and C.M. Agarwal, 2 nd edition 2015, Tata Magraw Hill Publication Company ltd., and New Delhi, India.
R.3	Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
R.4	Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

Chairperson

Useful Links	
1	http://www.nptelvideos.in/2012/12/computer-aided-design.html
2	https://nptel.ac.in/courses/105/104/105104148/

Sheet No.	List of Experiments/Drawing sheets	
1	Introduction to various CAD commands, units with simple example.	CO1
2	Introduction to computer aided drafting & coordinate system.	CO1
3	Exercise on Layer, Dimension, Texting & Block etc.	CO2
4	Drawing of building components like walls, lintels, Doors, Windows and Staircases.	CO2
5	Drawing a plan of Building dimensioning using layers and Developing sections and elevations for given Single story buildings.	CO3
6	Drawing plan of Residential & Commercial Building.	CO4
7	Introduction to 3D commands.	CO4
8	Draw Isometrics & Orthographic views drawing.	CO5

CO	Course Outcomes	CL	Class Session
CO1	Summarize foundational knowledge to design water, lighting, and waste systems in accordance with building requirements.	2	4
CO2	Use and integrate thermal, acoustic, and ventilation solutions for occupant comfort and energy efficiency.	3	4
CO3	Apply fire safety systems and building automation technologies to improve safety and management.	3	4

				July, 2026	5.00	Applicable for AY 2026-27 Onwards
Chairperson	Dean Academics	Vice Principal	Principal/Director (Administration)	Date of Release	Version	