ESTD: 1946

THE NATIONAL INSTITUTE OF ENGINEERING

An Autonomous Institution under Visvesvaraya Technological University, Belagavi), Recognised by AICTE, New Delhi, Grant-in-Aid by Government of Karnataka, Accredited by NAAC, New Delhi

2024 Outcome Based EDUCATION

Curriculum Structure and Syllabus 2024-25

I Year B.E.
Civil Engineering

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The National Institute of Engineering

Scheme of Teaching & Examination - 2024

Effective from the Academic year 2024-25

Department: Civil Engineering

B.E. 2024 Admitted Batch

Semester : I (Civil Engineering Stream) **(Physics Cycl**

Sl.No	Type of Course	Course Code	Course Title	Teaching Department (TD) / Question Paper setting Board (PSB)	Teaching Hrs/Week				Examination				Credits
					L	T	P	S	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	ASC(IC)	BMATC101	Mathematics-I for Civil Engg Stream	Maths	2	2	2	0	03	50	50	100	4
2	ASC(IC)	BPHYC102	Applied Physics for Civil Engg Stream	Physics	2	2	2	0	03	50	50	100	4
3	ESC	BCIVC103	Engineering Mechanics	Civil Engg. Dept	2	2	0	0	03	50	50	100	3
4	ESC-I	BESCK104x	Engineering Science Course-I	Respective Engineering Dept.	3	0	0	0	03	50	50	100	3
					OR								
					2	0	2	0					
5	ETC-I	BETCK105x	Emerging Technology Course-I	Any Dept.	3	0	0	0	03	50	50	100	3
	OR				*OR*								
	PLC-I	BPLCK105x	Programming Language Course-I		2	0	2	0	03				
6	AEC	BENGK106	Communicative English	Humanities	1	0	0	0	-	50	-	50	1
		OR											
		BPWSK106	Professional Writing Skills in English										
7	HSMC	BKSKK107/ BKBKK107	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	-	50	-	50	1
		OR											
		BICOK107	Indian Constitution										
8	AEC/SDC	BIDTK158	Innovation and Design Thinking	Any Dept.	1	0	0	0	-	50	-	50	1
		OR											
		BSFHK158	Scientific Foundations of Health										
									Total	**400**	**250**	**650**	**20**

Legend:

1. ASC - Applied Science Course
2. ESC - Engineering Science Course
3. ETC - Emerging Technology Course
4. **PLC - Programming Language Course**
5. AEC - Ability Enhancement Cours**e**
6. SDC - Skill Development Course
7. IC - Integrated Course [Theory Course Integrated with Practical Course]
8. HSMC - Humanity and Social Science and Management Course
9. MC - Mandatory Course (Non-Credit**)**
10. Lecture (L)/ Tutorial (T)/ Practical (P)/ Skill Development Activity (S)

The National Institute of Engineering

Scheme of Teaching & Examination – 2024

Effective from the Academic year 2024-25

Department: Civil Engineering

B.E. 2024 Admitted Batchp

Semester : II (Civil Engineering Stream) **(Chemistry Cyc**

Sl.No	Type of Course	Course Code	Course Title	Teaching Department (TD) / Question Paper setting Board (PSB)	Teaching Hrs/Week				Examination				Credits
					L	T	P	S	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	ASC(IC)	BMATC201	Mathematics-II for Civil Engg Stream	Maths	2	2	2	0	03	50	50	100	4
2	ASC(IC)	BCHEC202	Applied Chemistry for Civil Engg Stream	Chemistry	2	2	2	0	03	50	50	100	4
3	ESC	BCEDK203	Computer-Aided Engineering Drawing	Mechanical Engg. Dept.	2	0	2	0	03	50	50	100	3
4	ESC-II	BESCK204x	Engineering Science Course-II	Respective Engineering Dept.	2	0	2	0	03	50	50	100	3
					OR								
					3	0	0	0					
5	PLC-II	BPLCK205x	Programming Language Course-II	Any Dept.	2	0	2	0	03	50	50	100	3
		OR			*OR*								
	ETC-II	BETCK205x	Emerging Technology Course-II		3	0	0	0	03				
6	AEC	BPWSK206	Professional Writing Skills in English	Humanities	1	0	0	0	-	50	-	50	1
		OR											
		BENGK206	Communicative English										
7	HSMC	BICOK207	Indian Constitution	Humanities	1	0	0	0	-	50	-	50	1
		OR											
		BKSKK207/ BKBKK207	Samskrutika Kannada/ Balake Kannada										
8	AEC/SDC	BSFHK258	Scientific Foundations of Health	Any Dept.	1	0	0	0	-	50	-	50	1
		OR											
		BIDTK258	Innovation and Design Thinking										
									Total	400	250	650	20

Legend:

1. ASC - Applied Science Course
2. ESC - Engineering Science Course
3. ETC - Emerging Technology Course
4. **PLC - Programming Language Course**
5. AEC - Ability Enhancement Course
6. SDC - Skill Development Course
7. IC - Integrated Course [Theory Course Integrated with Practical Course]
8. HSMC - Humanity and Social Science and Management Course
9. MC - Mandatory Course (Non-Credit)
10. Lecture (L)/ Tutorial (T)/ Practical (P)/ Skill Development Activity (S)

B.E. 2024-25 Admitted Batch				
I SEMESTER				
Engineering Science Courses-I				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BESCK104A	Introduction to Civil Engineering	3	0	0
BESCK104B	Introduction to Electrical Engineering	3	0	0
BESCK104C	Introduction to Electronics Communication	3	0	0
BESCK104D	Introduction to Mechanical Engineering	3	0	0
BESCK104E	Introduction to C Programming	2	0	2

Programming Language Courses-I				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BPLCK105A	Introduction to Web Programming	2	0	2
BPLCK105B	Introduction to Python Programming	2	0	2
BPLCK105C	Introduction to JAVA programming	2	0	2
BPLCK105D	Introduction to C++ Programming	2	0	2

Emerging Technology Courses-I				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BETCK105A	Smart Materials and Systems	3	0	0
BETCK105B	Green Buildings	3	0	0
BETCK105C	Introduction to Nano Technology	3	0	0
BETCK105D	Introduction to Sustainable Engineering	3	0	0
BETCK105E	Renewable Energy Sources	3	0	0
BETCK105F	Waste Management	3	0	0
BETCK105G	Emerging Applications of Biosensors	3	0	0
BETCK105H	Introduction to Internet of Things (IOT)	3	0	0
BETCK105I	Introduction to Cyber Security	3	0	0
BETCK105J	Introduction to Embedded System	3	0	0
BETCK105P	Infrastructure for Smart City	3	0	0
BETCK105Q	Geographic Information Technologies	3	0	0
BETCK105R	Introduction to Building Environment	3	0	0
BETCK105S	Introduction to Robotics, Electric Vehicle System and 3D printing	3	0	0
BETCK105T	Renewable Energy Technology	3	0	0
BETCK105U	Introduction to Smart City	3	0	0
BETCK105V	Introduction to Database Management Systems	3	0	0

B.E. 2024-25 Admitted Batch				
II SEMESTER				
Engineering Science Courses-II				
Code	Course Title	Teaching Hrs/Week		
		L	T	P
BESCK204A	Introduction to Civil Engineering	3	0	0
BESCK204B	Introduction to Electrical Engineering	3	0	0
BESCK204C	Introduction to Electronics Communication	3	0	0
BESCK204D	Introduction to Mechanical Engineering	3	0	0
BESCK204E	Introduction to C Programming	2	0	2

Programming Language Courses-II				
Code	Course Title	Teaching Hrs/Week		
		L	T	P
BPLCK205A	Introduction to Web Programming	2	0	2
BPLCK205B	Introduction to Python Programming	2	0	2
BPLCK205C	Introduction to JAVA programming	2	0	2
BPLCK205D	Introduction to C++ Programming	2	0	2

Emerging Technology Courses-II				
Code	Course Title	Teaching Hrs/Week		
		L	T	P
BETCK205A	Smart Materials and Systems	3	0	0
BETCK205B	Green Buildings	3	0	0
BETCK205C	Introduction to Nano Technology	3	0	0
BETCK205D	Introduction to Sustainable Engineering	3	0	0
BETCK205E	Renewable Energy Sources	3	0	0
BETCK205F	Waste Management	3	0	0
BETCK205G	Emerging Applications of Biosensors	3	0	0
BETCK205H	Introduction to Internet of Things (IOT)	3	0	0
BETCK205I	Introduction to Cyber Security	3	0	0
BETCK205J	Introduction to Embedded System	3	0	0
BETCK205P	Infrastructure for Smart City	3	0	0
BETCK205Q	Geographic Information Technologies	3	0	0
BETCK205R	Introduction to Building Environment	3	0	0
BETCK205S	Introduction to Robotics, Electric Vehicle System and 3D printing	3	0	0
BETCK205T	Renewable Energy Technology	3	0	0
BETCK205U	Introduction to Smart City	3	0	0
BETCK205V	Introduction to Database Management Systems	3	0	0

Code:BMATC101 **Course: Mathematics-I for Civil Engineering Stream**

Credits: 4 **L:T:P:- 2:2:2**
SEE: 50 Marks **CIE: 50 Marks**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	**Course objectives:** The goal of the course **Calculus, Differential Equations and Linear Algebra(22MATC11)** is to 1. **Familiarize** the importance of calculus associated with one variable and two variables for civil engineering. 2. **Analyze** Civil engineering problems applying Ordinary Differential Equations. 3. **Develop** the knowledge of Linear Algebra refereeing to matrices.

Course Outcomes:
On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Compute the radius of curvature and apply the concept of partial differentiation to compute rate of change of multivariate functions.	Understand, Apply, Analyze
CO2	Analyze the solution of linear and non-linear ordinary differential equations.	
CO3	Get acquainted with solving equations by matrix methods	
CO4	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB	

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	1	To be identified for each branch by Course Instructor			
CO2	3	2	-	-	-	-	-	-	-	-	-	1				
CO3	3	2	-	-	-	-	-	-	-	-	-	1				
CO4	3	2	-	-	-	-	-	-	-	-	-	1				

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hour
	Module – 1			
1.1	**Introductiontopolarcoordinatesandcurvaturerelatingto Civilengineering.** Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves.	2	1	-
1.2	Pedal equations. Curvature and Radius of curvature - Cartesian and Pedal forms-Problems.	2	1	-
1.3	**Applications:** Engineering Mechanics.	1	1	-
	Module – 2			
2.1	**Introduction to series expansion and partial differentiation in the field of Civil Engineerin applications.** Taylor's and Maclaurin's series expansion for one variable (Statement only)–problems. Indeterminate	2	1	-

	forms-L'Hospital's rule-problems.			
2.2	Partial differentiation, total derivative-differentiation of composite functions. Jacobian- problems. Maxima and minima for a function of two variables- Problems.	2	1	-
2.3	**Applications:** Estimating thecritical points and extreme values using Lagrange's method.	1	1	-
	Module – 3			
3.1	**Introductiontofirstorderordinarydifferentialequationspertainingtotheapplicationsfortheengineering.** LinearandBernoulli'sdifferentialequations.Exactandreducibletoexactdifferentialequations. Applications of ODE's - Orthogonal trajectories.	2	1	-
3.2	**Nonlinear differential equations:** Introduction to general and singular solutions, Solvable for ponly,Clairaut'sequations-**Problems.**	2	1	-
3.3	**Applications: Newton's law of cooling.**	1	1	-
	Module – 4			
4.1	**Importance of higher-order ordinary differential equations in Civil Engineering applications.** Higher-order linear ODE's with constant coefficients-Inverse differential operator (e^{ax}, $\sin ax$ or $\cos ax$, x^n, $e^{ax}v$, x^nv).	2	1	-
4.2	Method of variation of parameters, Legendre homogeneous differential equations- Problems.	2	1	-
4.3	**Applications:** Oscillations of a spring.	1	1	-
	Module – 5			
5.1	**Introductionof Linear algebra related to Civil Engineering applications.** Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a System of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method.	2	1	-
5.2	Rayleigh's power method to find the dominant Eigen value and Eigen vector.	1	1	-
5.3	**Applications:** Fluid Mechanics.	1	1	-
	List of Experiments:			
1	2D plots for Cartesian and polar curves	-	-	1
2	Finding angle between polar curves, curvature and radius of curvature of a given curve	-	-	1
3	Finding partial derivatives, Jacobian and plotting the graph	-	-	1
4	Applications to Maxima and Minima of two variables	-	-	1
5	Solution of first order differential equation and plotting the graphs	-	-	1
6	Solutions of Second order ordinary differential equations with initial/boundary conditions	-	-	1
7	Solution of a differential equation of oscillations of a spring/deflection of a beam with different loads	-	-	1
8	Numerical solution of system of linear equations, test for consistency and graphicalrepresentation	-	-	1
9	Solution of system of linear equations using Gauss-Seidel iteration	-	-	1
10	Compute eigen values and eigenvectors and find the largest and smallest eigen value by Rayleigh power method.	-	-	1
Total No. of Lecture Hours		24	-	-
	Total No. of Tutorial Hours		**15**	**-**
	Total No. of Practical Hours			**10**

Self-learning topics:

1. Centre and circle of curvature
2. Euler's theorem and problems
3. Solvable for x and y.
4. Finding the solution by the method of undetermined coefficients.

5. Solution of a system of equations by Gauss-Jacobi iterative method.

Textbooks:

1. **B.S.Grewal**:"HigherEngineeringMathematics",Khannapublishers,44thEd.,2021.
2. **E.Kreyszig**:"AdvancedEngineeringMathematics",JohnWiley&Sons,10th Ed.,2018.

Reference Books:

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **Tom Apostol** "Calculus: One variable calculus with an introduction to Linear Algebra", Vol. 1, Wiley publications, 2nd edition.
4. **Tom Apostol** "Calculus: Multi-Variable Calculus and Linear Algebra with applications to differential equations and Probability, Vol.2, , Wiley publications, 2nd edition.

Online Resources:

1. https://www.youtube.com/watch?v=ixDGaEqWuA0
2. https://www.youtube.com/results?search_query=nptel+linear+algebra

Code: BPHYC102 **Course: Applied** Physics for Civil Engineering Stream

Credits: **4** **L:T:P:- 2:2:2**

SEE: **50 Marks** **CIE: 50 Marks**

SEE Hours: **3** **Max. Marks: 100**

Prerequisites if any	10+2 Physics
Learning objectives	1. Learn the basic principles of Physics pertaining to Engineering field. 2. To understand and explain the concepts of Physics relevant to Engineering and Technology 3. Applying the knowledge of Physics in solving problems.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand and discuss the Physical systems using theories in Physics	Understand
CO2	Apply the fundamental concepts to derive the expression and solve the problems	Apply
CO3	Analyze the behavior of physical systems by applying the knowledge of Physics	Analyze
CO4	Apply the knowledge of basic concepts and principles of experimental physics in measurements of various physical quantities which in turn give insight into the behavioral properties of radiation and matter.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2										1		To be identified for each branch by Course Instructor		
CO2	3	2										1				
CO3	3	3										1				
CO4	3	1							2			1				

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

Module 1: Oscillations		**No. of Lecture Hours**	**No. of Tutorial Hours**	**No. of Practical Hours***
1.1	Simple Harmonic motion (SHM), the differential equation for SHMVibratin of Spring mass system (Derivation), series and parallel combination of springs (derivation), numericals	1	1	0
1.2	Theory of damped oscillations (Derivation), Types of damping	1	0	0
1.3	Theory of forced oscillations(Derivation),amplitude resonance, condition for amplitude resonance.	1	0	0
1.4	Determination of Resonant frequency using Series and Parallel LCR Circuits	0	0	2
1.4	Numerical problems	0	1	0
1.5	Production of Ultrasonic waves using piezoelectric oscillator, Ultrasonic interferometer	1	0	0

1.6	Applications of Ultrasoncs: Non Destructive Testing (NDT)	1	1	0
SLE	Applications of resonance			
Module 2:Elasticity				
2.1	Stress-Strain Curve. Elastic Moduli, Poisson's ratio and its limiting values.	1	0	0
2.2	Relation between Y, n and σ (with derivation),beams, bending moment and derivation of expression, Cantilever and I section girder and their aapplications,	1	1	0
2.3	Uniform Bending	0	0	2
2.4	Elastic materials (qualitative). Torsion of a cylinder, Torsional pendulum and its period (derivation).	1	1	0
2.5	Determination of rigidity modulus and moment of inertia using Torsional pendulum.	0	0	2
2.6	Failures of engineering materials - ductilefracture, brittle fracture, stress concentration, fatigue and factors affecting fatigue (only qualitative explanation),	1	0	0
2.7	Numerical problems.	0	1	0
SLE	Shape memory alloys			
Module 3: Modern Physics for Civil Engineers				
3.1	Special theory of relativity :Introduction, Postulates of relativity, Lorentz transformation equations in one dimension,, Lorentz - Fitzgerald length contraction,	1	0	0
3.2	Time dilation, variation of mass with velocity, velocitgy addition theorem, Einestein's mass energy relation.	2	0	0
3.4	Application of Special theory of relativity in GPS, Differential GPS	0	1	0
3.5	Numerical problems.	0	2	0
3.6	Particle nature of radiation: EM Spectrum, Blackbody radiation spectrum, Planck's law reduction of Planck's law to Wein's law, Rayleigh Jeans Law and Stefan's Law,	2	0	0
3.7	Verification of Stefan's law	0	0	2
SLE	Compton Effect			
Module 4:Lasers and Optical Fibers				
4.1	Properties of a LASER Beam, Interaction of radiation with matter: absorption, spontaneous emission and stimulated emission	1	0	0
4.2	Einstein's coefficients (expression for energy density), Requisites of a Laser system.	1	0	0
4.3	Condition for Laser action, Principle, Construction and working of Ruby Laser	1	0	0
4.4	Applications of Laser: LIDAR, Road Profiling, Speed Checker.	1	0	0
4.5	Numerical Problems.	0	1	0
4.6	Principle and Construction of Optical Fibers, Acceptance angle and NA,	1	0	0
4.7	Expression for NA, Modes of Propagation, Attenuation and Fiber Losses, Fiber Optic Displacement Sensor, Fiber Optic Temperature Sensor,	1	1	0
4.8	Numerical problems.	0	1	0
SLE	Holography			
Module 5: Acoustics				
5.1	Introduction to acoustics, Types of acoustics, reverberation and reverberation time, Sabine's formula	1	0	0
5.2	Eyring's formula (no derivation), comparison of Eyring's and Sabine's formula,	1	0	0
5.3	absorption coefficient, measurement of absorption coefficient, Requisites for acoustics in auditorium, factors affecting the acoustics and remedial measures,	1	0	0

5.4	Noise and its Measurements, Sound Insulation and its measurements. Impact of Noise in Multi-storied buildings	0	1	0
5.5	Numerical problems	0	1	0
5.7	Radiometry and Photometry: Radiation quantities, Spectral Quantities, Relation between luminescence and radiant quantities,	1	0	0
5.8	Reflectance and Transmittance, Photometry: cosine law and inverse square law,	1	0	0
5.9	Verification of Inverse Square law using GM counter experiment	0	0	2
5.10	Numerical problems.	0	1	0
5.10	Numerical problems.			
Experiments*				
6.1	Determination of thickness of small objects using Air wedge	0	0	2
6.2	Determination of Dielectric constant by charging and discharging of capacitor	0	0	2
6.3	Demonstration Experiment	0	0	1
6.4	Simulation Experiment			
6.5	Determination of wavelength of Laser source using diffraction grating			
6.6	Determination of Spring constant in Series and Parallel Combination			
6.7	Measurement of velocity of ultrasonic waves using ultrasonic interferometer			
	Total No. of Lecture Hours	**25**	**-**	**-**
	Total No. of Tutorial Hours		**15**	**-**
	Total No. of Practical Hours			**15**

Text Books:

1. Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan & S. Rai Choudhury, Tata McGraw–Hill Publication, 7thEdition, 2017

2. Solid State Physics by S O Pillai, New Age International, 9th Edition, 2020

Reference Books:

1. Photometry Radiometry and Measurements of Optical Losses, MichealBukshtab, Springer, 2nd edition.

2. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002.

3. A textbook of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition,S Chand and Company Ltd. New Delhi-110055.

4. Laboratory manual for Engineering Physics Lab by Department of Physics, NIE, Mysuru.

Online Resources

Web links:

Simple Harmonic motion: https://www.youtube.com/watch?v=k2FvSzWeVxQ

Stress-strain curves: https://web.mit.edu/course/3/3.11/www/modules/ss.pdf

Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o

Oscillations and waves : https://openstax.org › books › college-physics-2e

Acoustics: https://www.youtube.com/watch?v=fHBPvMDFyO8

Modern Physics & Semiconductors: https://nptel.ac.in/courses/122/101/122101002/#

Department YouTube Channel: https://www.youtube.com/channel/UC6_wc9qDjUU6EBicaTeckjQ

Virtual labs: https://www.vlab.co.in/

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

http://nptel.ac.in

https://swayam.gov.in

https://virtuallabs.merlot.org/vl_physics.html

https://phet.colorado.edu

https://www.myphysicslab.com

Code: BCIVC103 **Course: Engineering Mechanics**

Credits: 3 **L:T:P:S:- 2:2:0**
SEE: 50 Marks **CIE: 50 Marks**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	Pre-University Physics and Mathematics
Learning objectives	• Construct "Free Body Diagrams" of real-world problems and apply Newton's Laws of motion and vector operations to evaluate equilibrium of particles and bodies. • Identify the moment of a force and calculate its value about a specified axis. Define the moment of a couple. • To analyze the member forces in trusses and students to learn the effect of friction on different planes • To develop the student's ability to find out the Centre of gravity and moment of inertia and their applications and learn about kinematics and kinetics and their applications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand coplanar concurrent and non-concurrent forces acting on particles and rigid bodies	Understand
CO2	Apply the concept of forces acting on plane truss and on bodies causing friction	Apply
CO3	Compute centroid and second moment of area of composite sections	Apply
CO4	Analysis of bodies in motion	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-		3		
CO2	3	3	3	-	-	-		-	-	-	-	-		3		
CO3	-	2	2	-	-	-	-	-	-	-	-	-		3		
CO4	3	3	2	-	-	-	-	-	-	-	-	-		3		

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

Module – 1: Resultant and Equilibrium of coplanar force system		**No. of Lecture Hours**	**No. of Tutorial Hours**
1.1	Basic dimensions and units, Idealisations, Classification of force system.	1	0
1.2	Principle of transmissibility of a force, composition of forces, resolution of a force.	1	0
1.3	Free body diagrams,	1	1
1.4	Resultant of coplanar concurrent forcesystem, Numerical examples.	1	1
1.5	Equilibrium of coplanar concurrent force system, Lami's theorem	1	1
Module – 2: Resultant and Equilibrium of non-coplanar force system			
2.1	Moment, Principle of moments, couple	1	0
2.2	Equilibrium of coplanar parallel force system	1	0
2.3	Types of beams, types of loadings, types of supports.	1	1
2.4	Equilibrium of coplanar non-concurrent force system	1	1
2.5	Support reactions of statically determinate beams subjected to various types of loads. Numerical examples.	1	1

Module – 3: Analysis of Trusses and Friction			
3.1	Introduction, Classification of trusses	1	0
3.2	Analysis of plane perfect trusses by the method of joints	1	1
3.3	Analysis of plane perfect trusses by method of sections and Method of elastic co-efficient Numerical examples.	1	1
3.4	Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane,	1	0
3.5	Equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples.	1	1
Module – 4: Centroid of Plane areas and Moment of inertia of plane areas			
4.1	Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration.	2	0
4.2	Locating the centroid of centroid of composite areas and simple built-up sections, Numerical examples.	1	1
4.3	Introduction, Rectangular moment of inertia, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem	1	1
4.4	Moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built-up sections, Numerical examples.	1	1
Module – 5: Kinematics and Kinetics			
5.1	Linear motion: Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity.	1	0
5.2	Numerical examples on linear motion	1	1
5.3	Projectiles: Introduction, numerical examples on projectiles.	1	1
5.4	Kinetics: Introduction, D 'Alembert's principle of dynamic equilibrium	1	0
5.5	Principle of dynamic equilibrium and its application in-plane motion and connected bodies including pulleys, Numerical examples.	1	1
	Total No. of Lecture Hours	**25**	**-**
	Total No. of Tutorial Hours		**15**

Self-learning topics:

1. Introduction to vector approach
2. Vector representation of moment of a force
3. Centroid of line segments
4. Product of inertia

Text Books:

1. Chandra Mouli P.N., "Engineering Mechanics" PHI Learning, 2011.
2. S. Rajasekharan, G. Sankarsubramanian, "Engineering Mechanics- Static's and Dynamics"- Vikas Publishing House, 2011

Reference Books:

1. Beer F.P. and Johnston E. R., ***"Mechanics for Engineers, Statics and Dynamics"***, McGraw Hill, 1987.
2. Irving H. Shames, ***"Engineering Mechanics"***, Prentice-Hall, 2019.
3. Hibbler R. C., ***"Engineering Mechanics: Principles of Statics and Dynamics"***, Pearson Press, 2017.
4. Timoshenko S, Young D. H., Rao J. V., ***"Engineering Mechanics"***, 5th Edition, Pearson Press, 2017.
5. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.

Online Resources:

1. Engineering Mechanics by Prof. K. Ramesh, IIT Madrashttps://nptel.ac.in/courses/112106286

Code:BENGK106/206 **Course: Communicative English**

Credits: 1 **L: T:P: 1:0:0**

SEE: - **CIE: 50 Marks**

SEE Hours: - **Max. Marks:50**

Prerequisites if any	
Learning objectives	1. To know about Fundamentals of Communicative English and Communication Skills in general. 2. To enhance with English vocabulary and language proficiency for better communication skills.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand and apply the Fundamentals of Communication in their communication skills.	Understand, Apply
CO2	Adopt the Techniques of Information Transfer through presentation	

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	2	-	3	3	3	1	2		To be identified for each branch by Course Instructor			
CO2	-	-	-	-	-	2	-	3	3	3	1	2					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Introduction to Communicative English** Communicative English, Fundamentals of Communicative English	1	-	-
1.2	Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English.	2	-	-
1.3	Interpersonal and Intrapersonal Communication Skills.	2	-	-
	Module – 2			
2.1	**Introduction to Phonetics** English Pronunciation, Pronunciation Guidelines to consonants and vowels	2	-	-
2.2	Sounds Mispronounced, Silent and Non silent Letters, Word Accent, Stress Shift and Intonation	2	-	-
2.3	Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.	1	-	-
3.1	**Communication Skills for Employment** Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking	2	-	-
3.2	Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence	2	-	-
3.3	Reading and Listening Comprehensions – Exercises.	1	-	-
	Total No. of Lecture Hours	15	-	
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			-

Self-learning topics:

1. Basic English Communicative Grammar
2. Words formation - Prefixes and Suffixes

Textbooks:

3. Communication Skills by Sanjay Kumar &Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
4. A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

Reference Books:

1. High School English Grammar & Composition by Wren and Martin, S Chandh& Company Ltd – 2015.
2. Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
3. English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018. 3. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.
4. Practical English Usage by Michael Swan, Oxford University Press – 2016.

Code: BKSKK107 / 207 **Course:**Samskrutika Kannada /ಸ ಂಸ್ಕೃತಿಕಕನ್ನಡ

Credits:1 **L:T:P:S 1:0:0**
SEE:- **CIE: 50 Marks**
SEE Hours:- **Max. Marks: 50**

ಪಠ್ಯಕಲಿಕೆಯಲು ದ್ದೇಶಗಳು:	1. ವ್ಯಕ್ತಿಪರಪದವಿವಿದ್ಯಾರ್ಥಿಗಳಯಗಿರುವುದರಿಂದಕನ್ನಡಭಯಷೆ, ಸಯಹಿತ್ಯಮತ್ತುಕಿಕನ್ನಡದಸಿಂಸ್ಕೃತಯಪರಚಯಮಯಡಿಕೊಡುವುದು 2. ಜನ್ನಾದಸಯಹಿತ್ಯದಪಠ್ಯಯನಭಯಗವಯದಆಧುನಿಕಪೂರ್ವಮಿತ್ತುಆಧುನಿಕಕಯವಗಳನ್ನುಸಯಿಂಕ್ಷಿತ್ರಕವಯಗಿಪರಚಯಿಸಿವಿ ದ್ಯಾರ್ಥಿಗಳಲ್ಲಿಸಯಹಿತ್ಯಮತ್ತುಸಿಸಿಂಸ್ಕೃತಯಬಗ್ಗೆಅರವುಹಯಗೂಆಸಕ್ತಿಯನ್ನುಮೂಡಿಸುವುದು. 3. ತಯಿಂತ್ರಕವಕ್ತಿಗಳಪರಚಯವನ್ನುಹಯಗುಅವರುಗಳನ್ನುಸಯಧಿಸಿದವಿಷಯಗಳನ್ನುಪರಚಯಿಸುವುದು.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	ಕನ್ನಡಭಯಷೆ, ಸಯಹಿತ್ಯಮತ್ತುಕಿಕನ್ನಡಸಿಂಸ್ಕೃತಯಪರಚಯವಯಗುತ್ತಿದೆ	ಪರಚಯ
CO2	ಕನ್ನಡಸಯಹಿತ್ಯದಆಧುನಿಕಪೂರ್ವಿಹಯಗೂಆಧುನಿಕಕಯವಗಳಪರಚಯಮತ್ತುಿಸಿಆಸಕ್ತಿಮೂಡುತ್ತಿದೆ.	ಗರಹಿಕೆ
CO3	ತಯಿಂತ್ರಕವಕ್ತಿಪರಚಯಮತ್ತುಕಿಕಥಯಸಯಹಿತ್ಯಪರಚಯ	ವಿಶ್ಲೇಷಣೆ

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	1	-	2	-	1		To be identified for each branch by Course Instructor			
CO2	-	-	-	-	-	-	-	1	-	2	-	1					
CO3	-	-	-	-	-	-	-	3	-	2	-	1					

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

	ಘಟಕ - 1 ಲೇಖನಗಳು: ಕನ್ನಡಇತಿಹಸ್ಕಮತ್ತುಸಂಸ್ಕೃತಿಪರಿಚಯ	No. of Lecture Hours	No. of Tutorial Hours	Practical Hours
1.1	ಕರ್ಯಿಟಕಸಿಂಸ್ಕೃತ - ಹಿಂಪರ್ಯಗರಯಜಯ	1	0	0
1.2	ಕರ್ಯಿಟಕದಏಕ್ಯಿಕರಣ: ಒಿಂದುಅಪೂರ್ವಿಚಿರತೆ - ಜಿವಿಿಂಕರಸಂಬಯ	1	0	0
1.3	ಆಡಳಿತ್ಭಯಷೆಯಯಗಿಕನ್ನಡ - ಡಯ. ಎಲ್. ತ್ರಮೃಶಮತ್ತುವಿವಿ. ಕೇಶವಮೊತ್ತಿ	1	0	0
ಘಟಕ - 2 ಪದ್ಯ: ಆಧುRಕಪೂರ್ವದಕ ರ್ಮತ್ತುಆಧುRಕಕ ರ್				

2.1	ವಚನ್‌ಗಳು: ಬಸವಣಣ, ಅಕ್ಕಮಹಯದ್ೇವಿ, ಅಲ್ಿಮಪಭು, ಆಯಹ್ಮಯರಯು, ಜ್ೇಡರದಕ್ಯಸಿಮಮಯು, ಆಯಹ್ಲ್ಕಕಮಮ	2	0	0
2.2	ಕ್ಷೇತ್ಿರ್ೆಗಳು: ಅದರಿಂದಕ್ಷೇನ್ುಫಲ್ಇದರಿಂದ್ೆೇನ್ುಫಲ್ - ಪುರಿಂದರದಕ್ಯಸರು ತ್ತ್ವಪದಗಳು: ಸಯವಿರಕೊಡಗಳಸುಟು - ಶಿಶುರ್ಯಳಶರ್ಫ	2	0	0
2.3	ಡಿವಿಜಿಅವರಮಿಂಕುತ್ಮಮನ್‌ಕಗೆದಿಂದಆಯದಕಳ್ವುಭಯಗಗಳು	1	0	0
2.4	ಕುರುಡುಕಯಿಂಚಯಣ : ದ. ರಯ. ಬ್ೆೇಡಿಂದಕ್	1	0	0
2.5	ಹ್ೂಸಬಯಳಿನ್‌ಗಿೇತೆ - ಕುವಂಪು	1	0	0
ಘಟಕ - 3ಗದ್ಯ: ತ ಾಂತಿಶಿಕರಕ್ಷುಪರಿಚಯ, ಕಥೆಮತಕ್ತುಪಶಿವ ಸ್ಕಕಥನ್				
3.1	ಡಯ. ಸರ್. ಎಿಂ. ವಿಶೆೇಶವರಯಾ :ವುಕ್ತಿಮತಕುಿಐತ್ತಹು - ಎ ಎನ್ುಮತ್ತಿರಯವ್	2	0	0
3.2	ಕರಕುಶಲ್ಕಲೆಗಳುಮತ್ುಿಪರಿಂಪರೆಯವಿಷ್ಯಯನ :ಕರೆಗ್ೊಡಬ್ೆಚನ್‌ಹಳಿಿ	1	0	0
3.3	ಯುಗ್ಯದ: ವಸುಧ್ೆಿಂದ ಮೃಗ್ಯರ್ೆವಿಂಬಗಿರಜನ್‌ಪವಿತ್ :ಹಿ. ಚಿ. ಬ್ೊೇರಲ್ಲಿಂಗಯು	2	0	0
	Total No. of Lecture Hours	**15**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Textbooks:

ಸಯಿಂಸೃತ್ತಕನ್ಡ

ಲ್ೆೇಖಕರು: ಹಿ. ಚಿ. ಬ್ೊೇರಲ್ಲಿಂಗಯುಮತ್ುಿಡಯ. ಎಲಶ. ತ್ಮ್ೇಶ

ಪುಸಯರಯಿಂಗ, ವಿಶೆೇಶವರಯುತಯಿಂತ್ರಕವಿಶವವಿದ್ಯಾಲ್ಯ,

ಬ್ೆಳಗ್ಯವಿ.

Code:BKBKK107/207 **Course:** Balake Kannada /ಬಳಕೆಕನ್ನಡ

Credits: 1 **L:T:P 1:0:0**
SEE: - **CIE: 50 Marks**
SEE Hours:- **Max. Marks: 50**

Learning objectives	To familiarise students in the use of local language (Kannada) for a comfortable communication; also make them to speak, read and write simple kannada as per theneed

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the necessity of learning the local language for a comfortable living and to listen and understand Kannada language properly.	Remember
CO2	Speak simple Kannada to communicate with localpeople in their daily life	Understand
CO3	To read and write Kannada and speak in polite way	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	1	2	-	1		To be identified for each branch by Course Instructor			
CO2	-	-	-	-	-	-	-	-	1	3	-	1					
CO3	-	-	-	-	-	-	-	-	1	3	-	1					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Practical Hours
1.1	Introduction, Necessity of learning local language. Methods to learn the Kannada language.	1	0	0
1.2	Easy learning of Kannada Language: A few tips. Hints for correct and polite Conservation, Listening and Speaking Activities	1	0	0
1.3	Key to Transcription.	1	0	0
1.4	ವೈಯಕ್ತಿಕ, ಸಯವಮಾಸೂಚಕ/ಸಂಬಂಧಿತ್ಸವರ್ಯಮಗಳುಮತ್ತುಪಶಯನರ್ಥಕಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words	1	0	0
	Module – 2			
2.1	ರ್ಯಮಪದಗಳಸಂಬಂಧಯರ್ಥಕರೂಪಗಳು, ಸಂದೇಹಯಸಪದಪಶೆಗಳುಮತ್ತುಸಂಬಂಧವಯಚಕರ್ಯಮಪದಗಳು - Possessive forms of nouns, dubitive question and Relative nouns ಗುಣ, ಪರಣಯಮಮತ್ತುವಣಬಣಚಶೆಷಣಗಳು, ಸಂಖ್ಯಾವಯಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals	2	0	0
2.2	ಕಯರಕರೂಪಗಳುಮತ್ತುವಿಭಕ್ತಿಪತ್ಯಗಳು - ಸಪಮಿವಿಭಕ್ತಿಪತ್ಯ - (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ Predictive Forms, Locative Case	1	0	0

2.3	ಚತ್ುರ್ಥಿವಿಭಕ್ತಿಪ್ರತ್ಯಯದಬಳಕೆಮತ್ತುಸಖಿಂಖ್ಯಾವಯಚಕ - Dative Cases, and Numerals ನ್ೊನ್ / ನಿಷೇಧಯರ್ಥಕಕ್ರಿಯಯಪದಗಳುಮತ್ುವಿಣಿಗುಣವಯಚಕಗಳು - Defective / Negative Verbs and Colour Adjectives	1	0	0
2.4	ಅಪಷ್ / ಒಪ್ಪಗೆ, ನಿದ್ೇಶನ್, ಪ್ರೇತಯಾಹಮರುಒರಯುಯಅರ್ಥಿರೊಪಪದಗಳುಮತ್ತುವಿಯಕ್ತಗಳು Permission, Commands, encouraging and Urging words (Imperative words and sentences) ಸಯಮಯನ್ಾಸಖಿಂಭಯಷಣೆಗಳಲ್ಲಿದವತ್ತುಯವಿಭಕ್ತಿಪ್ರತ್ಯಯಗಳುಮತ್ುಸಖಿಂಭವನಿೇಯಪಕಯರಗಳು Accusative Cases and Potential Forms used in General Communication	2	0	0
2.5	“ಇರುಮತ್ತುಇರಲ್ಲಿ” ಕ್ರಿಯಯಪದಗಳುಮತ್ುಸಖಿಂಭಯವಾಸೂಚಕಮತ್ತುನಿಷೇಧಯರ್ಥಕಕ್ರಿಯಯಪದಗಳು - Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs ಹಿೊಲ್ಕೆ (ತ್ರತ್ಮ), ಸಖಿಂಬಖಿಂಧಸೂಚಕಮತ್ತುವಿವಸುಸಸೂಚಕಪ್ರತ್ಯಯಗಳುಮತ್ುನಿಷೇಧಯರ್ಥಕಪದಗಳಬಳಕೆ - Comparitive, Relationship, Identification and Negation Words	2	0	0
	Module – 3			
3.1	ಕಯಲ್ಮತ್ುಸಮಯದಹಯಗೆೊಕ್ರಿಯಯಪದಗಳವಿವಿಧಪಕಯರಗಳು - different types of forms of Tense, Time and Verbs	1	0	0
3.2	ದ, -ತ, -ತ್ು, -ಇತ್ತು, -ಆಗಿ, -ಅಲ್ಲಿ -ಗ್, -ಕ್, ಇದ್ೆ, ಕ್ರಿಯಯಪ್ರತ್ಯಯಗಳೆmಖಿಂದಗ್ೆಭೊತ, ಭವಿಷತ್ತ್ುವಿತ್ಕಿಮಯನ್ಕಯಲ್ವಯಕಾರಚರ್ೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms	1	0	0
3.3	Kannada Vocabulary List: ಸಖಿಂಭಯಷಣೆಯಲ್ಲಿದರ್ೆೊಪಯೇಗಿಕನಡಪದಗಳು - Kannada Words in Conversation	1	0	0
	Total No. of Lecture Hours	**15**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Textbooks:

ಬಳಕೆಕನ್ನಡ

ಲೆೇಖಕರು: ಡಯ. ಎಲ. ತ್ರಮೇಶ್

ಪುಸಯರಯಖಿಂಗ, ವಿಶವೇಶವರಯುತಯಿಂತ್ರಕವಿಶವವಿದ್ಯಾಲ್ಯ, ಬಳಗ್ಯವಿ.

Code: BIDTK158 **Course:** Innovation and Design Thinking

Credits: 1 **L:T:P:- 1:0:0**

SEE: - **CIE: 50 Marks**

SEE Hours: - **Max. Marks:50**

Prerequisites if any	Nil
Learning objectives	1. To apply the concept of design thinking for product andservice development 2. To use the design thinking approach in innovation process of engineering products

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Describe the fundamental process and tools for design thinking	Understand
CO2	Apply design thinking for strategic innovation	Apply
CO3	Illustrate the business process and prototyping for engineering products	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2				2							3	To be identified for each branch by Course Instructor			
CO2	2				2							3				
CO3	2				2							3				

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1: Process of Design				
1.1	Shared model in team-based design	1	0	0
1.2	Theory and practice in Design thinking	1	0	0
1.3	Explore presentationsigners across globe – MVP or Prototyping	1	0	0
1.4	Real-Time design interaction capture and analysis	1	0	0
1.5	Enabling efficient collaboration in digital space	1	0	0
1.6	Empathy for design – Collaboration in distributed Design	1	0	0
Module – 2: DT For Strategic Innovations				
2.1	Growth, Storytelling representation, Strategic Foresight	1	0	0
2.2	Sense Making, MaintenanceRelevance, Value redefinition	1	0	0
2.3	Extreme Competition, experience design	1	0	0
2.4	Standardization, Humanization, Creative Culture	1	0	0
2.5	Rapid prototyping, Strategy and Organization, Business Modeldesign.	1	0	0
Module – 3: Design Thinking in Civil Engineering				
3.1	Introduction DT concepts - Empathize, Design	1	0	0
3.2	DT concepts - Ideate, Prototype - applications in Civil Engineering	1	0	0
3.3	DT concepts –Test - applications in Civil Engineering	1	0	0
3.4	Case studies	1	0	0
Total No. of Lecture Hours		**15**		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Textbooks:

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve- Apply", Springer, 2011

Reference Books:

1. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
2. Jeanne Liedtka, Andrew King, Kevin Bennett, Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013

Code: BMATC201 **Course:** Mathematics II for Civil Engineering Stream

Credits: 4 **L:T:P:- 2:2:2**
SEE: 50 Marks **CIE: 50 Marks**
SEE Hours:3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	**Course objectives:** The goal of the course **Integral Calculus, Partial Differential Equations and Numerical methods** (**22MATC21**) is to • **Familiarize** the importance of Integral calculus and Vector calculus essential for civil engineering. • **Analyze** Civil engineering problems applying Partial Differential Equations. • **Develop** the knowledge of solving civil engineering problems numerically

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Apply the concept of multiple integral to compute area and volume also solve certain improper integrals using beta and gamma functions. Also compute vector line integral using Green's, Stoke's theorem	Understand, Apply, Analyze
CO2	Demonstrate partial differential equations and their solutions for physical interpretations.	
CO3	Apply the knowledge numerical methods in solving physical and engineering phenomena	
CO4	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB	

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	1	To be identified for each branch by Course Instructor			
CO2	3	2	-	-	-	-	-	-	-	-	-	1				
CO3	3	2	-	-	-	-	-	-	-	-	-	1				
CO4	3	2	-	-	-	-	-	-	-	-	-	1				

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1 Integral Calculus			
1.1	**Introduction to Integral Calculus in Civil Engineering applications.**	1	1	-
1.2	**Multiple Integrals:** Evaluation of double and triple integrals,			-
1.3	Evaluation of double integrals by change of order of integration, changing into polar coordinates.	2	1	-
1.4	Applications to find: Area and Volume by double integral. Problems.			-
1.5	**Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions.	2	1	-
1.6	**Applications:** Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models.			-
	\Module – 2 Vector Calculus			
2.1	**Introduction to Vector Calculus in Civil Engineering applications.**		1	-
2.2	**Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.	2		-
2.3	**Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force		1	-
	and flux.			
2.4	Statement of Green's theorem Stoke's theorem. Problems.	2		-

2.5	**Applications:** Heat and mass transfer, oil refinery problems, environmental engineering. Analysis of stream lines, velocity and acceleration of a moving particle.	1	1	-
	Module – 3 Partial Differential Equations			
3.1	**Importance of partial differential equations for Civil Engineering application.**	1	1	-
3.2	Formation of PDE's by elimination of arbitrary constants and functions.	1		-
3.3	PDE by direct integration. Homogeneous PDEs involving derivative with respect to	1	1	-
3.4	Solution of non homogeneous one independent variable only. Solution of Lagrange's linear PDE.		1	-
3.5	**Derivation of one-dimensional heat equation and wave equation.**	1		-
3.6	**Applications: Design of structures (vibration of rod/membrane).**	1		-
	Module – 4 Numerical Methods- 1			
4.1	**Importance of numerical methods for discrete data in the field of Civil Engineering.**		1	-
4.2	Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems	2		-
4.3	Finite differences, Interpolation using Newton's forward and backward difference formulae.	1	1	-
4.4	Newton's divided difference formula.			-
4.5	Lagrange's interpolation formula (All formulae without proof). Problems.	1	1	-
	N**umerical integration**: Trapezoidal, Simpson's (1/3)rd and (3/8)th rules (without proof). Problems.			-
4.6	**Applications:** Estimating the approximate roots, extremum values, Area, volume, surface area. Finding approximate solutions to civil engineering problems.	1		-
	Module – 5 Numerical Methods -11			
5.1	**Introduction to various numerical techniques for handling Civil Engineering applications.** **Numerical Solution of Ordinary Differential Equations (ODE's):** Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method.	2	1	-
5.2	Modified Euler's Method-Problems	1	1	-
5.3	Runge- Kutta method of fourth order and Milnes predictor-corrector formula (No derivations of formulae)-Problems.	1	1	-
5.4	**Applications:** Finding approximate solutions to ODE related to civil engineering fields.	1		-
List of Experiments:				
1	Program to compute area, surface area, volume and centre of gravity.	-	-	1
2	Evaluation of improper integrals	-	-	1
3	Finding gradient, divergent, curl and their geometrical interpretation	-	-	1
4	Verification of Green's theorem	-	-	1
5	**Solution of one-dimensional heat equation and wave equation**	-	-	1
6	Solution of algebraic and transcendental equation by Ramanujan's, Regula-Falsi and Newton-Raphson method.	-	-	1
7	Interpolation/Extrapolation using Newton's forward and backward difference formula.	-	-	1
8	Computation of area under the curve using Trapezoidal, Simpson's (1/3)rd and (3/8)thrule.	-	-	1
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method.	-	-	1
10	Solution of ODE of first order and first degree by Runge-Kutta 4th order and Milnes predictor-corrector method.	-	-	1
Total No. of Lecture Hours		**25**		
	Total No. of Tutorial Hours		**15**	-
	Total No. of Practical Hours			**10**

Self-learning topics identified:

1. Evaluation of double integrals by changing into polar coordinates, Volume by triple integration.
2. Volume integral and Gauss divergence theorem.
3. Solution of one-dimensional heat equation and wave equation by the method ofseparation of variables.
4. Lagrange's inverse Interpolation, Weddle's Rule
5. Adam-Bashforth method.

Textbooks:

1. **B.S.Grewal**:"HigherEngineeringMathematics",Khannapublishers,44thEd.,2021.
2. **E.Kreyszig**:"AdvancedEngineeringMathematics",JohnWiley&Sons,10th Ed.,2018.

Reference Books:

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **Tom Apostol** "Calculus: One variable calculus with an introduction to Linear Algebra", Vol. 1, , Wiley publications, 2nd edition.
4. **Tom Apostol** "Calculus: Multi-Variable Calculus and Linear Algebra with applications to differential equations and Probability, Vol.2, , Wiley publications, 2nd edition.
5. **William Stallings:** "Cryptography and Network Security" Pearson Prentice Hall, 6th Ed., 2013.

Code: BCHEC202 **Course:** Applied Chemistry for Civil Engineering Stream

Credits: 4 **L:T:P 2:2:2**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	1. To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for relevant engineering branches. 2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	**Course Outcomes**	**Bloom's level**
CO1	Explain basic concepts of energy storage and energy conversion devices, solar cells. Understand the principles of corrosion and corrosion control.	Understand Apply
CO2	Understand the principles of water analysis and concept of phase rule.	Understand Apply
CO3	To understand and apply the concepts of polymers, structural materials and nano materials.	Understand Apply
CO4	To understand and apply the concept of analytical techniques in various technological applications	Understand Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	3	2					2					2		To be identified for each branch by Course Instructor			
CO2	3	2					2					2					
CO3	3	2					2					2					
CO4	3	2					2					2					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	**No. of Tutorial Hours**	**No. of Practical Hours**
Module – 1 Structural material				
1.1	**Metals and alloys:** Introduction, properties and applications of Iron and its alloys, Aluminum, and its alloys.	2	-	-
1.2	**Cement:** Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement.	2	2	-
1.3	**Glass:** Introduction, composition, types, preparation of soda–lime glass, properties, and applications of glass.	2	-	-
Module - 2 Storage and energy conversion devices, corrosion				

2.1	**Storage devices:** Introduction, construction and working of Li-ion battery.	1	-	-
2.2	**Energy conversion:** Introduction, Fuel cell- classification, comparison with battery, construction, working and applications of methanol - oxygen fuel cell. construction, working and applications of photovoltaic cells.	3	-	-
2.3	**Corrosion:** Introduction, electrochemical corrosion of steel in concrete, types: differential metal corrosion (galvanic corrosion) and aeration corrosion (pitting corrosion), stress corrosion in civil structures, corrosion control. (i) design and selection of materials. Cathodic protection - sacrificial anode method and impressed current method.	2	2	-
	Module – 3 Water technology and Nanotechnology			
3.1	**Water technology:** Introduction, water parameters, hardness of water, determination of hardness by EDTA method - numerical problems, desalination of water by electrodialysis, determination of COD of water effluent -numerical problems. Sewage treatment (Primary, secondary and tertiary).	2	2	-
3.2	**Nanotechnology:** Introduction, size dependent properties of nanomaterials (surface area and catalytic), synthesis of nanomaterial by sol – gel method and co-precipitation method. Nanomaterials for water treatment (metal oxide).	2	-	-
	Module – 4 polymer and composites			
4.1	**Polymer:** Introduction, methods of polymerization (Bulk, solution, suspension, and emulsion), molecular weight of polymers (Number average and weight average)- Synthesis, properties, and engineering applications of polyethylene (PE) and polyvinylchloride (PVC).	2	2	-
4.2	**Fibers:** Synthesis, properties and applications of polypropylene and nylon fibers.	1	-	-
4.3	**Geo polymer concrete:** Introduction, synthesis, constituents, properties, and applications. **Adhesives:** Introduction, properties, and applications of epoxy resin.	2	-	-
4.4	**Biodegradable polymers:** Synthesis of polylactic acid (PLA) and their applications.	1	-	-
	Module – 5 Phase rule and Analytical techniques			
5.1	**Phase rule:** Introduction, definition of terms: phase, components, degree of freedom, phase rule equation. Condensed phase rule, phase diagram: Two compo silver system, desilverisation of Pb.	1	2	-
5.2	**Analytical techniques:** Introduction, Potentiometry: principle, instrumentation, and application in the estimation of iron, Conductometry: principle and its application in the estimation of acid mixture, pH - sensors and its application in the determination of soil sample.	3	2	-
	List of Experiments:			
1	D1. Synthesis of polyurethane.	-	-	2
2	D2. Quantitative estimation of Aluminium by precipitation method.	-	-	2
3	D3. Synthesis of iron oxide nanoparticles.	-	-	2
4	D4. Determination of chloride content in the given water sample by Argentometric method	-	-	2
5	E1. Conductometric estimation of acid mixture.	-	-	2
6	E2. Potentiometric estimation of FAS using $K_2Cr_2O_7$.	-	-	2
7	E3. Determination of pKa of vinegar using pH sensor (Glass electrode).	-	-	2
8	E4. Determination of rate of corrosion of mild steel by weight loss method.	-	-	2
9	E5. Estimation of total hardness of water by EDTA method.	-	-	2
10	S1. Estimation of copper present in electroplating effluent by optical sensor (Colorimetry)	-	-	2
11	S2. Determination of viscosity coefficient of lubricant (Ostwald's viscometer).	-	-	2

12	S3. Estimation of iron in TMT bar by diphenyl amine method.	-	-	2
13	S4. Estimation of sodium present in soil /effluent sample using flame photometry.	-	-	2
14	S5. Determination of chemical oxygen demand (COD) of industrial waste water sample.	-	-	2
15	O1. Gravimetric estimation of gypsum in Portland cement.	-	-	2
16	O2. Electroplating of desired metal on substrate.	-	-	2
17	O3. Estimation of manganese dioxide in pyrolusite.	-	-	2
18	O4. Analysis of cement for its components.	-	-	2
19	O5. Estimation of percentage of iron in steel.	-	-	2
	Total No. of Lecture Hours	**26**	-	-
	Total No. of Tutorial Hours		**14**	-
	Total No. of Practical Hours			**20/38**

Self-learning topics identified:

1. Refractories: Classification based on chemical composition, properties and applications of refractory materials.
2. Metal coatings- galvanization and tinning.
3. Forward osmosis: Process and applications.
4. Polymer composites: Properties and applications of fiber reinforced polymers composites (FRPC).
5. Colorimetry: Principle and its application in the estimation of the copper.

Textbooks:

1. Wiley Engineering Chemistry, Wiley indiaPvt.Ltd.New Delhi,2013- 2nd Edition.
2. A Text book of engineering chemistry, Shashi Chawla,Dhanpat Rai & Co. (P) Ltd.
3. A Textbook of Engineering Chemistry, R.V. Gadag and Nityananda shetty, I.K. International Publishing house, 2nd Edition, 2016.
4. Textbook of engineering chemistry by Dr. K. Pushpalatha, published by wiley publications, 2nd edition.
5. Vogels textbook of quantitative inorganic analysis, revised by J. Bassett, R. C. Denny, G. H. Jeffery, 4th Ed.
6. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3,
2022.
7. A text book of Engineering Chemistry 15th Edition by P. C. Jain and Monica Jain, Dhanpat Rai Publishing Co (P) Ltd., New Delhi.
8. Text book of Engineering Chemistry by S.S. Dara, published by Chand and Co., 2009.

Reference Books:

1. Principles of Physical Chemistry by B.R.Puri, L.R. Sharma and M.S.Pathania,S. Nagin Chand and Co.
2. Textbook of Physical Chemistry by Soni and Dharmatha, S.Chand&Sons.
3. Textbook of polymers science by Gowarikar and Vishwanathan.
4. Corrosion Engineering by M.G. Fontana, Mc Graw Hill Publications
5. Nanotechnology A Chemical approach to Nanomaterials, G.A. Ozin& A.C. Arsenault, RSC Publishing, 2005.

Online Resources:

1. https://nptel.ac.in/downloads/122101001/
2. https://nptel.ac.in/courses/104/103/104103019/
3. https://ndl.iitkgp.ac.in/
4. https://www.youtube.com/watch?v=faESCxAWR9k
5. https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PL
6. https://www.youtube.com/watch?v=j5Hml6KN4TI
7. https://www.youtube.com/watch?v=X9GHBdyYcyo
8. https://www.youtube.com/watch?v=1xWBPZnEJk8
9. https://www.youtube.com/watch?v=wRAo-M8xBHM

Code: BCEDK203 **Course: Computer Aided Engineering Drawing**

Credits: 3 **L:T:P2:0:2**

SEE: 50% **CIE: 50%**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	1. Provide a fundamental understanding of Engineering Drawings and their creation using instruments. 2. Familiarization of a typical drafting software and its applications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Use drawing instrument and software to construct basic geometric sketches, illustrate the concepts of Orthographic Projections of Points & Lines.	Apply
CO2	Develop the projections of regular plane surfaces and solids	Apply
CO3	Understand the development of surfaces and isometric projections	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	1	-	3	1	-	-	-	1	-	1		-	-	-
CO2	3	3	1	-	3	1	-	-	-	1	-	1		-	-	-
CO3	3	3	1	-	3	1	-	-	-	1	-	1		-	-	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	Introduction to Computer Aided Sketching: Drawing Instruments and their uses, BIS conventions, Dimensioning, Drawing Scales and free hand practicing. (All sketching to be done on A4 Grid Sheets, Mini Drafter not required)	2		
1.2	Introduction to Computer Aided Drafting Software i.e. Solid Edge standard tool bar/menus. Co-ordinate system, selection of drawing sheet size and scale. Commands and creation of Points, Lines, axis, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning conventions.	2		1
1.3	Orthographic Projections of Points and Lines: Introduction to Orthographic Projections, Projections of points in all four quadrants, Orthographic projection of lines (Placed in first quadrant only). *Application on projection of Lines (For CIE only).*	5		3
Module – 2				
2.1	Orthographic Projections of Plane Surfaces: Orthographic projection of planes viz.			
	regular polygons like triangle, square, rectangle, pentagon, hexagon, & circular laminae.	3		3
Module – 3				

3.1	Orthographic Projections of Solids: Orthographic Projections of right regular solids like prisms, pyramids, cylinders, cones, Cubes and tetrahedron *(Solids resting on HP only).*	6		4
	Module – 4			
4.1	Development of Lateral Surfaces of solids: Development of lateral surfaces of right, regular prisms, cylinders, cones & pyramids resting with base on HP only. Representation of section planes & section points, Development of lateral surface of their frustum, truncations. *Application problems related to development of lateral surfaces like funnels and trays (For CIE only).*	3		2
	Module – 5			
5.1	Isometric Projection: Isometric scale, Isometric projection of plane figures, solids: tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, Isometric projection of combination of two simple solids.	3		2
5.2	Demonstration of drawing views in 3D environment.	1		
5.3	Demonstration of a typical Civil Building, Mechanical Production, Electrical and Electronic Wiring and Electronic engineering Drawings.	1		
Total No. of Lecture Hours		**25**		
	Total No. of Tutorial Hours			
	Total No. of Practical Hours			**15**

Self-learning topics identified: (Maximum of 5 topics)

1. First angle and third angle projection.
2. Different softwares used for drawing.
3. Use of drawings in different fields.
4. Study of a blueprint for house construction.
5. Solids resting on VP.

Text Books:

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal, 53rd edition, 2019-Charotar Publishing House, Gujarat.
2. Engineering Graphics by K.R. Gopalakrishna, 32nd edition, 2010- Subash Publishers Bangalore.

Reference Books:

1. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production- by Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice Hall of India Pvt. Ltd., New Delhi.

Online Resources:

1. Mechanical Engineering Department's YouTube channel: https://youtube.com/channel/UCXOY3X4xcbTFIczaNVhESQw
2. Projections of Points: https://youtube.com/playlist?list=PLSYYrV4OuACSlPD3LHQBT5huxrb3o8HM1
3. Projections of Lines: https://youtube.com/playlist?list=PLSYYrV4OuACSmvN5qnKdvM3yzldjp5238
4. Projections of Planes: https://youtube.com/playlist?list=PLSYYrV4OuACTL9RO6NjXdrw3EktYjpfZX
5. Projections of Solids: https://youtube.com/playlist?list=PLSYYrV4OuACSAbmbyoKV33NxB9gCDPsao
6. Development of Surfaces: https://youtube.com/playlist?list=PLSYYrV4OuACTb68S2CT0ncIQl353poXo8
7. Isometric projections: https://youtube.com/playlist?list=PLSYYrV4OuACTGMtF0X3QGT-av0V02jnTr

Code: BPWSK106 /206 **Course:** Professional Writing Skills in English

Credits: 1 **L:T:P: 1:0:0**

SEE: - **CIE: 50 Marks**

SEE Hours: - **Max. Marks: 50**

Prerequisites if any	
Learning objectives	1. To Identify the correct method of Writing and Speaking in English. 2. To Achieve better technical writing and Presentation skills for employment. 3. To Acquire Employment and Workplace communication skills.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	To understand and identify the correct method of Writing and Speaking English.	Understand
CO2	To read technical proposals properly and make them to Write good technical reports.	Apply
CO3	Acquire Employment and Workplace communication skills.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	3	3	3	1	2		To be identified for each branch by Course Instructor		
CO2	-	-	-	-	-	2	-	3	3	3	1	2				
CO3	-	-	-	-	-	2	-	3	3	3	1	2				

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Using Parts of Speech and Tenses in Writing And Speaking English** Introduction to Parts of Speech, Types of Parts of Speech and their use in Writing And Speaking English	2	-	-
1.2	Introduction to Tenses, Types of Tenses and their use in Writing And Speaking English	2	-	-
	Module – 2			
2.1	**Technical Reading and Writing Practices** Technical writing process, Introduction to Technical Reports writing	1	-	-
2.2	Types of Technical Proposals	1	-	-
2.3	Characteristics of Technical Proposals., Scientific Writing Process, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises.	2	-	-
3.1	**Professional Communication for Employment** Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills.	1	-	-

3.2	Reading Comprehension, Tips for effective reading.	1	-	-
3.3	Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos.	3	-	-
3.4	Facing Campus Interview/Other Interviews	2	-	-
	Total No. of Lecture Hours	15		
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			-

Self-learning topics:

1. Group Discussion and Professional Interviews,
2. Characteristics and Strategies of a GD

Textbooks:

1. High School English Grammar & Composition by Wren and Martin, S Chandh& Company Ltd – 2015.
2. "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].
3. English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.

Reference Books:

1. Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.

Code:BICOK107 / 207 **Course:** Indian Constitution

Credits: 1 **L:T:P -1:0:0**

SEE: - **CIE: 50 Marks**

SEE Hours: - **Max. Marks: 50**

Prerequisites if any	NIL
Learning objectives	1. To imbibe the knowledge of the Constitution so that one can function effectively in a Democracy. 2. To fulfill the responsibilities of a Citizen with Constitutional support for development of oneself and of the nation.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Analyse the basic structure of Indian Constitution. Understand and remember their Fundamental Rights.	Understand
CO2	Understand the importance of Directive Principles of State Policy and Fundamental Duties of the citizens of India. Know about our Union Government, State Government, political structure and judicial system of India.	Apply
CO3	Analyse our State Executive and Elections system of India, Emergency Provisions. Remember the Amendments to our Constitution and their significance.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	1	-	-	-	-	-	2	-	-	-
CO2	-	-	2	-	-	1	2	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-	2

PSO1	PSO2	PSO3	PSO4
To be identified for each branch by Course Instructor			

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Indian Constitution: Necessity of the Constitution, Introduction to the Indian Constitution, making of the Constitution, role of the Constituent Assembly.	1	-	-
1.2	Salient features of India Constitution. Preamble of Indian Constitution and key concepts of the Preamble.	1	-	-
1.3	Fundamental Rights, restrictions and limitations over them in different situations.	3		
	Module – 2			
2.1	Directive Principles of State Policy and its present relevance in Indian society. Funda Duties and its Scope and significance, Union Executive : Parliamentary System, Pres Minister and Union Cabinet.	2	-	-
2.2	Parliament - Lok Sabha and Rajya Sabha, Important parliamentary terminologies.	2	-	-
2.3	Judicial system of India , Supreme Court of India and other courts.	1	-	-
	Module – 3			
3.1	State Executive and Governer, Chief Minister, State Cabinet, State Legislature.	2	-	-
3.2	Election Commission, Elections and Electoral Process.	1	-	-
3.3	Amendment procedure to Constitution, and important constitutional amendments	2	-	-

	till today. Emergency Provisions.			
Total No. of Lecture Hours		**15**	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			-

Self-learning topics identified:

1. Know the functioning of the course in India.
2. Enforcement of our Fundamental Rights before the Supreme Court.
3. Know the duties of a citizen of India.
4. Study the latest cases relating to Fundamental Rights.
5. Study the Judicial Activism in India.

Textbooks:

1. Durga Das Basu : "Introduction to the Constitution of India" (Student Edition) Prentice - Hall EEE, 19th /20th Edition, 2001.

Reference Books:

1. “The Constitution of India” by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru. “The Constitution of India” by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

2. V N Shukla, “Constitution of India” Eastern Book Company, Lucknow, 10thEdition,2001, Reprint, October 2004

Online Resources:

1.https://www.constitutionofindia.net/
2.https://www.india.gov.in/topics/law-justice

Code: BSFHK158 /258 **Course:** Scientific Foundations of Health

Credits: 1 **L:T:P 1:0:0**

SEE: NA **CIE: 50 Marks**

SEE Hours: NA **Max. Marks: 50**

Prerequisites if any	Nil
Learning objectives	1. To know about Health and wellness (and its Beliefs) & It's balance for positive mindset. 2. To Create a Healthy and caring relationships to meet the requirements of good/social/positive life.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	To understand and analyse about Health and wellness (and its Beliefs) & It's balance for positive mindset.	Understand
CO2	Build a Healthy and caring relationships to meet the requirements of good/social/positive life.	Apply
CO3	To learn about avoiding risks and harmful habits in their campus and outside the campus for their bright future.	Analyze

Mapping with POs and PSOs:

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

PSO1	PSO2	PSO3	PSO4
To be identified for each branch by Course Instructor			

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	Health -Importance of Health, Influencing factors of Health, Health beliefs	1	0	0
1.2	Health & Society, Health & family, Health & Personality	1	0	0
1.3	Psychological disorders-Methods to improve good psychological health, Changing health habits for good health.	1	0	0
1.4	Developing healthy diet for good health, Nutritional guidelines for good health	1	0	0
1.5	Obesity & overweight disorders and its management, Eating disorders, Fitness components for health	1	0	0
Module – 2				
2.1	Building communication skills, Friends and friendship, the value of relationship and communication skills	1	0	0
2.2	Relationships for Better or worsening of life, understanding of basic instincts of life	1	0	0
2.3	Changing health behaviors through social engineering	1	0	0

2.4	Characteristics of health compromising behavior, Recognizing and avoiding of addictions	1	0	0
2.5	Effects of addictions, how to recovery from addictions	1	0	0
	Module – 3			
3.1	How to protect from different types of infections, How to reduce risks for good health	1	0	0
3.2	Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life	1	0	0
3.3	Health & Wellness of youth: a challenge for upcoming future	1	0	0
3.4	Measuring of health & wealth status	2	0	0
	Total No. of Lecture Hours	**15**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Practical Hours			**0**

Self-learning topics:

1. Process of infections and reasons for it.
2. Protection from transmitted infections.

Textbooks:

1. Health Psychology - A Textbook, Fourth Edition by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press.
2. Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.

Reference Books:

1. Health Psychology (Ninth Edition) by Shelley E. Taylor - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press.
2. SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos and other materials / notes.
3. Scientific Foundations of Health (Health & Wellness) - General Books published for university and colleges references by popular authors and published by the reputed publisher

Engineering Science Courses (ESC)

Code: BESCK104A **Course:** Introduction to Civil Engineering

Credits: 3 **L:T:P 3:0:0**

SEE: 50 Marks **CIE: 50Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	Pre-University Physics and Mathematics
Learning objectives	1. To make students learn the scope of various specializations of civil engineering. 2. Construct "Free Body Diagrams" of real-world problems and apply Newton's Laws of motion and vector operations to evaluate equilibrium of particles and bodies. 3. To develop the student's ability to find out the centre of gravity and moment of inertia and their applications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the various disciplines of civil engineering	Understanding
CO2	Apply principles of coplanar concurrent forces acting on particles	Apply
CO3	Apply principles of coplanar non-concurrent forces acting on rigid bodies	Apply
CO4	Analyze truss and Compute centroid, moment of inertia of plane geometrical and composite areas	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	To be identified for each branch by Course Instructor		
CO2	2	3	-	-	-	-	-	-	-	-	-	-			
CO3	2	3	-	-	-	-	-	-	-	-	-	-			
CO4	2	3	-	-	-	-	-	-	-	-	-	-			

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1 Introduction to Civil Engineering				
1.1	Civil Engineering Disciplines and Building Science:Surveying, Structural Engineering, Geotechnical Engineering.	1	0	0
1.2	Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering,	1	0	0
1.3	Construction planning & Project management	1	0	0
1.4	Basic Materials of Construction: Bricks, Cement & mortars,	1	0	0
1.5	Plain, Reinforced & Pre-stressed Concrete	1	0	0
1.6	Structural steel, Construction Chemicals	1	0	0
1.7	Structural elements of a building: foundation, plinth, lintel, chejja,	1	0	0
1.8	Masonry wall, column	1	0	0
1.9	Beam, slab and staircase	1	0	0
Module – 2 Analysis of Concurrent force system				
2.1	Classifications of Mechanics, Definitions – Particle, rigid body, force, mass, time, space force system	1	0	0
2.2	Newton's laws, system of units, sign conventions	1	0	0
2.3	Principle of transmissibility of forces	1	0	0
2.4	Concurrent forces in plane: Introduction	1	0	0

2.5	Resultant forces – Parallelogram law, Triangle law & Polygonal law	1	0	0
2.6	Resolution and component of forces	1	0	0
2.7	Resultant of several concurrent forces, free body diagram	1	0	0
2.8	Equilibrium conditions, Lami's Theorem	1	0	0
Module – 3 Analysis of Non-Concurrent force system				
3.1	Introduction, Moment of a force about a point	1	0	0
3.2	Varignon's Theorem, Moment of a couple	1	0	0
3.3	Resolution of a force into force-couple system	1	0	0
3.4	Coplanar parallel force system	1	0	0
3.5	Coplanar Non concurrent system	1	0	0
3.6	Resultant of Coplanar non concurrent system	1	0	0
3.7	Equilibrium of Rigid bodies	1	0	0
3.8	Applications of statics of rigid bodies – Types of support in two dimensions, beams, types of loads, multi-force members.	1	0	0
Module – 4 Analysis of Trusses and Centroid				
4.1	Pin jointed Plane Trusses (Method of Joints)	1	0	0
4.2	Pin jointed Plane Trusses (Method of Sections)	1	0	0
4.3	Importance of centroid and centre of gravity	1	0	0
4.4	Methods of determining the centroid	1	0	0
4.5	Locating the centroid of plane laminae from first principles	1	0	0
4.6	Centroid of built-up sections	1	0	0
4.7	Numerical examples	2	0	0
Module – 5 Moment of inertia				
5.1	Importance of Moment of Inertia	1	0	0
5.2	Method of determining the second moment of area (moment of inertia) of plane sections from first principles,	2	0	0
5.3	Parallel axis theorem and perpendicular axis theorem,	1	0	0
5.4	Section modulus, radius of gyration,	1	0	0
5.5	Moment of inertia of built-up sections,	1	0	0
5.6	Numerical Examples.	2	0	0
Total No. of Lecture Hours		**40**		
	Total No. of Tutorial Hours		**00**	**-**
	Total No. of Practical Hours			**00**

Self-learning topics identified:

1. Construction Chemicals
2. Multi-force members
3. Derivation of centroid of Quarter-circle
4. Derivation of moment of inertia of Quarter-circle

Textbooks:

1. R. K. Bansal, R. R. Beohar and A. A. Khan, "***Basic Civil Engineering and Engineering Mechanics***",Laxmi Publications, 2015.
2. S. Rajasekharan, G. Sankarsubramanian, "***Engineering Mechanics- Statics and Dynamics***"- Vikas Publishing House, 2011.

Reference Books:

1. Stephen Timoshenko, D. Young, J Rao "***Engineering Mechanics***", Tata-McGraw Hill, Special Indian edition, 2006.
2. Beer FP and Johnson ER, "***Mechanics for Engineers- Dynamics and Statics***", 3rd SI Metric edition, Tata McGraw Hill,2008.
3. P.N. Chandra Mouli, "***Engineering Mechanics***" PHI Learning, 2011.
4. Shames IH,"***Engineering Mechanics – Statics & Dynamics***", PHI, 2009.
5. J. L. Meriam and L. G. Kraige, "***Engineering Mechanics: Statics***", Don Fowley Publishers, 2006.

Online Resources:

1. Engineering Mechanics by Prof. K. Ramesh, IIT Madras https://nptel.ac.in/courses/112106286

Code: BESCK104B /204B **Course:** Introduction to Electrical Engineering

Credits: 3 **L:T:P:- 3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	None
Learning objectives	1. Discuss the fundamentals of different components of power system along with safety aspects. 2. Use fundamental laws to solve electrical circuit parameters in DC and AC circuit and demonstrate the construction, operation and characteristics of DC and AC machines.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the fundamentals of different components of power system along with safety aspects.	Understand
CO2	Analyse AC and DC circuits.	Analyse
CO3	Describe the construction, operation and characteristics of DC and AC machines.	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	-	-	-	-	1	-	-	-	-	-	2		To be identified for each branch by Course Instructor		
CO2	3	3	-	-	-	-	-	-	-	-	-	-				
CO3	3		-	-	-	-	-	-	-	-	-	-				

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1: Introduction to Electrical Engineering				
1.1	Concept of AC and DC	1	0	0
1.2	Generation of power from conventional energy sources	1	0	0
1.3	Generation of power from non-conventional	1	0	0
1.4	Single Line Diagram of Power System	1	0	0
1.5	Concept of power and energy	1	0	0
1.6	Tariff structure for electrical energy consumption	1	0	0
Module – 2: Electric Circuits				
2.1	Faraday's laws. Static and dynamically induced EMF	2	0	0
2.2	Fundamentals of AC and DC waveforms, representation of AC and DC quantities	1	0	0
2.3	Average and RMS values of Sinusoidal wave, Definition of form factor, and peak factor	1	0	0
2.4	Electric circuit analysis using Ohms law and Kirchhoff's laws	2	0	0
2.5	Current and Voltage division rule	1	0	0
2.6	Analysis of single-phase AC circuits with R, L, C, RL, RC and RLC series and parallel configuration, Power factor.	3	0	0
2.7	Numerical on AC circuit	2	0	0
Module – 3: DC Machines and Transformers				
3.1	Construction and working principle of DC Machine	1	0	0
3.2	DC Generator EMF equation. Back emf in DC motor	2	0	0

3.3	Classification of DC motor, DC Motor Characteristics and applications	1	0	0
3.4	Numerical	1	0	0
3.5	Construction and working principle of single phase transformer.	1	0	0
3.6	EMF equation and losses in transformer	1	0	0
3.7	Numerical	1	0	0
Module – 4: Three-phase Induction Machines and Synchronous Machines				
4.1	Advantages of three phase circuits	1	0	0
4.2	Relation between line and phase quantities in STAR and DELTA connected systems (No derivation), Numerical	1	0	0
4.3	Construction and working principle of Synchronous Generator, EMF equation.	1	0	0
4.4	Numerical	1	0	0
4.5	Construction and working principle of three phase Induction Motor	1	0	0
4.6	Slip, slip speed and frequency of rotor EMF	1	0	0
4.7	Numerical	1	0	0
Module – 5: Special Machines, Electrical wiring and safety				
5.1	Construction and working principle of BLDC Motor and Stepper Motor and their applications.	2	0	0
5.2	Introduction to domestic wiring, Fuse, MCB, and Relay.	2	0	0
5.3	Necessity of earthing, difference between earthing and grounding and types of grounding	1	0	0
5.4	Electric shocks, hazards and safety precautions,	1	0	0
5.5	Standards of wiring as per BIS	1	0	0
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**00**	
	Total No. of Practical Hours			**00**

Self-learning topics identified:

1. Need for conservation of energy
2. Methods for improving power factor
3. Necessity of starter in motors
4. Application of three phase induction motor
5. Earth leakage circuit breakers

Text Books:

1. D. C. Kulshreshtha, ***"Basic Electrical Engineering",***McGraw Hill, Revised 1st Edition, 2013.
2. D. P. Kothari and I. J. Nagrath, ***"Electrical Engineering",***Tata McGraw Hill, 4th Edition, 2019.

Reference Books:

1. Vincent Del Toro, ***"Electrical Engineering Fundamentals",*** Prentice Hall Publications, 2nd Edition, 2015.
2. H Cotton, ***"Electrical Technology",*** CBS Publishers & Distributors, 2004.

Online Resources:

1. Structure of Electric Power Systems: https://electrical-engineering-portal.com/electric-power-systems
2. Kirchoff's Laws: https://nptel.ac.in/courses/108/108/108108076/
3. Analysis of single phase AC circuits: http://elearning.vtu.ac.in/econtent/courses/video/BS/ELE1525.html
4. Working of DC machine:http://elearning.vtu.ac.in/econtent/courses/video/BS/15ELE25.html
5. Construction and working principle of transformer: https://nptel.ac.in/courses/108/108/108108076/

Three phase star and delta connected systems: http://elearning.vtu.ac.in/econtent/courses/video/BS/ELE1525.html

Code:BESCK104C / 204C **Course:** Introduction to Electronics Engineering

Credits: 3 **L:T:P 3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	Learn how to develop and employ electronic circuit models for elementary electronic components.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Acquire knowledge on fundamental blocks of analog electronic systems	Understand
CO2	Develop logic circuits of digital electronic systems using the basics of Boolean Algebra	Apply
CO3	Understand the basic concepts of embedded systems & electronic communication systems.	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	-	-	-	-	-	-	-	1		3	-	2	-
CO2	3	3	2	1	-	-	-	-	-	-	-	1		3	-	2	-
CO3	3	3	2	1	-	-	-	-	-	-	-	1		3	-	2	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Diodes:** PN junction diodes, Zener Diodes	2	-	-
1.2	**PowerSupplies**–Blockdiagram,Half-waverectifier,Full-waverectifiersandfilters,Voltage regulators.	3	-	-
1.3	**Bipolar Junction Transistors**– BJT as an amplifier,BJTasaswitch	3	-	-
	Module – 2			
2.1	**Operational amplifiers** - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op-ampcircuits:Invertingandnon-invertingamplifiers,	3	-	-
2.2	voltagefollower,summer,subtractor, integrator,differentiator.	2	-	-
2.3	**Oscillators**– Introduction to Oscillators, Crystal controlledoscillators	3	-	-
	Module – 3			
3.1	**BooleanAlgebraandLogicCircuits:**Introduction to number systems, Basicdefinitions,AxiomaticDefinitionofBooleanAlgebra,BasicTheoremsand	2	-	-
3.2	PropertiesofBooleanAlgebra,BooleanFunctions,CanonicalandStandardForms,Other Logic Operations	4	-	-
3.3	Digital Logic Gates, Adders-Halfadder,Fulladder, Multiplexer, demultiplexer, encoder, decoder, Flip-flop's, counters.	2	-	-
	Module – 4			

4.1	**EmbeddedSystems** –Definition,Embeddedsystemsvsgeneral computingsystems,Classificationof Embedded Systems, Major application areas of Embedded Systems, Elements of an EmbeddedSystem,	4	-	-
4.2	CoreoftheEmbeddedSystem,MicroprocessorvsMicrocontroller,RISCvsCISC.	4	-	-
	Module – 5			
5.1	**Introduction to communication systems:** Communication systems and types modulation sch Introduction satellite, mobile and wireless communication,	4	-	-
5.2	Introduction to standards of mobile and wireless communication systems. Working principle of Bluetooth and WI-FI.	4	-	-
	Total No. of Lecture Hours	**40**	-	-
	Total No. of Tutorial Hours		**0**	-
	Total No. of Practical Hours			-

Textbooks:

1. ElectronicDevicesandCircuits,DavidABell,5th Edition,Oxford,2016
2. DigitalLogicandComputerDesign,M.MorrisMano,PHILearning,2008ISBN-978-81-203-0417-8

Code: BESCK104D / 204D **Course:** Introduction to Mechanical Engineering

Credits: 3 **L:T:P 3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	1. To develop basic knowledge on mechanical engineering fundamentals 2. To acquire the knowledge of machine tools, manufacturing processes, hybrid vehicles, mechatronics, and automation

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the role of mechanical engineering in society, energy sources, and machine tool operations.	Understand
CO2	Describe the basic concepts of IC engines, future mobility, engineering materials, and joining processes.	Understand
CO3	Explain the Concepts of Mechatronics, Robotics, and Automation in IoT	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	1	2	-	-	1	-	1		-	-	-	-
CO2	3	-	-	-	-	1	1	-	-	1	-	1		-	-	-	-
CO3	3	-	-	-	-	1	1	-	-	1	-	1		-	-	-	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Introduction**: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.	04	-	-
1.2	**Energy**: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion	04	-	-
	Module – 2			
2.1	**Machine Tool Operations**: Working Principle of lathe, Lathe operations: Turning, facing, knurling.	02	-	-
2.2	Working principles of Drilling Machine, drilling operations: drilling, boring, reaming.	02	-	-
2.3	Working of Milling Machine, Milling operations: plane milling and slot milling.	02	-	-
2.4	**Introduction to Advanced Manufacturing Systems**: Introduction, components of CNC, advantages and applications of CNC.	02	-	-
	Module – 3			
3.1	**Introduction to IC Engines**: Components and Working Principles, 4-Strokes Petrol and Diesel Engines, Application of IC Engines.	04	-	-

3.2	**Insight into Future Mobility:** Hybrid Vehicles, Components of Hybrid Vehicles. Advantages and disadvantages of Hybrid vehicles.	04	-	-
	Module – 4			
4.1	**Engineering Materials**: Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer, Shape Memory Alloys.	04	-	-
4.2	**Joining Processes:** Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames.	04	-	-
	Module – 5			
5.1	**Introduction to Mechatronics and Robotics**: open-loop and closed-loop mechatronic systems.	02	-	-
5.2	Classification based on robotics configuration: polar cylindrical, Cartesian coordinate and spherical. Application, Advantages and disadvantages.	03	-	-
5.3	Automation in industry: Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages.	01	-	-
5.4	**Introduction to IOT**: Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.	02	-	-
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Practical Hours			**0**

Self-learning topics identified: (Maximum of 5 topics)

1. Origin of IC engines
2. Identification of materials of objects for engineering domain
3. Use of Robots in advanced countries
4. IOT and mechanical engineering

Text Books:

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012

Reference Books:

1. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
3. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017
4. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1
5. Dr SRN Reddy, Rachit Thukral and Manasi Mishra, " Introduction to Internet of Things: A Practical Approach", ETI Labs
6. Raj kamal, " Internet of Things: Architecture and Design", McGraw hill.

Code: BESCK104E / 204E **Course:** Introduction to C Programming

Credits: 3 **L:T:P - 2:0:2**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To learn the fundamental programming concepts, methodologies and structures which are essential to building good and efficient C programs.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Use the fundamental programming constructs of C language to solve problem.	Apply
CO2	Use functions and arrays to implement searching and sorting operations.	Apply
CO3	Demonstrate the use of structures and pointers to solve problems.	Apply
CO4	Implement modular programming using functions.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	-	-	-	-	-	-		To be identified for each branch by Course Instructor			
CO2	3	2	2	-	-	-	-	-	-	-	-	-					
CO3	3	2	3	-	1	-	-	-	-	-	-	1					
CO4	3	-	2	-	2	-	-	-	-	-	-	1					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	Introduction to C: Introduction to computers, input and output devices, designing efficient programs	1	-	-
1.2	Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants	2	-	-
1.3	Input/output statements in C	2	-	1
Module – 2				
2.1	Operators in C, Type conversion and typecasting	1	-	-
2.2	Decision control and Looping statements: Introduction to decision control, Conditional branching statements, Iterative statements,	2	-	1
2.3	Nested loops, break and continue statements	2	-	-
Module – 3				
3.1	Functions: Introduction using functions, Function definition, function declaration, function call, return Statement, Passing parameters to functions, scope of variables, storage classes, recursive functions.	3	-	1
3.2	Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions	2	-	1
Module – 4				
4.1	Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to	2	-	1

	functions, multidimensional arrays			
4.2	Applications of arrays and introduction to strings: Applications of arrays, case study with sorting techniques.	2	-	-
4.3	Introduction to strings: Reading strings, writing strings, summary of functions used to read and write characters.	1	-	-
Module – 5				
5.1	Strings: String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings	2	-	-
5.2	Pointers: Understanding the Computers Memory, Introduction to Pointers, Declaring Pointer Variables	2	-	-
5.3	Structures: Introduction to structures	1	-	-
List of Experiments:				
1	C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.	-	-	1
2	C Program to convert Kilometers into Meters and Centimeters.	-	-	1
3	C Program to Check the Given Character is Lowercase or Uppercase or Special Character.	-	-	1
4	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b1, b2, b3 such that the equation is balanced on both sides, and it must be the reduced form.	-	-	1
5	Implement Matrix multiplication and validate the rules of multiplication.	-	-	1
6	Compute sin(x)/cos(x) using Taylor series approximation. Compare the result with the built-in library function. Print both the results with appropriate inferences.	-	-	1
7	Sort the given set of numbers using Bubblesort.	-	-	1
8	Write functions to implement string operations such as compare, concatenate, string length.	-	-	1
9	Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students.	-	-	1
10	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.	-	-	1
	Total No. of Lecture Hours	**25**	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			**15**

Self-learning topics identified:

1. goto statement
2. Suppressing input using a Scanset

Textbooks:

1. Computer Fundamentals and Programming in C, Reema Thareja, 2nd Edition, Oxford University, 2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill, 2017.
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Online Resources:

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html 2. https://nptel.ac.in/courses/106/105/106105171/
3. https://sites.google.com/site/tojomathew/course-1/c-prgmng2020-21?authuser=0

Programming Language Courses (PLC)

Code: BPLCK105A / 205A **Course:** Introduction to Web Programming

Credits: 3 **L:T:P - 2:0:2**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	• To gain the knowledge of creating web pages in HTML and XHTML using different tags and style sheets. • To get familiarity with JavaScript language and understand the Document Object Model.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Discuss the differences between HTML and XHTML	Understand
CO2	Use semantic markup tags to develop HTML5 documents	Apply
CO3	Analyze attributes, values, and types of CSS to create web pages	Analyze
CO4	Use core constructs and event handling mechanisms of JavaScript to develop web pages.	Apply

Mapping with POs and PSOs:

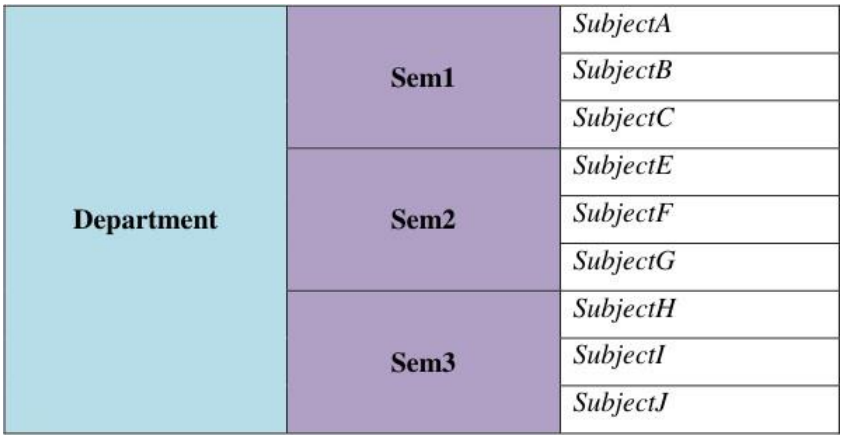
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	3	-	-	-	-	-	-	-
CO2	2	-	-	-	3	-	-	-	-	2	-	2
CO3	1	1	1	-	3	-	1	-	-	-	-	-
CO4	3	-	1	-	3	-	-	-	-	-	-	2

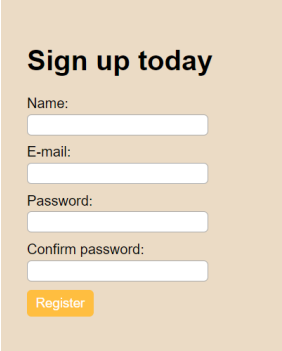
PSO1	PSO2	PSO3	PSO4
To be identified for each branch by Course Instructor			

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Traditional HTML and XHTML: First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History	1	-	-
1.2	HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML	2	-	-
1.3	The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths	2	-	-
	Module – 2			
2.1	HTML5: Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined	2	-	-
2.2	HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>	2	-	-
2.3	HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications	1	-	-
	Module – 3			
3.1	Cascading Style Sheets (CSS)Introduction, CSS Overview, CSS Rules, Example with Type Selectors and the Universal Selector	1	-	1
3.2	CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color	2	-	1

3.3	Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property, Case Study: Description of a Small City's Core Area	2	-	1
	Module – 4			
4.1	Tables and CSS, Links and Images Table Elements, Formatting a Data Table: Borders, Alignment, and Padding	1	-	1
4.2	CSS Structural Pseudo-Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values	2	-	-
4.3	a Element, Relative URLs, Navigation Within a Web Page	1	-	-
4.4	Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element	1	-	-
	Module – 5			
5.1	Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers, History of JavaScript, Hello World Web	1	-	-
5.2	Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects	2	-	-
5.3	Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side	1	-	-
5.4	Form Element, Controls, Text Control, Accessing a Form's Control Values	1	-	1
	List of Experiments:			
1	Create an XHTML page using tags to accomplish the following: a. A paragraph containing the text "All that glitters is not gold". Bold face and italicize this text b. Create equation: $x = 1/3(y_1^2 + z_1)^2$ c. Put a background image to a page and demonstrate all attributes of background image d. Create unordered list of 5 fruits and ordered list of 3 flowers	-	-	1
2	Create the following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary. 	-	-	1
3	Use HTML5 for performing following tasks: a. Draw a square using HTML5 SVG, fill the square with green color and make 6px brownstroke width b. Write the following mathematical expression by using HTML5 MathML.d=x^2-y^2 c. Redirecting current page to another page after 5 seconds using HTML5 meta tag.	-	-	1
4	Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience.	-	-	1
5	Create a class called **income** and make it a background color of #0ff. Create a class called **expenses** and make it a background color of #0ff. Create a class called **profit** and make it a background color of #0ff. Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document: ~~The current price is 50₹~~and new price is 40₹	-	-	1
6	Change the tag li to have the following properties:	-	-	1

	• A display status of inline • A medium, double-lined, black border • No list style type Add the following properties to the style for li: • Margin of 5px • Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the left. Also demonstrate list style type with user defined image logos.			
7	Create the following web page using HTML and CSS with tabular layout. 	-	-	1
8	Create the following calculator interface with HTML and CSS. 	-	-	1
9	Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay.	-	-	1
10	Create a webpage containing 3 overlapping images using HTML, CSS, and JS. Further when the mouse is over any image, it should be on the top and fully displayed.	-	-	1
	Total No. of Lecture Hours	**25**	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			**15**

Self-learning topics identified:

1. CSS for Links
2. JavaScript: Form reset and focus Methods

Textbooks:

1. HTML & CSS: The Complete Reference Thomas A. Powell, 5th Edition, Tata McGraw Hill.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 1st Edition

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill, 2017.
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/aic20sp11/preview

Code: BPLCK105B / 205B **Course:** Introduction to Python Programming

Credits: 3 **L:T:P - 2:0:2**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To gain insights on Python language syntax & semantics and use lists, tuples, built-in functions & object-oriented programming concepts to solve problems.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Demonstrate proficiency in handling loops and creation of functions.	Apply
CO2	Use methods to create and manipulate lists, tuples, and dictionaries.	Apply
CO3	Develop programs for string processing and file organization	Analyze
CO4	Illustrate the concepts of Object-Oriented Programming as used in Python.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	2	-	-	-	-	-	-	-		To be identified for each branch by Course Instructor			
CO2	3	3	3	-	3	-	-	-	-	-	-	2					
CO3	3	3	3	-	3	-	-	-	-	-	-	-					
CO4	2	-	-	-	2	1	-	1	-	-	-	2					

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program	2	-	-
1.2	Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules	2	-	-
1.3	Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number	2	-	-
	Module – 2			
2.1	Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References	2	-	1
2.2	Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things	2	-	1
	Module – 3			
3.1	Manipulating Strings: Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup	2	-	1
3.2	Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/	3	-	1

	Writing Process, Saving Variables with the shelve Module, Saving Variables with the print.format()Function, Project: Generating Random Quiz Files, Project: Multiclipboard			
	Module – 4			
4.1	Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-StyleDates, Project: Backing Up a Folder into a ZIP File	3	-	1
4.2	Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging	2	-	-
	Module – 5			
5.1	Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying	2	-	-
5.2	Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning	1	-	-
5.3	Classes and methods: Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The __str__method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation	2	-	-
	List of Experiments:			
1	a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks, and percentage with suitable messages. b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.	-	-	1
2	a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console. b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).	-	-	1
3	Read N numbers from the console and create a list. Develop a program to print mean, variance, and standard deviation with suitable messages.	-	-	1
4	Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.	-	-	1
5	Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]	-	-	1
6	Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].	-	-	1
7	Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.	-	-	1
8	Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.	-	-	1
9	Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.	-	-	1
10	Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.]	-	-	1
	Total No. of Lecture Hours	**25**	-	-
	Total No. of Tutorial Hours		**00**	**-**
	Total No. of Practical Hours			**15**

Self-learning topics identified:

1. Ending a Program Early with sys.exit()
2. IDLE's Debugger

Textbooks:

1. Al Sweigart, "Automate the Boring Stuff with Python",1st Edition, No Starch Press, 2015. For lambda functions use this link: https://www.learnbyexample.org/python-lambda-function/
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

Online Resources:

1. https://www.learnpython.org/
2. https://nptel.ac.in/courses/106106145

Code: BPLCK105C/205C **Course: Introduction to Java Programming**

Credits: 3 **L:T:P - 2:0:2**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To learn the features of java and write java programs to solve problems using object-oriented concepts and by importing packages.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the features and object-oriented concepts in JAVA programming	Understand
CO2	Analyze working of bitwise operators in JAVA	Analyze
CO3	Illustrate simple programs based on polymorphism and inheritance	Analyze
CO4	Use concepts of importing packages and exception handling mechanism	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	-	1	-	-	-	-	-	-	-		To be identified for each branch by Course Instructor			
CO2	2	3	1	-	1	-	-	-	-	-	-	-					
CO3	3	3	1	-	1	-	-	-	-	-	-	2					
CO4	3	3	3	-	3	-	-	1	-	-	-	3					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, TwoControl Statements, Using Blocks of Code, Lexical Issues	1	-	-
1.2	The Java Class Libraries, Data Types, Variables, andArrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters,Booleans	2	-	-
1.3	A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings	2	-	-
Module – 2				
2.1	Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, TheAssignment Operator, The ? Operator, Operator Precedence, Using Parentheses	2	-	-
2.2	Control Statements: Java's Selection Statements, Iteration Statements	3	-	1
Module – 3				
3.1	Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables,Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, AStack Class	3	-	1
3.2	A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final	2	-	-
Module – 4				

4.1	Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called	3	-	1
4.2	Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class	2	-	1
	Module – 5			
5.1	Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces	2	-	-
5.2	Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally	2	-	1
5.3	Java's Built-in Exceptions, Creating Your Own ExceptionSubclasses, Chained Exceptions, Using Exceptions	1	-	-
	List of Experiments:			
1	Write a JAVA program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.	-	-	1
2	Write a JAVA program for multiplication of two arrays.	-	-	1
3	Demonstrate the following operations and sign extension with Java programs a. << b. >> c. >>>	-	-	1
4	Write a JAVA program to sort list of elements in ascending and descending order	-	-	1
5	Create a JAVA class called Student with the following details as variables within it. USN NAME BRANCH PHONE PERCENTAGE	-	-	1
6	Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.	-	-	1
7	Design a super class called Staff with details such as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a JAVA program to read and display at least 3 staff objects of all three categories	-	-	1
8	Demonstrate dynamic dispatch using abstract class in JAVA.	-	-	1
9	Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C. In package P2, create class D inherited from class A in package P1 and class E. Demonstrate the working of access modifiers (private, public, protected, default) in all these classes using JAVA.	-	-	1
10	Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate the working of ArrayIndexOutOfBoundException.	-	-	1
	Total No. of Lecture Hours	**25**	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			**15**

Self-learning topics identified:

1. Jump Statements
2. Arrays Revisited

Textbooks:

1. Herbert Schildt, Java The Complete Reference, 7thEdition, Tata McGraw Hill, 2007.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Code: BPLCK105D/205D **Course: Introduction to C++ Programming**

Credits: 3 **L:T:P - 2:0:2**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To learn and apply object-oriented programming concepts such as class, objects, abstraction, encapsulation, inheritance, and polymorphism

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand and design the solution to a problem using object-oriented programming concepts.	Understand
CO2	Reuse the code with extensible Class types, User-defined operators and function Overloading.	Apply
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism	Analyze
CO4	Implement the features of C++ including templates, exceptions, and file handling for providing programmed solutions to complex problems.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	2	-	2	-	2	-	-	-	-	-	-	3		To be identified for each branch by Course Instructor			
CO2	2	2	3	-	3	-	-	2	-	-	-	-					
CO3	3	3	3	-	3	-	-	2	-	-	-	2					
CO4	3	2	3	-	3	-	-	-	-	-	-	-					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax	2	-	-
1.2	Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.	3	-	-
	Module – 2			
2.1	Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions	2	-	1
2.2	Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments –Function overloading	3	-	1
	Module – 3			
3.1	Inheritance & Polymorphism: Derived class Constructors, destructors	2	-	-
3.2	Types of Inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance	3	-	1
	Module – 4			
4.1	I/O Streams: C++ Class Hierarchy- File Stream	3	-	1
4.2	Text File Handling- Binary File Handling during file operations	2	-	0
	Module – 5			
5.1	Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch block	3	-	-

5.2	Throw statement- Pre-defined exceptions in C++	2	-	1
	List of Experiments:			
1	Write a C++ program to sort the elements in ascending and descending order.	-	-	1
2	Write a C++ program to find the sum of all the natural numbers from 1 to n.	-	-	1
3	Write a C++ program to swap 2 values by writing a function that uses call by reference technique.	-	-	1
4	Write a C++ program to demonstrate function overloading for the following prototypes. add(int a, int b) add(double a, double b)	-	-	1
5	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.	-	-	1
6	Suppose we have three classes Vehicle, FourWheeler, and Car. The class Vehicle is the base class, the class FourWheeler is derived from it and the class Car is derived from the class FourWheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class FourWheeler has a method 'fourWheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance, we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods. So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be I am a car I have four wheels I am a vehicle Write a C++ program to demonstrate multilevel inheritance using this.	-	-	1
7	Write a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.	-	-	1
8	Write a C++ program to write and read time in/from binary file using fstream	-	-	1
9	Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.	-	-	1
10	Write a C++ program function which handles array of bounds exception using C++.	-	-	1
	Total No. of Lecture Hours	**25**	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			**15**

Self-learning topics identified:

1. Special assignment expressions
2. Hybrid Inheritance

Textbooks:

1. Bhushan Trivedi, Programming with ANSI C++, Oxford Press, 2nd Edition, 2012.
2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt. Ltd, 4th Edition 2010.

Online Resources:

1. https://www.youtube.com/watch?v=BClS40yzssA
2. https://nptel.ac.in/courses/106101208

Emerging Technology Courses (ETC)

Code: BETCK105H / 205H **Course:** Introduction to Internet of Things

Credits: 3 **L: T: P:- 3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max.Marks:100**

Prerequisites if any	NIL
Learning objectives	Students will be able to learn: 1. Deployment strategies and networking technologies. 2. Potential application of IoT in healthcare, environment, and self-aware things.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain basics of networking, IoT networking components and IoT Framework.	Understand
CO2	Understand the significance of various sensing devices and actuator types.	Understand
CO3	Explain different Protocols and analyse IoT in real world applications.	Analyse

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1		2			1							1		2		1	
CO2		2	2		2							1		2	2	1	
CO3		2	2		2							1		2	2	1	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Basics of Networking:** Introduction, Network Types, Layered network models, IoT Networking Components.	4	0	-
1.2	IoT Definitions, IoT Frameworks, Internet of things application examples, Structural Aspects of the IoT.	**4**	0	-
	Module – 2			
2.1	**IoT Sensing and Actuation:** Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.	8	0	-
3.1	**IoT Processing Topologies and Types:** Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.	5	0	-
3.2	**IoT Connectivity Technologies:** LoRA, NB-IoT, Wifi and Bluetooth.	3	0	-
	Module – 4			
4.1	**IoT Communication Technologies:** Introduction and Infrastructural Protocols: IPV4/IPV6.	4	0	-
4.2	Data Protocols: MQTT, CoAP and REST.	4	0	-
	Module – 5			

5.1	**Associated IoT Technologies Cloud Computing:** Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.	4	0	-
5.2	**IoT case studies and future trends**: Vehicular IoT, Healthcare IoT, Agricultural IoT.	4	0	-
	Total No. of Lecture Hours	40	-	-
	Total No. of Tutorial Hours		**0**	**--**
	Total No. of Practical Hours			-

Self-learning topics:

1. Internet Security
2. IEEE 802.15.4, Zigbee
3. 6LoWPAN, XMPP
4. Fog Computing in IoT
5. IoT Analytics

Text Book:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "**Introduction to IoT"**, Cambridge University Press 2021.
2. Daniel Minoli, "**Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications**", Wiley, 2013.

Reference Books:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. **Introduction to Industrial Internet of Things and Industry 4.**0 CRC Press.
2. Vijay Madisetti, ArshdeepBahga, "**Internet of Things A Hands-On- Approach**", 2014.
3. Francis da Costa, "**Rethinking the Internet of Things: A Scalable Approach to Connecting Everything**", 1st Edition, Apress Publications, 2013.

Code: BETCK105I / 205I **Course:** Introduction to Cyber Security

Credits: 3 **L:T:P - 3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To gain knowledge on cybercrime terminologies, tools, cyber offenses, cybercrime methods, phishing, and computer forensics.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the cybercrime terminologies	Understand
CO2	Describe Cyber offenses and Botnets	Understand
CO3	Illustrate Tools and Methods used on Cybercrime	Analyze
CO4	Explain Phishing and Identity Theft and need for computer forensics	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	1	-	2	-	-	1	-	-	-	-	-	-		To be identified for each branch by Course Instructor			
CO2	2	-	2	-	2	-	-	-	-	-	-	-					
CO3	2	2	3	3	3	-	-	3	-	-	-	2					
CO4	1	-	2	-	2	-	-	3	-	-	-	-					

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?	4	-	-
1.2	Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives	4	-	-
	Module – 2			
2.1	Cyber Offenses: How Criminals Plan Them: Introduction, How criminals plan the attacks	2	-	-
2.2	Social Engineering, Cyber Stalking, Cybercafe & cybercrimes	3	-	-
2.3	Botnets: The fuel for cybercrime, Attack Vector	3	-	-
	Module – 3			
3.1	Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing	2	-	-
3.2	Password Cracking, Key Loggers and Spywares	2	-	-
3.3	Virus and Worms, Trojan Horses and Backdoors,	2	-	-
3.4	DoS and DDOS Attacks, Attacks on Wireless networks.	2	-	-
	Module – 4			
4.1	Phishing and Identity Theft: Introduction, methods of phishing, phishing techniques, spear phishing	4	-	-

4.2	Types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft	4	-	-
Module – 5				
5.1	Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital ForensicsScience	5	-	-
5.2	Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts	3	-	-
	Total No. of Lecture Hours	**40**	-	-
	Total No. of Tutorial Hours		**-**	**-**
	Total No. of Practical Hours			**-**

Self-learning topics identified:

1. Steganography
2. Network forensics

Textbooks:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives, Sunit Belapure and Nina Godbole, Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Online Resources:

1. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
2. https://ocw.mit.edu/courses/6-858-computer-systems-security-fall-2014/pages/lecture-notes/

Code: BETCK105J / 205J **Course:** Introduction to Embedded Systems

Credits: 3 **L:T:P 3:0:0**

SEE: 100 Marks **CIE: 100 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To introduce students to the modern embedded systems and to show how to understand and program such systems using a concrete platform built around.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain basic concepts and applications of Digital Electronics and Embedded Systems.	Understand
CO2	Explain the concept of sensors, actuators and operating systems.	Understand
CO3	Apply the concepts of Embedded systems in different applications	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	1	2	2									1		2	2	2	
CO2		3	2	2	2							1		2		2	
CO3	1	2	2									1		2	2	1	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Logic Gates, Combinational and Sequential circuits:** Sum of products and products of sums, Minterms and Maxterms, Karnaugh map Minimization, simplification using map entered variables,	3	-	-
1.2	Half and Full Adders, Half and Full Subtractors, Multiplexer,	2	-	-
1.3	Demultiplexer, Decoders, Flip-flops, counters, shift registers	3	-	-
	Module – 2			
2.1	**Introduction to Embedded Systems:** Application Domain, Features and characteristics, Model of Embedded Systems	3	-	-
2.2	Microcontroller vs Microprocessor, Example, Figures of Merit, Classification of MCU	2	-	-
2.3	History and current trends, Microcontroller Unit, A popular 8-bit MCU, Memory for Embedded systems	3	-	-
	Module – 3			
3	**Sensors and Actuators:** Introduction, Sensors	2	-	-
3.2	Analog to Digital Converters, Types of sensors	3	-	-
3.3	Actuators, Types of Actuators and Examples	3	-	-
	Module – 4			
4	**Operating Systems**: Embedded Operating Systems, Network Operating Systems	3	-	-
4.2	Layers, History, Functions, Terminologies associated with OS and Computer Usage	2	-	-
4.3	Kernel, Tasks, Processes, Scheduling Algorithm	3	-	-
	Module – 5			
5	**Example of Embedded Systems:** Mobile Phones, Automotive Electronics	2	-	-
5.2	Radio Frequency Identification, Wireless Sensor Networks, Robotics	3	-	-

5.3	Bio Medical Applications, Brain Machine Interfaces	3	-	-
	Total No. of Lecture Hours	40	-	-
		Total No. of Tutorial Hours	**0**	**-**
			Total No. of Practical Hours	**-**

Text Books:

1. Mano, Morris. "Digital logic." *Computer Design. Englewood Cliffs Prentice-Hall* (1979).
2. Das, Lyla B. Embedded systems: An integrated approach. Pearson Education India, 2012.

Reference Books:

1. Kumar, A. Anand. **Fundamentals of Digital Circuits** *2Nd Ed*. PHI Learning Pvt. Ltd.,
2. Raj Kamal, **Embedded Systems**, Tata Mc Graw Hill, India, 2005.
3. Frank Vahid and Tony Givargis, "**Embedded Systems Design**" – A Unified Hardware/Software Introduction, John Wiley
4. Shibu K V, "**Introduction to Embedded Systems**", Second Edition, Mc Graw Hill

Code: BETCK105P/205P **Course: Infrastructure for Smart City**

Credits: 3 **L:T:P:-3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks: 100**

Prerequisitesifany	None
Learningobjectives	1. To develop a basic understanding about various types of Infrastructure and Smart city. 2. To enable the students to apply the basic need and planning concept to solve various Infrastructure problems.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the necessity of infrastructural development for smart cities and its components	Understand
CO2	Understand smart transport system for smart cities and its application	Understand
CO3	Describe water resources systems for smart city and its application	Understand
CO4	Understand National and Global policies to implement for smart city development	Understand

Mapping with Pos and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	1	1	-	-	-	-	-	To be identified for each branch by Course Instructor		
CO2	2	-	-	-	-	1	1	-	-	-	-	-			
CO3	2	-	-	-	-	1	1	-	-	-	-	-			
CO4	2	-	-	-	-	1	1	-	-	-	-	-			

Mapping Strength: Strong– 3 Medium–2 Low– 1

Course Structure

Module–1: Fundamentals of Smart city & Infrastructure		No. of Lecture Hours	No. of Tutorial Hours
1.1	Introduction of Smart City, Concept of smart city, Objective for smart cities	02	0
1.2	History of Smart city world and India. Need to develop smart city	01	0
1.3	Various types of Infrastructure systems	02	0
1.4	Infrastructures need assessment	03	0
Module–2: Planning and development of Smart city Infrastructure			
2.1	Energy and ecology, solar energy for smart city	02	0
2.2	Housing, sustainable green building	02	0
2.3	Safety, security, disaster management	02	0

2.4	Project management	02	0
Module–3: Intelligent transport systems			
3.1	Smart vehicles and fuels	02	0
3.2	GIS, GPS, Navigation system	02	0
3.3	Traffic safety management	03	0
3.4	Mobility services	02	0
Module–4: Management of water resources and related infrastructure			
4.1	Storage and conveyance system of water	02	0
4.2	Sustainable water and sanitation	02	0
4.3	Sewerage system	02	0
4.4	Flood management	02	0
Module–5: Infrastructure Management system & Policy for Smart city			
5.1	Integrated infrastructure management systems for smart city	02	0
5.2	Infrastructure management system applications for existing smart city	02	0
5.3	Worldwide policies for smart city	01	0
5.4	Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India	02	0
	Total No. of Lecture Hours	**40**	
	Total No. of Tutorial Hours		**00**

Self-learning topics:

a. Challenges of managing infrastructure in India and world
b. Economy and cyber security
c. E-ticketing
d. Water conservation system
e. Case studies of smart city

Text Book/s:

1. Xianyi Li, ***"Smart City on Future Life - Scientific Planning and Construction"***
2. Hudson W.R., Haas R., Uddin W., ***"Infrastructure Management"***, McGraw-Hill, 1997

Reference Books:

1. Nicos Komninos, ***"The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities)"***
2. Anthony Townsend, ***"Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia"***
3. Grig N.S., ***"Infrastructure engineering and management",*** Wiley-Interseience, 1988
4. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). ***"Smart cities – Ranking of European medium-sized cities".*** Smart Cities. Vienna: Centre of Regional Science

Online Resources:

1 Smart city government of India. http://smartcities.gov.in
2 Reconceptualising Smart Cities: A Reference Framework for India https://www.niti.gov.in/writereaddata/files/document_publication/CSTEP%20Report%20Smart%20Cities%20Framework.pdf

Code: BETCK105Q/205Q **Course:** Geographic Information Technologies

Credits: 3 **L:T:P:- 3:0:0**
SEE: 50 Marks **CIE:50 Marks**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	Highschool Geography and Mathematics
Learning objectives	1. Outline basic concepts in GIS 2. Summarize applications of GIS in relevant areas

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	**Course Outcomes**	**Bloom's level**
CO1	Describe concepts of GIS and spatial data	Understand
CO2	Understand spatial data models and database	Understand
CO3	Demonstrate the utility of web-GIS and other GIS applications	Apply

Mapping with Pos and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												To be identified for each branch by Course Instructor		
CO2	3				2										
CO3	2				2	2									

Mapping Strength: **Strong– 3** **Medium–2** **Low– 1**

Course Structure

Module– 1: Fundamental Concepts of GIS		**No. of Lecture Hours**	**No. of Tutorial Hours**
1.1	Definition of GIS, history and evolution of GIS, GIS Technology, functions, components, GIS work flow, tools, capabilities.	3	0
1.2	Geospatial data, GIS data formats, data storage formats. GIS data acquisition, source – primary and secondary data, generation.	3	0
1.3	Coordinate systems and map projections, datums.	2	0
Module – 2:Spatial Data and Models			
2.1	Spatial data input, Non-spatial data. Vector data: Nature and characteristics, data input.	2	0
2.2	Vector data analysis, buffering, overlay, distance measurement, vector functions, spatial query, pattern analysis.	3	0
2.3	Raster data: Nature and elements, types, data structure and compression, quad tree data representation, data input, scanning, map transformations, resampling.	3	0
2.4	Raster versus vector. Raster data analysis, map calculator, reclassification.	2	

Module – 3: GIS Data Management			
3.1	Conceptual implementation models, Hierarchical, Network, Relational models.	3	0
3.2	RDBMS: components, concept, database. Spatial data input - Digitization, error identification.	2	0
3.3	Errors: Types, sources, correction. Editing and topology building.	2	0
Module–4: Web GIS			
4.1	History of Web GIS, OGC Web Services, System architecture for web mapping, elements of a web map.	3	0
4.2	Geocoding and address locations, Geoportals and NSDI, ArcGIS online, Geoserver, Google Earth, Bhuvan, OSM. Mobile GIS – ODK, Cloud GIS and computing – Google Earth Engine (GEE).	3	0
4.3	Web GIS application, case studies.	2	0
Module– 5: Applications of Geographic Information Technology			
5.1	Land use/cover mapping and Precision agriculture	3	0
5.2	Water resource management and Disaster management applications	2	0
5.3	Urban and regional planning applications, E-governance.	2	0
	Total No. of Lecture Hours	**40**	-
	Total No. of Tutorial Hours		**00**

Self-learning topics:

1. Everest datum
2. Location - allocation analysis
3. Bhuvan applications
4. Application of GIS in forest fire mapping

Text Books:

1. Burrough, P. A., McDonnell, R., McDonnell, R. A., & Lloyd, C. D. ***"Principles of geographical information systems"***, 3rd Edition, Oxford university press, 2015.
2. Chang, K. T. ***"Introduction to geographic information systems"***, 9th Edition, Boston: McGraw-Hill Higher Education, 2019.

Reference Books:

1. Manoj K. Arora, R.C. Badjatia. ***"Geomatics Engineering"***, Nemichand & Bros. Roorkee, 2011.
2. Panigrahi, N. ***"Geographical information science"***. Universities press, 2009.
3. Reddy, M. A. ***"Remote Sensing and Geographical Information Systems: An Introduction"***, 4th Edition, Book Syndicate, 2012.
4. DeMers, M. N. "***Fundamentals of geographic information systems"***, 4th Edition, John Wiley & Sons, 2008.

Online Resources:

1. Geographic Information Systems OER by NPTEL - https://nptel.ac.in/courses/105107206
2. Open Web Mapping OER by Penn State - https://www.e-education.psu.edu/geog585/node/519

Code: BETCK105R / 205R **Course:** Introduction to Building Environment

Credits: 3 **L:T:P-3:0:0**
SEE: 50 Marks **CIE:50 Marks**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	Highschool Geography and Mathematics
Learning objectives	1. Understand the concepts of functional design of building for thermal aspects and energy efficiency. 2. Understand the concept of ventilation, noise cancelation

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	**Course Outcomes**	**Bloom's level**
CO1	Understand the basics of built environment	Understand
CO2	Describe the importance of acoustics in built environment	Understand
CO3	Summarize the lighting principles to design fenestration in buildings.	Apply

Mapping with Pos and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					2	3						To be identified for each branch by Course Instructor		
CO2	3					1	2								
CO3	3						2								

Mapping Strength: **Strong– 3** **Medium–2** **Low– 1**

Course Structure

Module– 1: Fundamentals of Built Environment		**No. of Lecture Hours**	**No. of Tutorial Hours**
1.1	Introduction to environmental features relevant to functional design. Their measures description and quantification.	2	0
1.2	Tropical environments and site environments	2	0
1.3	Human response to environment: Factors affecting human comfort	2	
1.4	Human response to thermal environment, noise, visual environment.	2	0
Module – 2:Heat exchange in built environment			
2.1	Response of building to thermal environment	2	0
2.2	Processes of heat exchange of building with environment; Effect of solar radiation;	2	0
2.3	Thermal properties of material and sections and their influence,	2	0
2.4	Steady and periodic heat transfer in buildings, Heat flow computations.	2	

Module – 3: Fundamentals of Ventilation			
3.1	Natural ventilation:	2	0
3.2	Purpose of ventilation, Mechanisms,	3	0
3.3	Fenestration Design for natural ventilation.	3	0
Module–4: Acoustics and Noise			
4.1	Noise and Building: Basic acoustics and noise, Planning	2	0
4.2	Sound in free field, protection against external noise.	3	0
4.3	Internal noise sources, protection against air borne & structure borne noise.	3	0
Module– 5: Day lighting in building			
5.1	Day lighting: Lighting principles and fundamentals, Lighting principles and delighting.	3	0
5.2	Day light factor, and design for desired illumination and glare free lighting.	3	0
5.3	Sky, Indian sky, daylight prediction and design of fenestration.	2	0
Total No. of Lecture Hours		**40**	-
	Total No. of Tutorial Hours		**00**

Self-learning Topics:

1. Human response to visual environment
2. Effect of solar radiation
3. Fenestration Importance
4. Internal noise types
5. Interior illumination requirements

Text Books:

1. Bureau of Indian Standards, ***"Hand Book of Functional Requirements of Buildings, (SP-41 & SP- 32)"***, BIS 1987 and 1989.
2. Maekawa. Z. and Lord. P ***"Environmental and architectural acoustics"*** E&FN Spon, 2015.

Reference Books:

1. Koenighsberger, O.H. et al, ***"Manual of tropical housing and building Part-I climatic design"*** Orient Longman, 1973.
2. Foreman, J.E.K ***"Sound analysis and Noise control".*** Van Nostrand Reinhold, 1990.
3. McMullan, Randall. ***Noise control in buildings***. BSP, 1991.
4. Croome, D J ***"Noise, buildings and people"*** Pergamon press, 1977.
5. Markus,T.A.& Morris, E.N. ***"Building climate and energy"*** Pitman publishing limited, 1980.

Online Resources:

1. Energy Efficiency, Acoustics and Daylighting in Building by NPTEL - https://www.youtube.com/@energyefficiencyacousticsd86/videos

Code: BETCK105S / 205S **Course: Introduction to Robotics, Electric Vehicle System and 3D Printing**

Credits: **3** **L:T:P 3:0:0**
SEE: **50 Marks** **CIE: 50 Marks**
SEE Hours: **3** **Max. Marks:100**

Prerequisites if any	
Learning objectives	1. To familiarize with the concepts of robotics, automation and electric vehicles. 2. To acquire the basic concepts of additive manufacturing

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the robot structure and various sensors	Understand
CO2	Discuss the basics of electric vehicles, materials used, and battery management	Apply
CO3	Explain additive manufacturing processes, comprehend the principle of operation for process of Stereolithography and fused deposition modelling.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	3					2						2					
CO2	3											2					
CO3	3					2						2					

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Introduction to robotics, history of robotics, degrees of freedom, reference frames, robot joints.	2	-	-
1.2	Anatomy of a robot and robot configurations.	2	-	-
1.3	Reference frames attributed to the robot structure. Robot motions, wrist movements and various grippers.	1	-	-
1.4	Work volume, resolution, accuracy, payload and repeatability. Advantages and disadvantages of robots.	2	-	-
1.5	Artificial Intelligence based robotic arm, robot exoskeleton for disabled.	1	-	-
	Module – 2			
2.1	Introduction to robotic sensors. Various sensor characteristics.	2	-	-
2.2	Potentiometer, strain gauge, torque sensor, micro switch and light sensor.	3	-	-
2.3	Touch and tactile sensor, proximity sensor, range sensor, camera sensor, Inertial Measurement Unit and accelerometer sensor.	3		
	Module – 3			
3.1	Configurations of Electric Vehicles.	4	-	-
3.2	Performance of Electric Vehicles (Traction Motor, Characteristics, Tractive Effort and	4	-	-

	Transmission Requirement and Vehicle Performance)			
Module – 4				
4.1	Electrochemical Reactions, Specific Power, Energy Efficiency.	4	-	-
4.2	Materials for Electric Vehicles: Steel, Aluminium, Composites; Solid Oxide Fuel Cells for Batteries	3	-	-
4.3	Intelligent battery management and charging for electric vehicles, vehicle to grid technology.	1	-	-
Module – 5				
5.1	General overview Introduction, history of AM systems	1	-	-
5.2	The Generic AM Process, The Benefits of AM, Distinction between AM and CNC machining, classification of AM Process.	2	-	-
5.3	Stereo Lithography Systems: Working Principle, Process details, advantages and disadvantages, Applications	2	-	-
5.4	Fusion Deposition Modeling: Working Principle, Process details, advantages and disadvantages, Applications	2	-	-
5.5	Concepts of "Design for Additive Manufacturing".	1	-	-
	Total No. of Lecture Hours	**40**	-	-
	Total No. of Tutorial Hours		**00**	**-**
	Total No. of Practical Hours			**00**

Self-learning Topics:

1. Usage of robots in advanced countries
2. History of electric vehicles
3. 3D Printing
4. Study of robots available in the institute

Text Books:

1. Introduction to Robotics Analysis, Systems, Applications by Saeed B. Niku, Prentice Hall, 2001.
2. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles - Fundamentals, Theory, and Design by Mehrdad Ehsani, Yimin Gao and Ali Emadi, CRC Press, London Second Edition (2nd ed.) 2010.
3. Pham D.T. & Dimov S.S "Rapid Manufacturing" Springer London 2011.

Reference Books:

1. Industrial Robotics (second edition), Technology, programming and applications, Mikell P Groover, McGraw Hill, Year 2012.
2. Electric and Hybrid Vehicles by Tom Denton, Taylor & Francis (Routledge), 2018.
3. Ian Gibson, David W. Rosen, Brent Stucker, Additive manufacturing technologies: rapid prototyping to direct digital manufacturing Springer, 2010.

Code: BETCK105T / 205T **Course:** Renewable Energy Technology
Credits: 3 **L:T:P-3:0:0**
SEE: 50 Marks **CIE:50 Marks**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	None
Learning objectives	3. To discuss various available Energy Sources and the impact of renewable energy generation on environment 4. Explain Solar Thermal Energy Conversion, Photovoltaic, Wind Energy, Biomass and Ocean Energy conversion technologies

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom'slevel
CO1	Discuss various available Energy Sources and the impact of renewable energy generation on environment.	Understand
CO2	Explain Solar Thermal Energy Conversions, Photovoltaic and Wind Energy Systems.	Understand
CO3	Discuss Biomass and Ocean Energy conversion technologies.	Understand

Mapping with Pos and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	3	3	-	-	-	-	1	To be identified for eachbranchby CourseInstructor		
CO2	3	1	1	-	-	3	3	-	-	-	-	1			
CO3	3	1	1	-	-	3	3	-	-	-	-	1			

MappingStrength: **Strong– 3** **Medium–2** **Low– 1**

Course Structure

		No. ofLecture Hours	No. ofTutorial Hours	No. ofPractical Hours
Module–1: Renewable Energy Sources				
1.1	Introduction, Importance of Energy in Economic Growth, Energy scenario in India	1	0	0
1.2	Green footprint, carbon footprint, ecological footprint concepts	1	0	0
1.3	National Green Tribunal (NGT) Act, NGT activities	1	0	0
1.4	Need for Renewable energy sources, advantages and limitations, Impact of renewable energy generation on environment	2	0	0
1.5	Initiatives, schemes, and policies by MNRE, Government of India	3	0	0
Module–2: Solar Energy Conversion Systems				
2.1	Solar Energy: Potential, Present Utilization, Solar terminologies, Pyranometer and Pyrheliometer	1	0	0
2.2	Principle of Conversion of Solar radiation into Heat, Liquid Flat Plate Collectors	1	0	0
2.3	Solar Water Heaters, Solar Air Heaters, Solar Thermal Electric Systems	1	0	0
2.4	Basics of Solar PV Cells, V-I characteristics, MPPT of PV arrays	2	0	0
2.5	Configuration of Interconnected panel, Applications of PV Systems, Sizing	3	0	0

	of solar PV panels for roof-top solar application			
Module–3: Wind Energy Systems				
3.1	Wind Energy Potential in India, Factors governing location of site	2	0	0
3.2	Wind Energy Conversion Systems (WECS), Classification of WECS	2	0	0
3.3	Principle of working with block diagram	2	0	0
3.4	Characteristics of wind turbine, Power developed by wind turbine	2	0	0
Module–4: Biomass Energy Resources and Urban Waste Conversion				
4.1	Introduction to biomass resources, Products from biomass and their applications	2	0	0
4.2	Energy by Photosynthesis, Classification–Cultivated biomass, Waste Organic Matter	2	0	0
4.3	Biomass conversion processes – Direct, Thermo-chemical and Biochemical.	2	0	0
4.4	Urban Waste to Energy conversion, composition, gasification, conversion by incineration process, by pyrolysis, Landfill biogas plant, field visit	2	0	0
Module–5: Ocean Energy Technologies				
5.1	Potential of ocean energy in India, Tidal Energy Conversion system – principle and types	2	0	0
5.2	Site selection criteria, Single basin and double basin schemes	2	0	0
5.3	Wave energy conversion systems – principle, devices for harnessing wave energy	2	0	0
5.4	Ocean Thermal energy conversion – open and closed OTEC schemes	2	0	0
	TotalNo.of LectureHours	**40**	-	-
	TotalNo.ofTutorialHours		**00**	-
	Total No. of Practical Hours			**00**

Self-learning topics identified:

1. Environmental impact of fossil fuels
2. MPPT algorithms of solar PV cells
3. Power coefficient of wind turbines
4. Benefits of biomass
5. Challenges in Ocean Energy Technology in India

Textbooks:

1. S. Rao and Dr. B.B. Parulekar, ***"Energy Technology",*** 3rd edition, Khanna Publishers.
2. Rai G.D***, "Non-conventional Sources of Energy",*** 4th edition, Khanna Publishers, New Delhi, 2007.

ReferenceBooks:

1. Mukherjee D, and Chakrabarti S, ***"Fundamentals of Renewable Energy Systems",*** New Age International Publishers, 2005.
2. B.H. Khan, ***"Non-conventional energy resources",*** 2nd Edition, McGraw Hill, Education (India) Pvt. Ltd, 2009.
3. D.P. Kothari, K. C. Singal, Rakesh Ranjan**, "Renewable Energy Sources and Emerging Technology",** 2011.

Code: BETCK105U/205U **Course: Introduction to Smart City**
Credits: 3 **L:T:P-3:0:0**
SEE: 50 Marks **CIE: 50 Marks**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	None
Learning objectives	1. Explain the fundamentals of smart city, policies and initiatives by government of India 2. Discuss various components and key technologies of smart city and conduct case study on smart city, document and present

Course Outcomes:

COs	Course Outcomes	Bloom'slevel
CO1	Explain the fundamentals of smart city, policies and initiatives by government of India	Understand
CO2	Discuss various components and key technologies of smart city	Understand
CO3	Conduct case study on smart city, document and present.	Apply

Mapping with Pos and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	2	3	3	-	-	-	-	1	To be identified for eachbranchbyCourseInstructor		
CO2	3	1	1	-	2	3	3	-	-	-	-	1			
CO3	3	1	1	-	2	3	3	-	2	2	-	1			

Mapping Strength: **Strong– 3** **Medium–2** **Low– 1**

Course Structure

		No. ofLecture Hours	No. ofTutorial Hours	No. of Practical Hours
Module– 1: Fundamentals of smart city				
1.1	Introduction to smart city, Key components, Technology framework, Features and Elements of smart city	3	0	0
1.2	Government of India - policy for smart city, Mission statement & guidelines	3	0	0
1.3	Government of India - smart city Initiatives and its challenges	2	0	0
Module – 2: Building blocks of smart city architecture				
2.1	Large scale instrumentation – Widespread Sensors	2	0	0
2.2	High-speed Network Infrastructure - Wired Networks - cables, hubs etc.	3	0	0
2.3	High-speed Network Infrastructure - Wireless Networks – RFID, Wi-Fi, Bluetooth etc.	3	0	0
Module – 3: Green Energy and Smart Energy Management				
3.1	Energy and ecology, renewable energy for smart city	3	0	0
3.2	IoT, Big data analysis, Smart metering	3	0	0
3.3	Smart energy management systems to automate, monitor, and optimize energy distribution and usage	2	0	0
Module– 4: Intelligent Transport Systems				

4.1	Smart mobility systems - mass transit systems and individual mobility systems	3	0	0
4.2	Artificial Intelligence for Smart vehicles and fuels, GIS, GPS, Navigation system	3	0	0
4.3	Traffic safety management, E-ticketing	2	0	0
Module– 5: Infrastructure Management for Smart city				
5.1	Smart Health - Digital health records, home health services, remote diagnosis, treatment, and patient monitoring systems	2	0	0
5.2	Storage and conveyance system of water, Flood management, Smart waste management system	2	0	0
5.3	Smart home, sustainable green building	2	0	0
5.4	Smart cities in India - case study	2	0	0
	TotalNo.of LectureHours	**40**	-	-
	TotalNo.ofTutorialHours		**00**	**-**
	Total No. of Practical Hours			**00**

Self-learning topics identified:

1. Smart citizens and smart governance
2. Selection of sensors, Sensor Characteristics
3. Key characteristics of smart devices
4. Types of Electric Vehicle charging systems
5. Smart building architecture

Textbook:

1. Anil Kumar, ***"Introduction to Smart Cities",*** Pearson India, 1st Edition, 2019.

Reference Books:

1. Nicos Komninos, ***"The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities)"***
2. Xianyi Li, ***"Smart City on Future Life - Scientific Planning and Construction"***
3. Anthony Townsend, ***"Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia"***
4. Grig N.S., ***"Infrastructure engineering and management",*** Wiley-Interseience, 1988
5. Hudson W.R., Haas R., Uddin W., ***"Infrastructure Management"***, McGraw-Hill, 1997
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). ***"Smart cities – Ranking of European medium-sized cities".*** Smart Cities. Vienna: Centre ofRegional Science

Online Resources:

1. Mission statement & guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf

Code: BETCK105V/ 205V **Course:** Introduction to Database Management System

Credits: 3 **L:T:P - 3:0:0**

SEE: 50 Marks **CIE: 50 Marks**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NIL
Learning objectives	To learn the fundamentals of Database Management Systems, its design, interacting with database and other related concepts.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the fundamentals of database management systems.	Understand
CO2	Design relational database using Entity Relationship model and Normalization.	Analyze
CO3	Use relational operations & expressions and write SQL queries and SQL queries to interact with the database.	Apply
CO4	Explain the concepts of database transactions and create triggers, indexes, and views in SQL.	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	2	-	2	-	2	-	-	-	-	-	-	-		To be identified for each branch by Course Instructor			
CO2	3	-	2	-	2	-	-	-	-	-	-	1					
CO3	3	2	2	-	3	-	-	-	-	-	-	2					
CO4	2	-	1	-	2	-	-	-	-	-	-	-					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Introduction:** Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach	4	-	-
1.2	Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence	4	-	-
	Module – 2			
2.1	Database Design: Entity, Entity Sets, Attributes, Relationships, Constraints on Relationship types, Weak entity type	3	-	-
2.2	Notations for ER Diagrams, Sample ER Notations.	2	-	-
2.3	Definition of Functional Dependencies, Normal Forms Based on Primary Keys - 1NF, 2NF, 3NF, BCNF.	3	-	-
	Module – 3			
3.1	Relational Algebra Operations and Expressions	2	-	-
3.2	SQL: Basics, Data Definition Language	2	-	-
3.3	Data Manipulation Language	2	-	-
3.4	Stored Routines	2	-	-
	Module – 4			
4.1	Transactions: Informally Speaking, Transactions in SQL, Transaction Semantics,	4	-	-

	Serializability, Locks, Transactions in MySQL			
4.2	Constraints: Constraints in SQL	2	-	-
4.3	Triggers: Triggers in SQL	2	-	-
Module – 5				
5.1	Indexes: How does an Index Work?, Types of Indexes, Different Types of Indexes, Hash Indexes	5	-	-
5.2	Views: Two Implementations of Views, Views in MySQL, Examples	3	-	-
	Total No. of Lecture Hours	**40**	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			-

Self-learning topics identified:

1. Constraint Check Time
2. Indexes in MySQL

Textbooks:

1. The Database Book: Principles and Practice using MySQL, Narain Gehani, Universities Press (India) Private Limited, 2008.
2. Fundamentals of Database Systems, Elmasri and Navathe, Addison-Wesley, 7th Edition, 2016.

Reference Books:

1. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke McGraw-Hill, 3rd Edition, 2003.
2. Database System Concepts, Silberschatz, Korth and Sudharshan, 6th Edition, McGrawHill, 2010.

Online Resources:

1. https://nptel.ac.in/courses/106105175
2. https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/