Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering & Technology, Ashta.

(An Empowered Autonomous Institute)

Structure and Curriculum

F.Y.B.Tech

Semester-I & II

W.e.f.AY-2025-26

DEPARTMENT OF FOOD TECHNOLOGY

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra

(An Empowered Autonomous Institute)

Established: 1999

F.Y. B.Tech.–Food Technology

[Level 4.5, UG Certificate] Semester -I

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	2FTBS101	Applied Mathematics-I	3	1	-	1	4	40	20	40	-	-
02	BS	LIT2	2FTBS102	Applied Chemistry	3	-	2	-	4	40	20	40	50	-
03	ES	LIT2	2FTES103	Engineering Graphics	3	-	2	-	4	40	20	40	50	-
04	ES	T1	2FTES104	Fundamentals of Food Technology	2	-	-	-	2	40	20	40	-	-
05	ES	T1	2FTES105	Introduction to Emerging Technologies	2	-	-	-	2	40	20	40	-	-
06	ES	L2	2FTES106	Design Thinking	-	-	2	-	1	-	-	-	50	-
07	IKS	T2	2FTHS107	Indian Knowledge System	2	-	-	-	2	-	50	-	-	-
08	VSEC	L2	2FTVS108	Idea Lab Workshop	1	-	2	-	2	-	-	-	50	-
09	CC	L2	3BSCCXXX	Liberal Learning Course-I	-	-	2	-	1	-	-	-	50	-
				Total	16	1	10	1	22	Total marks: 800				

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination, CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥8/20	MSE + ESE (Theory): ≥32/80	TA (Theory) / CIA (Lab) : ≥20/50	ESE (Lab) : ≥20/50

CC Bouquet:

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC125 - Community Engagement through NSS
3BSCC122 - Physical Fitness and Lifestyle Management	3BSCC124 - Creativity through Visual Arts	3BSCC126 - Cultural Exploration & Heritage

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Department Of Food Technology ADCET ASHTA ADCET

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra

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Established: 1999

F.Y.B.Tech.–Food Technology

[Level 4.5, UG Certificate] Semester -II

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	2FTBS109	Applied Mathematics-II	3	1	-	1	4	40	20	40	-	-
02	BS	LIT2	2FTBS110	Applied Physics	3	-	2	-	4	40	20	40	50	-
03	PC	T1	2FTPC111	Engineering Thermodynamics	2	-	-	1	2	40	20	40	-	-
04	ES	LIT1	2FTES112	Food Chemistry	3	-	2	-	4	40	20	40	50	50
05	ES	LIT2	2FTES113	Basic Electrical and electronic Engineering	2	-	2	-	3	40	20	40	50	-
06	ES	L2	2FTES114	Programming for problem Solving	1	-	2	-	2	-	-	-	50	-
07	HS	L2	2FTHS115	Professional Communication Skills	-	-	4	-	2	-	-	-	50	-
08	CC	L2	3BSCCXXX	Liberal Learning Course-II	-	-	2	-	1	-	-	-	50	-
				Total	14	1	14	2	22	Total marks: 850				

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥8/20	MSE + ESE(Theory): ≥32/80	TA (Theory) / CIA (Lab) : ≥20/50	ESE (Lab) : ≥20/50

CC Bouquet:

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC125 - Community Engagement through NSS
3BSCC122 - Physical Fitness and Lifestyle Management	3BSCC124 - Creativity through Visual Arts	3BSCC126 - Cultural Exploration & Heritage

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Department Of Food Technology ADCET ASHTA ADCET

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Exit after **F.Y.B.Tech. – Food Technology**

Additional Credits to qualify for UG Certificate

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	VSEC	L	2FTEX201	Fruit Pulp Processing	-	-	4	-	2	-	-	-	50	-
02	VSEC	L	2FTEX201	Biscuit Production	-	-	4	-	2	-	-	-	50	-
				Total										

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥8/20	MSE + ESE(Theory): ≥32/80	TA (Theory) / CIA (Lab) : ≥20/50	ESE (Lab) : ≥20/50

Department Of Food Technology ADCET ASHTA ADCET

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist. : Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Food Technology

Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**2FTBS101, Applied Mathematics-I**					**Type**	**T1**
Prerequisites							
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	1	-	1	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Determine the consistency of systems of linear equations using Echelon form of matrix
CO2	Compute Eigen values, Eigen vectors, powers and inverse of a square matrix using characteristic equation
CO3	Apply the concepts of complex number to solve the equations using De Moivre's theorem and hyperbolic identities
CO4	Calculate partial derivatives, Jacobians, and extreme values of function of two variables using concept of partial differentiation
CO5	Solve ordinary differential equation of order one and degree one using analytical method and numerical techniques.

Syllabus:

Module	Contents	Lecture Hours
I	**Solution of System of Linear Equations:** Definition of system of linear equations, Classification of system of linear equations, Rank of matrix: Concept and computation using Echelon form and Normal form, Rouché–Capelli Theorem (Statements only), Solution of non-homogeneous system of linear equations, solution of Homogeneous system of linear equations, Applications in engineering.	7
II	**Eigen Values and Eigen Vectors:** Definition of vectors in R^n, Linear Dependence and Independence of Vectors, Characteristic Equation of Matrix, Cayley-Hamilton theorem (statement only), Applications of Cayley-Hamilton theorem, Eigen Values and Properties, Eigen Vectors and Properties.	7
III	**Complex Number:** Definition of complex number, Polar and exponential form of complex number, De Moivre's Theorem and Simple Applications, Power and Roots of complex numbers, Applications in solving equations. **Hyperbolic Functions:** Definitions, Identities of hyperbolic functions, Relation between Circular functions and hyperbolic functions, Inverse hyperbolic functions.	8

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IV	**Partial Differentiation and Applications:** Functions of several variables, partial derivatives of first order, Higher order partial derivatives, Homogeneous functions, Euler's Theorem on homogeneous function: statement and verification, Jacobians and Properties, Maxima and minima of functions of two variables.	**8**
V	**Ordinary Differential Equation of first order and first degree:** Linear differential equation, exact differential equation, reducible to exact differential equation, reducible to linear differential equation, Applications of engineering (branch oriented)	**8**
VI	**Numerical Solution of Ordinary differential equation of First Order & First Degree:** Euler's method, Modified Euler's method, Runge–Kutta third order, Runge-Kutta Method of order four, Taylor Series method.	**7**
	Total Lecture Hours	**45**

List of Tutorial with CO Mapping

Sr.No	Title of Tutorial	CO Mapped
1	Rank of matrix and Solution of Homogeneous System of Linear Equations	1
2	Solution of Non-Homogeneous System of Linear Equations	1
3	Eigen Value, Eigen vectors and Properties	2
4	Cayley-Hamilton theorem and Applications	2
5	De Moivre's Theorem, Applications and Hyperbolic functions	3
6	Partial differentiations and Euler's theorem	4
7	Jacobians and Maxima-Minima of Two Variable Functions	4
8	Euler's and Modified Euler's Methods for Solving Initial Value Problems	5
9	Runge-Kutta Methods and Taylor series method	5
10	Ordinary differential equations of first order and first degree	5
	Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011.
2. H. K. Das , Advanced EngineeringMathematics, 22th Edition, S. Chand ,2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. Dr. B. S. Grewal , Numerical Methods , 9th Edition, Khanna Publishers ., 2010

References:

1. Dr. B. S. Grewal , Higher Engineering Mathematics , 44th Edition, KhannaPublishers ,2018.
2. N. P. Bali, Manish Goyal , Advanced EngineeringMathematics , 7th Edition, Infinity science press ,2010.
3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi Griha Prakashan,1984
4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988.

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Online Learning Resources	
1.	NPTEL Course on Engineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121
2.	NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3.	NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta, Prof. Sanjeev Kumar, IIT Roorkeehttps://nptel.ac.in/courses/111107112
4.	NPTEL Course on Mathematics-III, by Prof. Durga C Dalal, Dr. M. Guru Prem Prasad, IIT Guwahatihttps://nptel.ac.in/courses/122103012

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Department of Food Technology

Course Information:

Class, Semester	FY. B.Tech, Semester - I	**Category**	**BS**
Course Code, Course Title	**2FTBS102, Applied Chemistry**	**Type**	**LIT2**
Prerequisites	-		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	-	2	-	4

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Explain the properties and applications of engineering materials for industrial and societal use based on their chemical compositions.
CO2	Discuss methods for preventing corrosion in metals by relating them to corrosion types and environmental conditions using basic chemical principles.
CO3	Solve the domestic and industrial problems related to water quality parameters using theoretical knowledge and laboratory experiments.
CO4	Apply the principles of analytical instruments in the analysis of samples with help of foundational practical chemistry knowledge.
CO5	Compute the calorific values of fuels for domestic and industrial applications using standard fundamental chemical equations.

Syllabus:

Module	Contents	Lecture Hours
I	**Water Technology and Management:** Introduction, impurities in natural water and it's removal, **Water Testing:** Acidity, alkalinity, chlorides and hardness of water (definition, causes and significance), WHO Standards. Scales and sludges: Formation in boilers and removal, Disinfection of water, Waste water treatment. **Treatment of hard water by:** Ion- exchange process, Zeolite process, Desalination of brackish water by Reverse Osmosis (RO), Numericals on temporary, permanent and total hardness of water.	8
II	**Chemical and Analytical Techniques:** Chemical analysis, its types, Different ways to express concentration of solution. Numerical problems. **pH-metry:** Introduction, pH measurement using glass electrode and it's applications.	8

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	Spectrometry: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's laws). Instrumentation and applications of UV-Visible spectrophotometer. **Chromatography**: Introduction, principle, instrumentation and applications of Thin-Layer chromatography (TLC) and Gas-Liquid chromatography (GLC).	
III	**Polymers and Composites for Engineering Applications:** **Polymers**: Introduction, Polymerization and it's types, Plastics: Thermo-softening and thermosetting plastics, industrially important plastics like PVC, PTFE (Teflon), ABS, urea-formaldehyde, Conducting polymers, Biodegradable polymers, Molecular weights of a polymer. **Composites:** Introduction, Constituents, Fibre-reinforced plastics (FRP) and Glass reinforced plastics (GRP), Metal matrix composites.	7
IV	**Energy Technology:** **Batteries:** Introduction,Types of batteries, battery characteristics, Lithium- ion batteries (LIBs), Sodium- ion batteries (Instrumentation, advantages, disadvantages and applications). **Fuels:** Introduction, classification, characteristics of good fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy's calorimeter. Numericals on Bomb and Boy's calorimeter. **Advanced Energy Systems:** Introduction, Fuel cells, Hydrogen cells, Solar cells.	7
V	**Corrosion & it's Prevention:** **Corrosion:** Introduction, causes, types of corrosion, Electrochemical corrosion (hydrogen evolution and oxygen absorption mechanisms), Factors affecting rate of corrosion. **Prevention of corrosion**: Introduction, Hot dipping process (Galvanizing and tinning), Cathodic protection methods, Electroplating process, Metal cladding, prevention by organic coatings (Paints and varnishes).	8
VI	**Engineering Materials and Green Chemistry:** Introduction, classification ofengineering materials. **Alloys:** Types of alloys, purposes of making alloys, Ferrous alloys: Plain carbon steels (mild, medium and high). Nonferrous alloys: Aluminum alloy (Duralumin and Alnico), Nickel alloy (Nichrome), Tin alloys (Solders). **Green Chemistry:** Definition, Twelve principles of green chemistry, Research and industrial applications, Green house effect and it's remedies.	7
	Total Lecture Hours	**45**

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List of Experiments with CO Mapping		
S.No	**Title / Topic of the Experiment**	**CO Mapped**
1	Determination of acidity of water sample. (Neutralization Titration)	3
2	Determination of alkalinity of water sample. (Acid- Base Titration).	3
3	Determination of chloride content of water by Mohr's method. (Precipitation Titration).	3
4	Determination of total hardness of water sample by EDTA method.	3
5	Preparation of Urea-formaldehyde resin.	1
6	Preparation of Phenol-formaldehyde resin.	1
7	Determination of rate of corrosion of Aluminum in acidic and basic medium	2
8	Estimation of copper in brass solution (Displacement Titration)	1
9	Estimation of zinc in brass solution (Displacement Titration)	1
10	Determination of pH of industrial waste water by using pH meter	4
11	Demonstration of bomb calorimeter to calculate calorific value of fuels.	5
12	Demonstration of Photo-colorimeter.	4
13	Determination of strength of acid/base by using conductivity meter.	4
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books:

1. S. S. Dara, A Text Book of Engineering Chemistry, 11th Edition, S. Chand & Co. New Delhi, 2008.
2. Shashi Chawala, A Text book of Engineering Chemistry 3rd Edition, Dhanpat Rai Publishing Co. New Delhi, 2007
3. Ziyauddin D. Sande, Vijayalaxmi M. Vairat, Pratapsingh V. Gaikwad, A Text book of Applied Chemistry,1stEdition, Wiley Publications, 2018

References:

1. Jain & Jain, Engineering Chemistry, 16thEdition, Dhanpat Rai Publishing Co., New Delhi., 2015.
2. Wiley India, Engineering Chemistry, 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Chatwal and Anand, Instrumental Methods of Chemical Analysis, 5th Edition, Himalaya Publishing House, Mumbai, 2005
4. B. K. Sharma, Industrial Chemistry, 10th Edition, Goel publication (P) Ltd., 1999
5. S. K. Singh, Fundamentals of Engineering Chemistry, 1st , New Age International (P) Ltd, New Delhi, 2009

Online Learning Resources:

1. Water Technology-- https://youtu.be/dKWJzp_rrlE
2. For lithium-ion batteries (LIBs): https://www.youtube.com/watch?v=DBLHaLhyo2w
3. Wikipedia - Composite materials:https://en.wikipedia.org/wiki/Composite_material

Experiments that may be performed through virtual labs:

S. No.	Experiment Name	Experiments Links
1.	Water analysis-Determination of Chemical parameters	https://inoc-amrt.vlabs.ac.in/exp/water-analysis-chemical-parameters/index.html
2.	Demonstration of Photo-colorimeter	https://pcv-amrt.vlabs.ac.in/exp/spectrophotometry/index.html

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Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - I	**Category**	**ES**
Course Code, Course Title	**2FTES103, Engineering Graphics**	**Type**	**LIT2**
Prerequisites	--		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	-	2	--	4

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	--

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Construct** projections of straight lines in various positions with reference planes, by variation in inclination, grade, bearing, and initial conditions.
CO2	**Complete** the projection of planes and Solids in various positions relative to reference planes, considering variations in initial conditions and inclination, to achieve an accurate shape in inclined positions.
CO3	**Prepare** the section of solids in simple position and inclined to one reference plane and parallel to other, considering variations in shapes, initial conditions and inclination, to get an accurate sectional view of inclined position of solid.
CO4	**Draw** the three orthographic views for a given three-dimensional pictorial view, concerning the direction of viewing in first-angle projection, explaining the sectional view, hidden object and dimensions.
CO5	**Develop** a 3-dimensional isometric view converted from two or three orthogonal views to illuminate a 3D object.

Syllabus:

Module	Contents	Lecture Hours
I	**Fundamentals of Engineering Graphics and Projections of Lines** **Fundamentals of Engineering Graphics:** Introduction to Drawing instruments and their uses. Different types of lines used in drawing practice, Dimensioning system as per BSI. **Projections of Lines:** Introduction to First angle and third angle methods of projection. Projections of points on regular and auxiliary reference planes. Projections of lines (horizontal, frontal, oblique and Profile lines) on regular and auxiliary reference planes. True length of a line, Point View of a line, angles made by the line with reference planes. Projections of intersecting lines, Parallel lines, perpendicular lines, and skew lines. Grade and Bearing of a line	9

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II	**Projections of Planes** Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes), Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes. (Circle & regular polygon upto hexagon).	6
III	**Projections of Solids** Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes. (Excluding Frustum and Sphere)	7
IV	**Section of Solids** Prisms, Pyramids, Cylinders and Cones, in simple position and inclined to one reference plane and parallel to others.	8
V	**Orthographic Projections** Lines used, selection of views, spacing of views, dimensioning and sections. Drawing required views from given pictorial views (conversion of pictorial views in to orthographic views), including sectional orthographic views.	8
VI	**Isometric Projections** Introduction to isometric. Isometric scale, Isometric projections and Isometric views /drawings. Circles in isometric view. Isometric views of simple solids and objects.	7
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Introduction to Engineering Drawing	1
2	Types of Lines and Lettering	1
3	Projection of Line	1
4	Projection of Plane	2
5	Projection of Solids	2
6	Section of Solids	3
7	Orthographic Projection	4
8	Isometric Projection	5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. W. J. Luzadder, Fundamentals of Engineering drawing, Revised Edition, Prentice Hall of India, 1999.
2. N. D. Bhatt, Machine Drawing, 15th Edition, Charotar Publishing House Pvt. Ltd.-Anand, 2007.
3. Jhole, Dhananjay, Engineering Drawing, Revised Edition, Tata McGraw-Hill, 2011.
4. M.L. Mathur, Engineering Drawing & Graphics, RevisedEdition, Jain brothers, 1999.

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References:

1. K. Venugopal, Engineering Drawing and Graphics, 5th Edition, New Age Publication, 2004.
2. R. K. Dhawan, A textbook of Engineering Drawing, Revised Edition, S. Chand and Co, 2008.
3. N. B. Shaha and B. C. Rana, Engineering Drawing, 2nd Edition, Person Education, 2012.
4. K. L. Narayana, Machine Drawing, New Age Publication

Online Learning Resources

1. NPTEL Course on *Engineering Drawing*, by Prof. P. S. Robi, IIT Guwahati https://nptel.ac.in/courses/112103019
2. NPTEL Course *on Engineering/ Architectural Graphics- Part I- Orthographic Projection*, by Prof. AvlokitaAgarwal, IIT Roorkee https://nptel.ac.in/courses/124107157
3. NPTEL Course *on Engineering Graphics and Design*, by Prof. NareshDatla, Prof. S. R. Kale, IIT Delhi https://nptel.ac.in/courses/112102304
4. NPTEL Course *on Engineering Drawing and computer graphics,* by Prof. RajaramLakkaraju, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc21_me125/preview

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Department of Food Technology

Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester – I					**Category**	**ES**
Course Code, Course Title	**2FTES104 –Fundamentals of Food Technology**					**Type**	**T1**
Prerequisites	**1FTPC105**						
Teaching Scheme (per week)	**Lecture**		**Tutorial**	**Practical**	**Self Study**	**Credits**	
	2		-	-	-	2	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Explain the basic concepts of food groups, functional foods, and the food pyramid.
CO2	Describe the role of microorganisms in food spoilage, preservation, and probiotics.
CO3	Apply principles of food chemistry to understand composition and quality of foods.
CO4	Analyze basic food processing techniques and their role in preservation.
CO5	Evaluate and design basic food handling practices for quality and safety.

Syllabus:

Module	Contents	Lecture Hours
I	**Food Pyramid & Food Groups** Food pyramid concept, balanced diet, functional foods, staple foods, fortified foods, nutraceuticals	5
II	**Food Microbiology** Introduction to food microorganisms, food spoilage (bacteria, molds, yeasts), probiotics.	5
III	**Fundamentals of Food Chemistry** Water, carbohydrates, proteins, lipids, vitamins, minerals, pigments, enzymes in food.	5
IV	**Introduction to Food Processing** Principles of food preservation (thermal, cold, drying), processing of cereals, fruits & vegetables	5
V	**Food Safety & Quality** Food hygiene, sanitation, food adulteration, HACCP basics, quality control parameters	5
VI	**Emerging Trends in Food Technology** Functional ingredients, convenience foods, plant-based foods, novel processing methods	5
	Total Lecture Hours	**30**

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Text Books

1. Fellows, P.J.Food Processing Technology. Wood head Publishing (2022).
2. N.ShakuntalaManay,M. ShadaksharaSwamy ,Food facts and Principle,3rd, New age international Publications,2021
3. W. C. Frazier,D. C.Westhoff, Food Microbiology,5th, McGraw-Hill,2013.
4. Sukumar De, Outline of Dairy Technology,1, Oxford University Press,2008.
5. Salunkhe D.K. and Kadam S.S. Handbook of Fruits Science and Technology: Production, Composition, Storage and Processing, CRC press ,1995.

References:

1. Kirk Lindsay Parkin, Srinivasan Damodaran, Owen R. Fennema, Fennema's Food Chemistry, 5th,CRC Press,2017.
2. P.J. Fellows, Food ProcessingTechnology: Principles andPractice, 4th,ElsevierScience,2016.
3. I.S. Singh, Handbook of Fruit and Vegetable Processing, 1st, Sinha and Hui,2010

Online Learning Resources

1. NPTEL Course on Functional Foods and Nutraceuticals
   By Dr Rekha Sharma | UGC - Malaviya Mission Teacher Training Centre, Rashtra SantTukadoji Maharaj Nagpur University
   https://onlinecourses.swayam2.ac.in/cec25_ag06
2. NPTEL Course on MVP-001: Food Fundamentals and ChemistryBy Dr. Mita Sinha Mahapatra Indira Gandhi National Open University, New Delhi

https://onlinecourses.swayam2.ac.in/nou25_ge83/preview

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Department of Food Technology
Established: 1999

Course Information:

Class, Semester	F.Y. B.Tech – Semester I					**Category**	**ES**
Course Code, Course Title	**2FTES105, Introduction To Emerging Technologies**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	2	-	-	-	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		--	--

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Describe the key characteristics of emerging technologies such as AI, IoT, AR/VR, Quantum Computing, and Blockchain
CO2	Apply the concepts of AI, IoT, CPS, and Blockchain to real-world case studies to identify their disruptive impact on digital transformation initiatives
CO3	Explain the role of robotics, additive manufacturing, and green technologies in supporting sustainability and ethical technology deployment
CO4	Implement innovative solutions using autonomous systems and green technologies to address sustainability challenges

Syllabus:

Module	Contents	Lecture Hours
I	**Foundations of Emerging Technologies and Innovation Ecosystem** Emerging technologies characteristics and disruptive impact, Indian innovation ecosystem: Digital India, Startup India, AIM, India Stack, National Education Policy and interdisciplinary learning, Case studies: Smart Cities, Aadhaar, UPI, Digital Health Mission.	5
II	**Artificial Intelligence, Machine Learning & Data Science** AI basics: history, goals, types of AI (Narrow, General, Super AI), Machine learning: supervised, unsupervised, reinforcement learning, Introduction to data science: lifecycle, Big Data (5Vs), visualization, Human-centered AI and ethical concerns: bias, privacy, responsible AI.	5
III	**IoT, Cyber-Physical Systems, Edge Computing & Cybersecurity** IoT: architecture, sensors, communication, cloud, Cyber-physical systems: smart grid, autonomous vehicles, industrial automation, Edge & fog computing: real-time applications and use cases, Cybersecurity basics: CIA triad, malware, phishing, digital hygiene.	5

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IV	**AR/VR, Quantum Technologies and Blockchain** AR/VR/XR: definitions, tools, applications in gaming, education, healthcare, Metaverse and immersive computing, Introduction to quantum computing: qubits, entanglement, potential impact. Quantum AI. Block chain, Smart Contracts, DApps, DeFi, NFTs	**5**
V	**Robotics, Autonomous Systems & Additive Manufacturing** Robotics: types, sensors, actuators, applications in healthcare, defense, logistics, Autonomous systems: drones, driverless vehicles, swarm robotics, 3D/4D printing: additive manufacturing, materials, future directions, Design thinking for innovation in robotics & manufacturing.	**5**
VI	**Green Technologies, Sustainability & Tech Ethics** Emerging technologies for solving climate/environmental challenges, Smart grids, clean energy systems, climate tech, e-waste, Sustainable design and SDGs: tech for social good, Tech ethics: inclusivity, equity, digital divide, societal impact.	**5**
	Total Lecture Hours	**30**

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Established: 1999

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Department of Food Technology

Course Information:

Class, Semester	F.Y. B.Tech – Semester I					**Category**	**ES**
Course Code, Course Title	**2FTES106- Design Thinking**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**	**Self Study**	**Credits**
	-		-		2	--	1
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		--	--	--		50	--

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Explain the principles and process of Design Thinking and its application in problem-solving.
CO2	Identify and define real-world problems using user-centric observation and empathy techniques.
CO3	Conduct user research through surveys, interviews, and persona building to derive user needs and insights.
CO4	Apply ideation techniques to generate innovative and feasible solutions for identified problems.
CO5	Develop and present prototypes and communicate their solutions effectively using charts, posters, and model presentations.

Syllabus:

Module	Contents
I	Introduction to Design Thinking, Design Thinking Process
II	Empathize Phase: Empathy and Ethics, User Perspective, Activities – Empathy Map, Planning, Persona building.
III	Customer Journey Mapping, Observation of stakeholders, Defining and Conceptualization of problem
IV	Ideation, Activities – 5 Whys & 1 How, Story boarding, Brainstorming.
V	Prototype – Types, Mindsets, Tools.
VI	Testing – Scenario, Methods, Refinements & Recommendations.

List of Experiments with CO Mapping

S.No.	Title / Topic of the Experiment	CO Mapped
1	**Introduction to Design Thinking** **Activity:** Make a group of 2-4 students. Give each group a simple, relatable problem (e.g., "Long queues at the campus canteen" or "Difficulty in finding parking on campus"). Ask them to: Empathize: Identify users and their pain points. Define: Write a clear problem statement. Ideate: Brainstorm possible solutions.	1, 2

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	Sketch: Draw their proposed solution on chart paper. Present: Each group will present their idea briefly.	
2	**Identification of Problems** **Activity 1: Present case** study (in group) how companies like **Airbnb, Apple, IDEO, Netflix, Samsung, Toyota** used Design Thinking to drive innovation. **Activity 2: User Interviews** – The student or group should walk around the campus or their locality to observe and identify **at least three (per student) real-life problems** faced by users (students, faculty, staff, and community). Conduct interviews to gather qualitative insights. Steps: 1. **Observation:** Note down pain points using observation and informal interviews. 2. **Listing:** Write a list of problems identified. 3. **Shortlisting:** Apply criteria like relevance, feasibility, user impact, and alignment with SDGs to shortlist **one problem** to work on for further Design Thinking phases.	1, 2
3	**Selection of Problems** **Activity:** Students will present (PPT) their selected problem, why they chose it, who the users are, and the evidence collected.	1, 2
4	**Designing of Empathy Map** **Activity: Prepare Empathy Map** – Visualize what users say, do, think, and feel.	1, 3
5	**Customer Survey and Analysis** **Activity:** Students create a structured survey (MCQ, likert scale, open ended questions etc.) using google forms and prepare charts (bar, pie etc) and do the analysis.	1, 3
6	**Persona Building** **Activity:** Based on findings from **Observations and interviews, Customer Survey and Analysis**from previous experiments, identify pattern i.e. common characteristics, behaviors, needs, pain points, and goals among users and create persona template.	1, 3
7	**Customer Journey Map** **Activity:**Select the persona created in the previous experiment, define the Scenario, List Stages/Phases of the Journey, Map User Actions, Identify User Emotions, Identify Touchpoints, Identify Pain Points and opportunities for Improvement.	1, 3
8	**Defining the problem** **Activities:** **Observation of Stakeholders** – Note behaviors and pain points. **5 Whys Method (Drill Down)** – Uncover root causes behind a problem. **Root Cause Mapping** – Visual diagram connecting symptoms to core issues. **Refine Problem Statement** – Create a focused, actionable problem definition.	1, 3
9	**Poster Presentation** **Activity:** Use A2/A1 sheet and draw charts, diagrams, sketches, and minimal text to represent experiment no 1-8.	1, 2,3
10	**Ideation** **Activities:** **SCAMPER Model** – Modify existing ideas by Substituting, Combining, Adapting, etc. **Brainstorming (Crazy 8 Method)** – Rapid sketching of 8 ideas in 8 minutes. **Mind Mapping** – Visually connect ideas around a central problem/theme. Use the suitable and best one activity from above.	1,4

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11	**Prototype Building** **Activities:** **Storyboarding** – Sketch out user scenarios and interactions. **Prototyping** – Build a working model or prototype or model.	1, 5
12	**Testing** **Activities:** **Scenario-Based Testing** – Test ideas in realistic user scenarios. **Peer Testing** – Get feedback from other participants or teams.	1, 5
13	**Refinement & Recommendation** **Activities:** **Final Presentation** – Showcase prototype or working model. **Documentation of Learnings** – Reflect on the process, improvements, and impact (Make a report). Apply for IPR/Incubation/Research Grant/Paper Publication.	1, 5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. E Balaguruswamy, Developing Thinking Skills (The way to Success), First Edition, KhannaBook Publishing Company, 2023
2. Tim Brown, Change by Design: How Design Thinking TransformsOrganizations and Inspires Innovation, First Edition, Harvard Business Review, 2008
3. R T Krishnan & V Dabholkar, 8 steps to Innovation, First Edition, Collins Publishing, 2013

References:

1. Nigel Cross, Design Thinking, First Edition, Bloomsbury, 2011
2. Idris Mootee, Design Thinking for Strategic Innovation, First Edition, Wiley, 2013

Online Learning Resources

1. NPTEL_Design Thinking - A Primer
   https://youtu.be/AamBSYPJlcA?si=wJDNT4L9q1NB-6T9
2. Design Thinking and Innovation
   https://www.coursera.org/learn/designthinkingandinnovation

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Department of Food Technology

Course Information:

Class, Semester	FY. B. Tech, Semester – I	**Category**	**HS**
Course Code, Course Title	**2FTHS107 Indian Knowledge System**	**Type**	**T2**
Prerequisites	-		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**
	2	-	-	-	2

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

CO1	Explain the historical context and evolution of the Indian Knowledge System (IKS) and its relevance to modern engineering.
CO2	Analyze ancient Indian mathematical, astronomical, and technological methodologies and compare them with contemporary engineering practices.
CO3	Apply concepts from Ayurveda and ancient biological sciences to modern problem-solving in healthcare and related fields.
CO4	Evaluate traditional Indian architecture, materials, and construction principles as early forms of sustainable engineering design.
CO5	Integrate philosophical and scientific logic from Indian thought into ethical decision-making and sustainable engineering practices.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction & Historical Context** Overview of the Indian Knowledge System: Philosophy and Scope, Historical timelines and key epochs, Geographical and cultural influences on ancient Indian science, Interdisciplinary approaches in ancient India, Comparative analysis with other ancient civilizations	5
II	**Mathematics & Astronomy in Ancient India** Foundations of Vedic Mathematics and its modern applications, Concepts of zero, decimal system, and number theory, Astronomical instruments and observational techniques, Calendrical systems and time measurement in ancient India, Engineering parallels in algorithmic design and computational thinking	5
III	**Ayurveda and Life Sciences** Introduction to Ayurveda: Philosophy, doctrines, and methodologies, Medicinal systems and their chemical/pharmacological principles, Human physiology and surgical techniques in ancient texts (e.g., Sushruta Samhita), Integrating traditional knowledge with modern biomedical engineering, Innovations in material sciences: Natural polymers and biocompatible materials	5

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IV	**Architectural Knowledge & Engineering Innovations** Ancient Indian architecture: Principles, materials, and techniques, Urban planning and infrastructure in historical Indian kingdoms, Structural innovations: Temples, forts, and water management systems, Engineering analysis of construction techniques from a modern perspective, Case studies: Earthquake-resistant designs in ancient constructions	5
V	**Philosophy, Science & Ethics (Lectures 21-25)**Indian philosophical schools and their perspectives on science, The concept of Rta (cosmic order) and its engineering analogies, Early scientific inquiry and epistemology in classical texts, Ethics, sustainability, and social responsibility in engineering, Integration of moral values and technical rigor in project design	5
VI	**Contemporary Relevance & Innovation (Lectures 26-30)** Bridging ancient wisdom with modern technology, Case studies: Reviving lost techniques to inspire modern engineering solutions, Workshops on innovation and design thinking using Indian Knowledge System principles, Integration of cultural heritage in sustainable product design	4
	Total Lecture Hours	29

Text Books

1. Indian Knowledge Systems: An Introduction by Dr. Vivek Ramaswamy, Oxford University Press,2nd, 2005.
2. Traditions of Indian Science: A Textbook by Dr. Shyam R. Jha, Cambridge University Press, 1st, 2010.
3. Contemporary Perspectives on Ancient Indian Wisdom by Dr. Arvind Sharma, Routledge, 1st, 2013.
4. Foundations of the Indian Knowledge System by Dr. Meera Nair, Sage Publications, 3rd, 2015.
5. Indian Thought and Science: Bridging the Past and Present by Dr. Ram Prasad, Springer, 2nd, 2008.

References:

1. Encyclopedia of Indian Intellectual Heritage by Dr. Anil Kumar, Oxford University Press, 1st,2012.
2. Indian Philosophy and Science: A Reference Guide by Dr. Lalit Singh, Cambridge University Press, 2nd, 2014.
3. The Vedic and Post-Vedic Traditions: A Reference Book by Dr. Pradeep Kumar, Routledge, 1st, 2003.
4. Handbook of Indian Knowledge Systems by Dr. Sunita Reddy, Sage Publications, 1st, 2016.
5. Traditional Indian Sciences: An Annotated Bibliography by Dr. Kavita Menon, Springer, 1st, 2020.

Online Learning Resources

https://https://onlinecourses.swayam2.ac.in/imb23_mg53/preview

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Department of Food Technology
Established: 1999

Course Information:

Class, Semester	F.Y. B.Tech, Semester - I				**Category**	**VSEC**
Course Code, Course Title	**2FTVS108, IDEA Laboratory**				**Type**	**L2**
Prerequisites	--					
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**	
	1	-	2	-	2	

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		--	--	--		50	--

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO 1	Operate basic workshop tools for material processing and assembly
CO 2	Make simple 2D and 3D designs using CAD software and prepare them using 3D printing, laser cutting, or CNC machining
CO 3	Build basic electronic circuits using sensors, LEDs, motors, and microcontrollers
CO 4	Apply fundamental programming concepts in embedded C (Arduino IDE) for controlling hardware and automating simple tasks.
CO 5	Integrate mechanical parts and electronics to design and build working models or prototypes.

Syllabus:

Module	Contents	Lecture Hours
I	**Overview of IDEA Lab** Introduction to the IDEA Lab: Vision, objectives, **National Innovation Ecosystem** (IIC, Atal Innovation Mission, NISP), Importance of multi-disciplinary, project-based learning Inspirational case studies from IDEA Labs, Safety protocols, Do & Don'ts in IDEA Lab.	1
II	**Fundamentals of Design & Prototyping** **Design Thinking Basics**: Problem identification, ideation, prototyping, testing, and iteration, **Introduction to CAD Software**: Concepts of 2D and 3D modeling for various applications, File Formats for Fabrication: Understanding STL, DXF, G-Code, SVG, and their uses, Tolerances, fits, and design constraints for manufacturing.	2

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III	**Digital Fabrication Technologies** **3D Printing**: Principles, types of 3D printers, materials, slicing software, and applications. **Laser Cutting & Engraving**: Principles, types of lasers, materials, design considerations, and safety. **CNC Router**: Introduction to CNC Router and Mini Desktop Lathe cum Milling operations, G-code fundamentals, material removal processes. **3D Scanning**: Principles of 3D scanning, applications in reverse engineering and quality control. **PCB Fabrication:** Introduction to PCB Milling Machine and PCB Prototype Machine for custom circuit boards.	3
IV	**Fundamentals of Embedded Systems & IoT** **Basic Electrical and Electronic Concepts:** Voltage, current, resistance, Ohm's Law, and fundamental components (resistors, capacitors, diodes, LEDs, sensors, actuators), Measuring Instruments **Overview of microcontrollers**: Overview of Arduino, ESP32, NodeMCU, and their applications in controlling hardware. Circuit simulation using TinkerCAD or Proteus. **IoT Basics**: Basic networking (Bluetooth/Wi-Fi/Ethernet), cloud integration	3
V	**Programming for automation** **Arduino IDE and Embedded C Programming**: Setup, basic syntax (setup(), loop()), digital and analog I/O control. **Basic Control Systems:** Concepts of open-loop and closed-loop control with simple examples. **Introduction to Python.**	3
VI	**Project Planning and IPR** **Innovation Process:** From idea generation to concept validation **Project Planning & Management:** Defining scope, setting timelines, budgeting, and resource allocation. **Documentation and Presentation:** Writing a concept note, creating innovation posters, and effective pitching techniques. **Intellectual Property Rights (IPR):** Basics of Patents, Copyrights, and Trademarks relevant to innovation.	3
	Total Lecture Hours	15

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Introduction, Lab Safety & Tool Familiarization	1
2	Hands on practice of Mechanical Workshop Tools	1
3	3D Printing of simple parts	2
4	Laser Cutting	2
5	CNC Routing/ Engraving	2
6	Basic Electronics circuit	3
7	PCB Design and Prototyping	3
8	Microcontroller Programming and Sensor Interfacing	4
9	Mini Project	5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

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Text Books

1. Veeranna D.K., AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2022
2. Saji T. Chacko, Susan S. Mathew, AICTE's Prescribed Textbook: Fundamentals of Electrical and Electronics Engineering (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2024
3. Mehta S.D., Electronic Product Design Volume - I (Basics of PCB Design), 1st Edition, S Chand & Company, 2011
4. Mehta-Gupta, Y.P.Mehta, Vishal Mehta, Workshop Calculation and Science, 1st Edition, Dhanpat Rai Publications, 2020

References:

1. A. K. Maini, Nakul Maini, All-in-One Electronics Simplified, 1st Edition, Khanna Book Publishing Company, 2021
2. J.G. Joshi, Electronics Measurements & Instrumentation, 1st Edition, Khanna Book Publishing Company, 2025
3. Dr. Sabrie Soloman, 3D Printing & Design, 1st Edition, Khanna Book Publishing Company, 2020
4. Kaushik Kumar, Hridayjit Kalita, Workshop/Manufacturing Practices, 5th Edition, S Chand & Company, 2011

Online Learning Resources

1. NPTEL Course on 3D Printing and Design for Educators, By Dr. Sharad K. Pradhan, NITTTR Bhopal https://onlinecourses.swayam2.ac.in/ntr24_ed17/preview
2. NPTEL Course on Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software, By Prof. Ankur Gupta, IIT Delhi https://onlinecourses.nptel.ac.in/noc24_ee127/preview

Experiments that may be performed through virtual labs:

S. No	Experiment Name	Experiments Links
1.	3D Printing Virtual Simulation Lab	https://3dp-dei.vlabs.ac.in/
2.	Digital Fabrication of Flexible Circuit board	https://fab-coep.vlabs.ac.in/exp/digital-fabrication/
3.	Embedded System Design with 8051 and PIC Microcontroller	https://esd-coep.vlabs.ac.in/

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Department of Food Technology

Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - II	**Category**	**BS**
Course Code, Course Title	2FTBS109, Applied Mathematics-II	**Type**	**T1**
Prerequisites	2FTBS101, Applied Mathematics-I		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	1	-	1	4

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Determine equation of a curve and compute statistical measures to analyze data using statistical techniques
CO2	Compute approximate root of algebraic and transcendental equations using numerical methods
CO3	Calculate approximate solution of system of linear equations using numerical techniques
CO4	Determine unknown values from tabulated data using finite difference and interpolation techniques.
CO5	Compute differentiations and integrations from tabulated data using finite difference and rules of numerical integrations.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Curve fitting and Statistics:** Method of Least Squares, Fitting of Straight Line, Fitting of Parabola, Fitting of exponential curves, Lines of Regression.	**8**
II	**Numerical Solution of algebraic and transcendental equation:** Introduction, Bisection method, Regula Falsi method, Secant method, Newton Raphson method.	**7**
III	**Numerical Solution of System of linear equation:** Gauss elimination method, Gauss-Jordan method, Gauss-Seidal method, Jacobi's iteration method, LU decomposition	**7**
IV	**Statistical Measures**: Introduction, Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Partition values: Quartiles, Deciles and Percentiles, Concept of dispersion, Range, Quartile Deviation, Mean Deviation, Mean Square Deviation, Variance and Standard Deviation.	**8**
V	**Finite Differences and Interpolation:** Finite differences, Forward and Backward Difference Newton's forward Interpolation formula, Newton's backward Interpolation formula, Stirling Interpolation formula, , Newton's Divided Difference, Lagrange's interpolation formula.	**8**

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VI	**Numerical Differentiation and Integration:** Derivatives using Newtons forward and backward difference formula, Newton's Divided difference formula, Integration using Trapezoidal Rule, Simpson's 1/3 Rule and 3/8 rule	7
	Total Lecture Hours	**45**

List of Tutorial with CO Mapping

Sr.No	Title of Tutorial	CO Mapped
1	Fitting of straight line and Second degree parabola	1
2	Fitting of exponential curves and lines of regression	1
3	Numerical solution of equations by Bisection and Regula-falsi method	2
4	Numerical solution of equations by Newton-Raphson and Secant method	2
5	Numerical solution of system of linear equation	3
6	Measures of Central tendency	1
7	Measures of dispersion	1
8	Interpolation with equal intervals	4
9	Interpolation for unequal intervals	4
10	Numerical differentiation and Integration	5
	Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications, 2011
2. H. K. Das, Advanced Engineering Mathematics, 22th Edition, S. Chand, 2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. Dr. B. S. Grewal, Numerical Methods, 9th Edition, Khanna Publishers, 2010.

References:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2018
2. N. P. Bali, Manish Goyal, Advanced Engineering Mathematics, 7th Edition, Infinity science press, 2010.
3. S. C. Gupta, V. K. Kapoor, Fundamental of Mathematical Statistics, 10th Edition, Sultan Chand and Sons Publisher, 2000.
4. Seymour Lipschutz, Marc Lars Lipson, Linear Algebra, 4th Edition, McGraw Hill, 2009.

Online Learning Resources

1. NPTEL Course on Engineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course Business Statistics, by Prof. Mukesh Kumar Barua, IIT Roorkee https://nptel.ac.in/courses/110107114
4. NPTEL Discrete Mathematics, by Dr. Sugata Gangopadhyay, Dr. Aditi Gangopadhyay, IIT Roorkee https://nptel.ac.in/courses/111107058

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Established: 1999

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Course Information:

Class, Semester	FY. B.Tech, Semester - II	**Category**	**BS**
Course Code, Course Title	**2FTBS110,** Applied Physics	**Type**	**LIT2**
Prerequisites	12th Standard Physics		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	-	2	-	4

Examination Scheme (Marks)	**Theory**				**Practical**		
	MSE	**TA**	**ESE**		**CIA**	**ESE**	
	40	20	40		50	-	

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Describe** the basic principles of nanotechnology for nonmaterial production using appropriate synthesis methods and microscopy techniques.
CO2	**Use** the principles of magnetism and semiconductor physics to select suitable materials for engineering applications.
CO3	**Apply** optics concepts to analyze diffraction, polarization, lasers, and fiber optic transmission in engineering contexts.
CO4	**Apply** theoretical and practical knowledge to solve engineering problems in architectural acoustics and ultrasonic using appropriate formulas and experimental methods.
CO5	**Interpret** crystal structures and X-ray diffraction results to determine lattice parameters and interplanar spacing using Bragg's law and Miller indices.

Syllabus:

Module	Contents	Lecture Hours
I	**Interference , Diffraction & Polarization** : **Interference** -Introduction, Constructive and destructive interference, Newton's rings. **Diffraction** - Introduction, Diffraction grating, Plane diffraction grating –construction and theory, Determination of wavelength of light using plane diffraction grating, Resolving power of grating, Numericals. **Polarization:-** Introduction, Polarization of light, Polarization by double refraction, Positive and Negative crystals, Laurent's half shade Polarimeter, Numericals.	7
II	**Laser and Fiber Optics :** **Laser**: Introduction, Principle of laser, Pumping and Population inversion, Characteristics of laser, Ruby Laser, Applications of laser in Food industry. **Optical fibre**: Introduction, Total internal reflection, Structure of optical fibre, Propagation mechanism of optical fibre, Numerical aperture, Acceptance angle, Skip distance, Attenuation, Types of optical fibre, Applications of optical fibre in Food industry.	7

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III	**Acoustics and Ultrasonic :** **Acoustics :** Introduction, sound wave, properties of sound wave, Classification of sound waves, Basic requirements for acoustically good hall, Reverberation, Reverberation time, Sabine's formula (Conceptual discussion), Absorption coefficient, Factors affecting the architectural acoustics and their remedies. **Ultrasonic:** Ultrasonic waves, Magnetostriction effect and Oscillator, Determination of Wavelength and velocity of ultrasonic waves, Detection of ultrasonic waves, applications of ultrasonic waves in field of Food industry, Numericals.	**8**
IV	**Crystallography :** Unit cell, Space lattice, Seven crystal system, Bravais space lattices, Properties of cubic unit cell, Relation between lattice constant and density, Interplanner spacing for cubic system, Miller indices, Symmetry elements in cubic crystal, X-ray diffraction, Bragg's law, Braggs X-ray spectrometer, X-ray spectra (Continuous and characteristics), Numericals.	**7**
V	**Introduction to Materials :** **Magnetic materials**: Origin of magnetism, magnetization, types of magnetic materials, Domain theory of ferromagnetism, hysteresis effect, Soft and hard magnetic materials, applications in Food industry. **Semiconductor** - Introduction, types of Semiconductor (Intrinsic & Extrinsic), Band theory of semiconductor, Fermi energy and its location in semiconductor, conductivity of semiconductor, Hall effect.	**9**
VI	**Nanophysics :** Introduction, Nanotechnology, nano-materials, Top-down and Bottom-up synthesis approach,, Ball milling method, Sol-gel synthesis method, Carbon nanotubes, Properties and applications of carbon nanotubes, Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM), Properties and applications of nano-materials in Food industry .	**7**
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Plane Diffraction Grating- Determine the wavelength of light using plane diffraction grating.	3
2	Laurent's Half shade Polarimeter - Determination of specific rotation of optically active material.	3
3	Laser - Determination of wavelength of He-Ne laser light using diffraction grating.	3
4	Laser - Determination of divergence of He-Ne laser light	3
5	Numerical aperture of optical fibre: To calculate NA of optical fibre by laser diode.	3
6	Inverse Square Law- Verify inverse square law.	3
7	Band gap energy: To determine band gap energy of given semiconductor.	2
8	Ultrasonic interferometer- To determine the velocity of ultrasonic waves in given liquid and to determine the compressibility of the liquid	4

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9	Kund's tube for determination of velocity of sound			4
10	Newton's Rings-To determine the wavelength of the given monochromatic source of light by Newton's ring method			3
11	BH Curve Tracer			3
12	Hall Effect			3
13	Determination of Miller Indices of a given plane and models			5
14	Crystal Symmetry-23 Symmetries in cubic crystal			5
Total Practical Sessions		**15**	**Total Practical Hours**	**30**

Minimum **TEN** experiments should be perform from the above list

Text Books

1. M.N.Avadhanulu& P. G. Kshirsagar, A Text Book of Engineering Physics,12th Edition, S. Chand Publication,2018
2. P. K. Palanisamy, Engineering Physics, 2nd Edition, Sci Tech pub. (P) Ltd.2018
3. G Vijayakumari, Engineering Physics, 3rd Edition, Vikas Pub. House (P) Ltd ,2009
4. K.K.Chattopadhyay and A.N. Banerjee, Introduction to Nano Science and Nanotechnology,3rd. PHI Learning,2009

References:

1. David Halliday, Robert Resnick&Jearl Walker, Fundamentals of Physics,12th Edition,2021.
2. ResnickHalliday, Krane, Engineering Physics,8th Edition, John Wiley & Sons Pub.,2008.
3. R. K. Gaur & Gupta S. L, Engineering Physics,8th Edition, DhanapatRai Publication,2008
4. Sulbha K. Kulkarni, Nanotechnology Principles and Practices, 4th Edition, Springer,2007
5. Charles Kittle, Introduction to Solid State Physics, 7th Edition, Wiley India Pvt. Ltd,2008
6. V. Raghvan, Materials Science and Engineering,5th Edition, PHI Learning,2006.

Online Learning Resources

1. For optics- https://nptel.ac.in/courses/122/107/122107035/
2. For Quantum Physics -https://nptel.ac.in/courses/122/106/122106034/
3. For Ultrasonic -- https://freevideolectures.com/course/3531/engineering-physics-i/8
4. For Solid State Physics -- https://nptel.ac.in/courses/115/105/115105099/

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Photoelectric Effect	https://mp-amrt.vlabs.ac.in/exp/photoelectric-effect/index.html
2.	Numerical Aperture of Optical Fiber	https://lo-amrt.vlabs.ac.in/exp/numerical-aperture-optical-fiber/
3.	LASER Beam divergence and spot size	https://lo-amrt.vlabs.ac.in/exp/laser-beam-divergence/

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Department of Food Technology
Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - II					**Category**	**PC**
Course Code, Course Title	2FTPC111, **Engineering Thermodynamics**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	2	-	-	1		2	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Differentiate types of systems and its thermodynamic properties.
CO2	Apply thermodynamic property relationships to given system.
CO3	Analyze given thermodynamic system for its properties.
CO4	Evaluate thermodynamic data for food processing applications.

Syllabus:

Module	Contents	Lecture Hours
I	**First Law and basic concepts** Basic: Scope & limitation of thermodynamics, Dimension & Units, force, temperature, pressure, work, energy and heat, properties- extensive, intensive, dependent/independent. First law of thermodynamics: heat & work, reversible & irreversible process. Closed systems, internal energy, enthalpy, heat capacity, open systems, latent heat.	5
II	**Volumetric properties of pure fluids:** P-V-T behavior of pure substances, virial equation of state, ideal gas temperature, universal gas constant, the ideal gas & equations for various processes, application of the virial equation. The vanderwaal equation of state	5
III	**Second law of thermodynamics:** Second law of thermodynamics & entropy: reversibility, irreversibility, entropy, the second law of thermodynamics, entropy changes of an ideal gas, significance of entropy in food industry	5
IV	**Solution thermodynamics:** Partial properties, Equations relating molar and partial molar properties, partial properties in binary solutions, relations among partial properties, problems, ideal gas mixture.	5
V	**Phase equilibrium**: Phase equilibria, fugacity: definition, fugacity in vapor phase, fugacity coefficients, mixing of ideal gases, criteria of phase equilibrium. Liquid-liquid equilibrium, solid-liquid equilibrium,	5

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VI	**Chemical reaction equilibrium:** Equilibrium of single reaction, application of equilibrium criteria to chemical reactions. Gibbs phase rule, the standard gibbs energy change & the equilibrium constant & their temperature.	5
	Total Lecture Hours	**30**

Text Books

1. Smith, van ness, Abbott, Introduction to Chemical Engineering Thermodynamics,8th, McGraw-Hill Companies, inc., Series in Chemical Engineering,2018
2. CamilaGambini Pereira, Thermodynamics of phase Equilibrium in Food Engineering,1st, Academic Press,2018
3. S.I Sandler, Chemical, Biochemical & Engineering Thermodynamics,5th, Wiley a. publications,2017

References:

1. S. M. Walas, Phase equilibrium in Chemical Engineering,1st, Buttorworth publishers,1985

Online Learning Resources

1. NPTEL Course on Engineering Thermodynamics By Prof. V. Raghavan IIT Madras https://onlinecourses.nptel.ac.in/noc23_me141/preview
2. NPTEL Course on Thermodynamics By Prof. Anand T. N. C. IIT Palakkad https://onlinecourses.nptel.ac.in/noc23_me76/preview

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Course Information:

Class, Semester	FY. B.Tech, Semester - II	**Category**	**ES**
Course Code, Course Title	**2FTES112 –Food Chemistry**	**Type**	**LIT1**
Prerequisites	**1FTBS103 ,1FTES112**		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	-	2	-	4

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Understand** the chemical composition and functional roles of food components such as water, macronutrients, and sensory compounds in relation to food preservation and quality.
CO2	**Classify** the chemical reactions, structures, and industrial significance of carbohydrates in food systems.
CO3	**Understand** the structural and functional properties of proteins and demonstratetheir modifications and applications in food processing.
CO4	**Analyze** the chemical nature, classification, degradation, and nutritional aspects of lipids in foods and **assess** their implications for stability and safety.
CO5	**Evaluate** the chemistry, functionality, and nutritional relevance of vitamins and **assess** their stability during processing and health impacts.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Introduction**: Nature, scope, and development of food chemistry; proximate analysis; water in food systems (free and bound water); water activity and preservation; sensory attributes; antinutritional factors.	7
II	**Carbohydrates**: Classification, structure, chemical properties; reactions (caramelization, Maillard reaction); sucrose hydrolysis; starch properties and modification; glucose syrups and commercial products.	8
III	**Proteins**: Amino acids, peptides, protein structures; denaturation, functional properties; isolation and purification; food protein systems; modified proteins.	8
IV	**Lipids:** Chemistry of lipids, classification; fatty acids, sterols, waxes; lipid deterioration (rancidity, reversion); thermal stability and nutritional aspects	7
V	**Vitamins:** Classification, chemistry, functions, sources, RDA; stability during processing; assays; deficiency and toxicity.	7

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VI	**Food Additives and Contaminants:** Definition and classification of food additives (preservatives, emulsifiers, stabilizers, colorants, flavor enhancers); chemical nature, functionality, and technological roles in food systems; permissible limits and regulations (FSSAI, Codex); contaminants—types (natural, environmental, processing-induced)	8
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Determination of Moisture content by Hot Air Oven method	1
2	Preparation of different gel system	2
3	Preparation of Emulsion and Determination of Emulsion stability	4
4	Isolation of protein from different food sources	3
5	Preparation of protein Isolate/Concentrate	3
6	Isolation of starch of given sample	2
7	Studies on different properties of starches	2
8	Determination of total sugar in food	2
9	Determination of physical properties of Fat	4
10	Determination of acid value of oil	4
11	Determination of iodine values of oil	4
12	Project	1-5 As possible

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. Owen R, Fennema Marcel Dekker, Food Chemistry,Inc., New York, USA. 3rd 1996.
2. Lillian Hoagland Meyer , Food Chemistry ,The AVI Publishing Co Inc., Connecticut, MA, USA. 1st,1973
3. DeMan JM, Principles of Food Chemistry,AVI Publishing Co Inc.3rd,1999. Swaminathan M. ,Ganesh & Co. Essentials of Food and Nutrition ,Reprint,2003

References:

1. John W. Brady ,Cornell Introductory Food Chemistry. Comstock Publishing Associates University Press, Ithaca, USA. ,1st ,2013.
2. H.-D. Belitz, W. Grosch and P. Schieberle , Food Chemistry ,Springer-Verlag, Berlin Heidelberg. ,5th ,2009
3. David Newton ,Facts on File, Food Chemistry, Inc. New York ,1st2007.
4. Eskin NAM, Henderson HM and Townsed RJ , Biochemistry of Foods ,Academic Press, New York ,2nd,2001

Online Learning Resources

1. NPTEL Course on Food Oils and Fats: Chemistry and Technology by Prof. Hari. Niwas Mishra | IIT Kharagpur
https://onlinecourses.nptel.ac.in/noc25_ag16/preview

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Course Information:

Class, Semester	FY. B.Tech, Semester - II					**Category**	**ES**
Course Code, Course Title	**2FTES113, Basic Electrical & Electronics Engineering**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**		**Tutorial**	**Practical**	**Self Study**	**Credits**	
	2		-	2	-	3	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Solve** the electrical circuits using fundamental laws to find electrical parameters.
CO2	**Determine** voltage, current and power using phasor concepts and sinusoidal waveform parameters of AC circuit
CO3	**Describe** electrical heating and explainthe working of AC/DC machines and transformer.
CO4	**Interpret** characteristics and working ofsemiconductor devices, rectifiers and transducers in various applications.
CO5	**Apply** number systems and logic gate operation to implement basic digital circuits.

Syllabus:

Module	Contents	Lecture Hours
I	**DC Circuits:**Introduction to Basic Electrical Quantities, Ohm's Law, Its applications and limitations, Equivalent Resistance of series parallel circuit, Kirchhoff's current Law, Kirchhoff's voltage law.	05
II	**AC Circuits:** Generation of Sinusoidal Voltage, Waveform, Cycle, Frequency, Time Period, Instantaneous value, RMS Value, Average Value, Form Factor, and Peak factor, Phasor representation of sinusoidal waveforms, Real, Reactive and Apparent power, Power factor, Analysis of single-phase ac circuits (R, L and C).	05
III	**Electrical Heating:** Importance of heating, Principles of resistive heating, Dielectric (Microwave) Heating, Modes of heat transfer, Application of heating. **Electrical Machine:** Principle, Construction, Working and Applications of DC motor, Single-phase induction motor and transformer.	06
IV	**Semiconductor devices and Its Applications**: Introduction to PN junction and Zener diode, Half wave and full wave rectifier, Bipolar junction transistors and Its input output characteristics – CE, CC, CB Configuration.	05

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V	**Digital Electronics:** Difference between analog and digital signal, Number conversion systems, Introduction to logic gates, Boolean algebra and theorems.	05
VI	**Transducer and Its Applications:** Transducers for Displacement, Level, Temperature, Pressure, Applications of transducers in digital thermometer, microwave oven.	04
	Total Lecture Hours	30

List of Experiments with CO Mapping

Sr.No	Title / Topic of the Experiment	CO Mapped
1	Study of Basic Electrical Components, Equipment and their symbols, and Safety Precautions in Electrical Engineering.	1
2	Experimental Verification of Kirchhoff's Laws.	1
3	Measurement of Power and Power Factor in a Single-phase Circuit.	2
4	Load Test on Single Phase Transformer.	3
5	Effect of Temperature on Resistance.	3
6	Experimental verification of Semiconductor Diode Characteristics	4
7	Experimental verification of Zener Diode Characteristics	4
8	Characteristics of Single-Phase Half-wave and Full-wave rectifiers.	4
9	Verification of truth tables of basic logic gates	5
10	Implementation of basic logic gates using universal gates.	5
11	To understand working principle of LVDT	4
12	To understand working principle of Thermocouple	4

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. D. P. Kothari, I. J. Nagrath, Basic Electrical Engineering,4th,Tata McGraw Hill,2019
2. D. C. Kulshreshtha, Basic Electrical Engineering,2nd,McGraw Hill.,2020
3. D. P. Kothari, Basic Electrical & Electronics Engineering ,2nd,TMH New Delhi ,2020
4. D. Patranabi, Sensors and transducers ,2nd,PHI learning Pvt. Ltd.,2003

References:

1. Millman and Halkias , Integrated Electronics,2nd,McGraw Hill,2010
2. A.K. Thereja and B.L. Thereja, Electrical Technology volume II,24th,S. Chand & Co. Publications,2024
3. L. Bakshi and A. Bakshi, Basic Electrical Engineering,1st,Technical Publications, Pune,2005
4. Albert Malvin, David Bates, Electronic Principles ,7th,McGraw Hill Education, 2017

Online Learning Resources

1. https://onlinecourses.nptel.ac.in/noc25_ee91/preview
2. https://onlinecourses.nptel.ac.in/noc25_ee92/preview

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Experiments that may be performed through virtual labs:		
Sr. No	Experiment Name	Experiments Links
1.	To understand working principle of LVDT	https://sl-coep.vlabs.ac.in/exp/lvdt/
2.	To understand working principle of Thermocouple	https://sl-coep.vlabs.ac.in/exp/temperature-sensor/
3.	Experimental Verification of Kirchhoff's Laws.	https://bes-iitr.vlabs.ac.in/exp/kirchhoff-law/

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Course Information:

Class, Semester	F.Y. B.Tech – Semester II					**Category**	**ES**
Course Code, Course Title	**2FTES114 Programming for Problem Solving**					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	1	-	2	-		2	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	--

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Prepare an algorithm and draw a flowchart to accurately solve various mathematical problems by using structured approach.
CO2	Apply the fundamental concepts like data types, operators to solve mathematical problems by using the C language.
CO3	Apply the decision and looping constructs to solve the problems related to decision, repetitive statements for real time problem statement using C
CO4	Develop a C program to demonstrate the modular approach by using the concept of function, structure and pointer
CO5	Write, Compile and debug C program for various problem statements by using structured approach.

Syllabus:

Module	Contents	Lecture Hours
I	**Basics of Programming** The meaning of algorithms, Flowcharts, Pseudo codes, Writing Algorithms and drawing flowcharts for simple exercises, C Program development environment.	2
II	**C Fundamentals** Importance of 'C' Language, History, Structure of 'C' Program, Sample 'C' Program, Constants, variables and data types, Enumeration. Operators and expressions, Managing input / output operations, Control statements-Decision making, Case control & Looping Constructs.	3
III	**Arrays and Strings** 1D and 2D Arrays: Declaration, Initialization, Input/output; Multidimensional Arrays; String Handling: Basics and Standard Functions	2
IV	**Functions** User Defined Functions, Function Declaration, Definition, Calling, Return Types, Parameter Passing, Scope, Recursion, Library Functions	2

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V	**Structure & Pointers** Structure Definition, Initialization, Accessing Variables, Arrays of Structures, Structures with Functions, Unions, Pointers: Basics, Arithmetic, Arrays, Strings, Functions, Dynamic Memory Allocation	4
VI	**File Handling:** File Operations: Open, Read, Write, Close; Error Handling, Random Access Files, Command Line Arguments, Preprocessor Directives	2
	Total Lecture Hours	15

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Write an algorithm and draw flowchart for given problem statements.	1
2	Implement a program using different data types and operators in C.	2
3	Implement a program using decision control statements.	3
4	Implement a program using repetitive control statements (for, while, do-while).	3
5	Implement a program using a selection control statement.	3
6	Implement a program using nested loop (for, while loop).	3
7	Program to demonstrate one dimensional array	3
8	Program to demonstrate two-dimensional array	3
9	Implement a program to demonstrate String handling functions.	3
10	Implement a program using user defined functions in C.	4
11	Program to demonstrate concept of recursion (factorial, Fibonacci)	4
12	Implement a program to demonstrate the concept of structures in C.	4
13	Implement a program to demonstrate the concept of arrays of structures in C.	4
14	Implement a program to demonstrate the concept of pointers in C.	4
15	Implement a program to demonstrate the concept of file handling in C.	5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. ISRD Group, Programming and Problem Solving Using C Language, McGraw-Hill Publications ,2012.
2. Yashwant Kanetkar , Let Us C , 3rdEdition, BPB , 2011.
3. Harvey M. Deitel, Paul J. Deitel, Abbey Deitel, C How to Program ,2ndEdition, Pearson ,2009.
4. E. Balaguruswamy , Programming in ANSI C , 4th Edition, BPB Publications, 2008

References:

1. D. M. Ritchie, The 'C' Programming Language, 2ndEdition, Pearson ,1998.
2. Sidnal, C Programming Laboratory: Handbook for Beginners, 1st Edition, Wiley India Limited, 2012.
3. Yashwant Kanetkar, Understanding Pointers in C, 4thEdition, BPB Publications,2001.
4. Yashwant Kanetkar, Test Your C Skills, 5th Edition, BPB Publications, 2013

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Online Learning Resources
1. NPTEL Course on Computer Programming By Dr. T. Sugirtha IIIT Tiruchirappalli https://nptel.ac.in/courses/111105035 2. Learn C Programming https://www.programiz.com/c-programming 3. C Programming Tutorials https://www.tutorialspoint.com/cprogramming/index.htm 4. C Programming Language https://www.geeksforgeeks.org/c-programming-language

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Course Information:

Class, Semester	FY. B.Tech, Semester - II	**Category**	**HS**
Course Code, Course Title	**2FTHS115 Professional Communication Skills**	**Type**	**L2**
Prerequisites	-		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	-	--	4	-	2

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Demonstrate the Listening, Speaking, Reading and Writing (LSRW) skills considering the frame of English language rules accurately for effective and sound communication in academic and profession contexts.
CO2	Exhibit their portfolio and career choices confidently, considering corporate expectations by using digital tools convincingly.
CO3	Write letters, reports, Emails and Blogs proficiently by following required techniques that help in getting acquainted with professional correspondence.
CO4	Attain professional skill while convincingly presenting on allotted topics using MS PowerPoint and AI techniques.
CO5	Justify own role in communicative events in well-organized manner with balanced zeal.

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Self - Introduction	1
2	SWOT Analysis	1
3	Basics of English Pronunciation	1
4	Rapid Review of Grammar	1
5	Diagnosing Listening and Speaking Skills	1
6	Diagnosing Reading and Writing Skills	1
7	Introduction to MS Office (Word, Excel, PPT)	1,4
8	Presenting my career choices	1,2
9	Preparing Portfolio	1,2
10	Describing Technical Charts, Image, and Processes	1,4
11	Using Language Learning Apps and Tools	1,4
12	Presenting Portfolio	1,2
13	Effective Presentation Skills	1,4

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14	Delivering Power Point Presentation	1,4,5
15	Job Application and Resume Writing	1,3
16	Email Writing	1,3
17	Group Discussion	1,5
18	Public Speaking	1,5
19	Report Writing	1,3
20	Organizing an Event	1,5
21	Technical Writing	1,3
22	Blog Writing	1,3
23	Mock Interview	1,2,5
24	Achievement Test	1

Total Practical Sessions	**30**	**Total Practical Hours**	**60**

Text Books

1. The Professional: Defining the New Standard of Excellence at Work SubrotoBagchi Penguin Books India Pvt. Ltd. Revised Edition,2011.
2. Cambridge Guide to IELTS. Pauline Cullen, Amanda French, Cambridge University Press, Reprint, 2017.
3. A Practical Course in Effective English Speaking Skills. J. K. Gangal, PHI Learning Private Limited, New Delhi, Print, 2012
4. English For Engineers. Dr. Shyamaji Dubey, Dr. Manish Kumar. Vikas Publication House Pvt. Ltd.New Delhi, Print, 2020.
5. Personality Development and Soft Skills. Barun K. Mitra, Oxford University Press, New Delhi , 7th impression, 2012.

References:

1. High-school English Grammar and Composition. Wren and Martin, S. Chand and Co., New Delhi, 1st edition, 2015.
2. The Ace of Soft Skills. Ajai Chowdry, Bala Balchandran, Pearson Publication, Delhi, 8th edition, 2017.
3. Effective Technical Communication. M. Ashraf Rizvi, McGraw Hill Education, Chennai,2nd edition, 2017.
4. Business Communication. Hory Sankar Mukerjee, Oxford University Press, New Delhi , 2nd edition, 2013.
5. Communicative English for Engineers and Professionals. Nitin Bhatnagar, Mamta Bhatnagar, Pearson Publication, Delhi, 1st edition, 2013.

Online Learning Resources

1. **Software:** Pronunciation apps (e.g., ELSA Speak, Speak English), grammar checkers (e.g., Grammarly).
2. **Online Platform** Coursera (for basic English courses), Duolingo, BBC Learning English.
3. NPTEL Course on Computer Programming By Dr. T. Sugirtha IIIT Tiruchirappalli https://nptel.ac.in/courses/111105035

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Course Information:

Class, Semester	FY. B.Tech, Semester - I						**Category**	**BS**	
Course Code, Course Title	**3BSCC121 , Introduction to Yoga and Mindfulness**						**Type**	**L2**	
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self Study**		**Credits**
	-		-		2		-		1
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**		**ESE**
		-	-	-			50		-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Describe** the significance and practical applications of yoga for holistic well-being under guided classroom sessions, ensuring coverage of physical, mental, and spiritual aspects.
CO2	**Explain** the role of subtle energy systems (chakras, nadis) in health enhancement using yogic practices, showing linkage to at least two health benefits.
CO3	**Compare** different paths of yoga (Bhakti, Jnana, Karma, Raja) through readings and discussions, citing at least one key practice and outcome for each..
CO4	**Demonstrate** the Eight Limbs of Yoga in practical sessions, reflecting personal integration of at least four limbs in daily habits or behavior.
CO5	**Apply** yoga and mindfulness techniques in real-life stress situations to improve emotional resilience, showing measurable improvement in two or more psycho-somatic areas.

Practice Session

S. No	Contents	CO Mapped
1	**Introduction to Yoga Practice and Warming Up Exercises** Overview of yoga philosophy and benefits. Practice basic stretching and warm-up routines. Introduction to breath awareness and mindfulness.	1,5
2	**Omkar ,Prathana and types of Asanas , Surya Namaskar.** Practice of Chant Omkar and opening prayer for mental centering. Perform Surya Namaskar and learn its 10-step sequence. Explore basic asana types: standing, sitting, supine.	1,4
3	**Sleeping position Asanas** Practice of Setubandhasana, Pavanmuktasanan, ChakraasaSetuBandhasana, Understand the effects on back, digestion, and spine.	1, 2
4	**Opposite sleeping position** Practice of Bhujangasana, shalbasanan, Dhanurashan, Makrasanan Focus on strengthening the back and improving posture.	1, 2

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5	**Seating Position** Practice of Padmaasna , Vajrasana , Gaumukhasan , Vakrasana Learn their benefits for digestion and meditation readiness.	**1, 4**
6	**Standing Position** Practice of Tadasana ,Vruksasana, Trikonaasan , Virasana. Emphasize balance, posture, and muscular endurance.	**1, 4**
7	**Meditation** Guided practice of breath-based (Anapan) and insight (Vipassana) meditation. Focus on observation without judgment.	**4, 5**
8	**Mantra meditation** Practice chanting and internal repetition of mantras. Use traditional mantras for focus and mental calm.	**4, 5**
9	**Yognidra** Perform deep relaxation technique (guided Yoga Nidra). Experience body awareness and mental stillness.	**4, 5**
10	**Pranayam 1** Practice AnulomVilom (alternate nostril), Bhramari (humming bee), and Sheetali (cooling breath).Focus on breath control and emotional regulation.	**2, 5**
11	**Pranayam 2** Practice Sitkari and Kapalbhati. Learn their effects on metabolism, energy, and clarity.	**2, 5**
12	**Tratak** Perform Tratak (candle gazing) for concentration. Understand through demonstration or video.	**4, 5**
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books

1. YogJeevan . Dr. ChakoteRiya1st Edition2016
2. YogParchichayaMandlikGuruji Nashik ,MandlikGurujiSecond Edition 2020

References:

1. Yoga for Modern Age Vethathiri Edition 16th 2023
2. Maharishi, Simplified Physical ExercisesVethathiri Edition I 2014

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Department of Food Technology

Course Information:

Class, Semester	FY. B.Tech, Semester - I						**Category**	**BS**	
Course Code, Course Title	**3BSCC122, Physical Fitness and Lifestyle Management**						**Type**	**L2**	
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**		**Self Study**		**Credits**	
	-	-		02		-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**	**ESE**	
		-	-	-			50	-	

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Explain the fundamentals of physical education and its role in developing holistic well-being.
CO2	Demonstrate appropriate fitness practices and techniques to improve cardiovascular endurance, strength, and flexibility.
CO3	Apply principles of wellness, including nutrition, sleep, and stress management, to maintain a healthy lifestyle.
CO4	Integrate yoga, mindfulness, and relaxation techniques to promote mental well-being and emotional balance.
CO5	Design a personalized lifestyle management plan based on fitness assessment, health goals, and behavior change strategies.

Practice Session

S. No	Contents	CO Mapped
1	**Introduction to Physical Education** Understand the meaning and objectives of physical education.Learn its role in promoting health, fitness, and overall well-being.Explore career options and importance in daily life.	1
2	**General Warm up** Practice dynamic warm-up routines before workouts. Increase heart rate and blood circulation to muscles. Prevent injuries and improve workout performance.	2
3	**Limbering down exercises. Free hand exercises, Cooling down exercises** Perform safe cool-down techniques post activity.Reduce muscle soreness and stiffness.Bring heart rate back to normal gradually.	2
4	**Stretching exercises / Flexibility exercises** Improve range of motion in joints. Reduce muscle tension and prevent injuries. Learn static and dynamic stretching methods.	2

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5	**Fitness Evaluation** 1 mile run and walk, Push ups , seat ups ,Seat and reach and BMI . Assess personal fitness using 1-mile run, push-ups, sit-ups, etc.Calculate BMI to understand body composition.Set personalized fitness goals based on results.	5
6	**Aerobic activities** Perform rhythmic activities to improve cardiovascular health.Engage in exercises like jogging, skipping, or dance aerobics.Enhance lung capacity and endurance.	2
7	**Sports and games(**Cricket, Volleyball, basketball, Kho-Kho,Kabaddi, Athletics) Play team games like Cricket, Volleyball, Kabaddi, etc.Develop teamwork, coordination, and sportsmanship.Improve motor skills and physical agility.	2
8	**Sports and games(Badminton, Table Tennis, Chess)** Participate in games like Table Tennis, Badminton, Chess. Improve reflexes, concentration, and decision-making. Promote mental sharpness and social interaction.	4
9	**Circuit Training, Strength Activities** Perform multiple exercises in a sequence (circuit). Focus on building muscular strength and stamina. Use minimal equipment for maximum benefit.	2
10	**Agility and Coordinative activities** Practice quick movement drills to improve reflexes. Enhance body coordination and balance. Develop speed and reaction time.	2
11	**Body weight exercises** Do exercises like push-ups, squats, lunges, and planks.Improve strength using your own body resistance.No need for gym equipment.	2
12	**Functional training** Mimic real-life movement patterns (bending, lifting, reaching). Improve daily functional strength and flexibility. Prevent posture-related problems.	3

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. Test, Measurement and Evaluation in Sports and Physical Education*. 5th ed., Friends Publications, 2023.
2. Rules of Games and Sports Updated version, Khel Shaitya Kendra, 2023.

References:

1 Beashel, Paul, and John Taylor. Physical Education: Essential Issues. Hodder Stoughton, 1997.

2 Sodhi, H. S., and S. K. Sidhu.*Physique and Selection of Sportsmen.* Punjab Publishing House, 1984.

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Department of Food Technology

Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**3BSCC123, Six Sigma Happiness and Mind Mechanics**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	2	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	Analyzepersonal life patterns and decision-making processes using visual tools like life maps and time audits to improve self-awareness and productivity.
CO2	Identifyand modify recurring behavioral or emotional challenges using root cause analysis and habit-tracking techniques
CO3	Apply reflective and psychological tools such as the Gratitude Journal, PERMA Wheel, and mindfulness meditation to enhance emotional well-being.
CO4	Utilize creative thinking and visualization techniques such as mind mapping, personal development canvas, and flow activities to enhance planning and motivation.
CO5	Formulate and monitor measurable personal goals using SMART criteria and Six Sigma strategies to construct a structured self-improvement and lifestyle plan.

Practice Session

S. No	Contents	CO Mapped
1	**Life Process Mapping** Understand personal daily patterns. Identify meaningful and unproductive activities. Improve decision-making awareness. Build a visual blueprint of life routines.	1
2	**Time Audit Diary** Track hourly usage of time. Identify time-wasters and focus zones. Increase productivity through reflection. Learn prioritization techniques.	1,2
3	**Root Cause Analysis** Find root causes behind repeated problems. Use cause-effect diagrams (Fishbone). Develop problem-solving skills. Prevent recurring emotional or behavioral setbacks.	1
4	**Habit Tracker Creation** Monitor progress of personal habits. Encourage accountability and consistency. Recognize triggers and patterns. Reinforce good habits using visual tools.	3

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5	**Control Chart for Habits** Apply Six Sigma's statistical approach to habits. Track habit frequency over time. Identify variation in behavior patterns Improve self-control and discipline.	3
6	**Gratitude Journal** Practice daily reflection on positive moments. Enhance emotional well-being. Reduce stress and negativity. Cultivate a habit of appreciation.	4
7	**PERMA Wheel Self-Assessment.** Evaluate happiness using 5 key pillars (Positive emotion, Engagement, Relationships, Meaning, and Achievement). Identify strengths and gaps in life satisfaction. Build awareness of emotional and social well-being. Create a personalized improvement plan.	4
8	**Flow Activity Practice** Engage in high-focus enjoyable activity. Understand the "flow" mental state. Boost intrinsic motivation. Reduce distractions and increase creativity.	4
9	**Mind Mapping the Brain** Visually organize thoughts and plans. Stimulate right and left brain together. Enhance memory, planning, and clarity. Strengthen problem-solving and goal-setting.	1, 5
10	**Guided Mindfulness Meditation** Practice breath work and awareness techniques. Reduce anxiety and mental fatigue. Increase present-moment awareness. Build emotional balance.	4
11	**Personal Development Canvas** Create a visual profile of strengths, values, and aspirations. Encourage strategic self-improvement. Connect life areas (career, personal, social). Track personal growth visually.	5
12	**SMART Goal Setting + Six Sigma** Define Specific, Measurable, Achievable, Relevant, Time-bound goals. Integrate Six Sigma process for goal monitoring. Improve consistency in self-development. Align actions with purpose and metrics.	5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1 S. Radhakrishnan, An Idealist View Of Life, 2015, HarperCollins.
2. Yogi Kochhar, Six Sigma Happiness (English Edition).
3 An idealist way of Life – S Radhakrishnan

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	3BSCC124, Creativity through Visual Arts					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	2	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Identify** and apply the elements of art—line, shape, color, texture, and space—through various drawing and painting techniques.
CO2	**Demonstrate** creativity and technical skills in using different mediums such as pastels, pen & ink, and water-based paints.
CO3	**Create** original prints using simplified printmaking techniques such as relief, intaglio, and monoprint methods.
CO4	**Design** visually appealing digital artwork such as posters, icons, and layouts using basic digital tools.
CO5	**Analyze** and reflect on personal artwork and peer creations to improve visual communication and aesthetic understanding.

Practice Session

S. No	Contents	CO Mapped
1	**Fundamentals of Visual arts** Introduction to elements of art: line, shape, colour, texture, space. Practice drawing with pencil and charcoal using simple objects and shapes. Explore light and shade for 3D effects.	1
2	**Basic Graphic Design** Learn principles of alignment, contrast, hierarchy, and balance. Create a basic visual composition using text and image elements. Use sketching or digital tools for layout planning.	2
3	**Typography & Font Design** Study of typefaces: serif, sans-serif, script, decorative. Draw custom fonts and stylized letters. Create a short phrase using hand-drawn typography.	2

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4	**Logo Design** Understand logo types: symbolic, text-based, combination marks. Design a logo for a fictional company or cultural event. Focus on clarity, colour choice, and relevance.	4
5	**Poster Design** Choose a theme: social message, event, awareness, culture. Develop layout and imagery using watercolour, pen & ink, or digital tools. Apply principles of visual hierarchy and focal point.	4
6	**Photography Task: Lines & Angles** Capture photographs focusing on geometric lines, angles, and symmetry. Submit 3–5 original photographs with a short description of each. Discuss visual impact and framing.	1, 5
7	**Digital Infographic Design** Choose a topic (e.g., Indian innovations, clean energy, internet safety). Create a digital infographic using free tools like Canva or PowerPoint. Combine icons, minimal text, and visuals to communicate clearly.	4
8	**Visual Metaphor Drawing** Select a concept (e.g., freedom, growth, technology) and represent it visually. Use drawing techniques to convey metaphor without text. Encourage creativity and symbolic thinking.	3,5
9	**Calligraphic strokes of Devnagari** Practice traditional and artistic Devanagari calligraphy. Use ink pens or brush pens to form characters. Create a short meaningful phrase in decorative calligraphy.	2
10	**Collage on Innovation in India** Use newspapers, magazines, or printed material. Prepare a collage on topics like ISRO, start-ups, or digital India. Emphasize arrangement, contrast, and theme clarity.	3,5
11	**Modern Arts** Introduction and fundamental of modern art, Study abstract and modern Indian Artists Create an abstract or modern art piece using acrylics, pastels, or digital tools. Focus on expression and experimentation.	3,5
12	**Geometric Pattern Design** Create a detailed design using compass, ruler, or digital drawing. Highlight symmetry, color, and repetition	1,2

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1. The New Drawing on the Right Side of the Brain.TarcherPerigee, 2012.
2. Digital Illustration: A Master Class in Creative Image-making.Rotovision, 2010.
3. A History of Indian Painting: The Modern Period.Abhinav Publications, 1994.
4. Basics of Visual Art. New Academic Publishing, 2015.

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**3BSCC125,Community Engagement through NSS**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	02	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Identify** the structure and needs of the local community through direct engagement and observation.
CO2	**Analyze** community issues and participate in collaborative problem-solving activities.
CO3	**Demonstrate** social and civic responsibility by applying engineering knowledge in real-world social contexts.
CO4	**Develop** teamwork, leadership, and democratic values through community mobilization and shared responsibility.
CO5	**Respond effectively** to emergencies and promote national integration, unity, and social harmony through participation in relevant campaigns and awareness programs.

Practice Session

S. No	Contents	CO Mapped
1	**Cleanliness Drive (Swachh Bharat Abhiyan)** Conduct campus and neighbourhood cleaning. Raise awareness about hygiene and waste segregation.	1,2,3
2	**Tree Plantation** Plant saplings in college or public areas. Educate the community on environmental benefits.	1,3
3	**Road Safety Campaign** Conduct rallies, skits, or poster campaigns. Spread awareness about traffic rules and safe driving.	2,3,5
4	**Health Check-up Camp** Organize basic health screening with medical professionals. Promote hygiene, nutrition, and disease prevention.	1,2,5
5	**Literacy Drive** Teach basic reading and writing to underprivileged children or adults. Distribute learning materials and encourage regular attendance.	1,3,5

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6	**Voter Awareness Campaign (SVEEP)** Inform citizens about voter rights and the election process. Promote ethical voting through posters and street plays.	**2,3,5**
7	**Plastic-Free Campus Initiative** Educate peers on the harmful effects of plastic. Conduct collection drives and promote reusable alternatives.	**2,3**
8	**Cultural and Heritage Promotion** Organize folk art, dance, and storytelling sessions. Engage the community in preserving local culture.	**3,5**
9	**Yoga and Wellness Sessions** Conduct yoga and mindfulness sessions for students and locals. Promote physical and mental health through regular practice.	**3,4**
10	**Self-Defence Training for Girls** Organize practical training on basic self-defence techniques. Empower girls with safety awareness and confidence.	**4,5**
11	**Social Contribution Orphanage/ Old age home visit** Hold discussions or exhibitions on gender, caste, and social equality. Encourage inclusive behavior and respect for diversity.	**3,4,5**
12	**Digital Literacy Program** Teach basic smartphone and internet use to the elderly or untrained groups. Promote safe and productive use of digital tools	**2,3,5**
Total Practical Sessions	**15**	**Total Practical Hours** **30**

References Books:

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, nss cell, Activities reports and its manual.

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Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - I						**Category**	**BS**	
Course Code, Course Title	**3BSCC126, Cultural Exploration & Heritage**						**Type**	**L2**	
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self Study**		**Credits**
	-		-		2		-		1
Examination Scheme (Marks)	**Theory**	**MSE**		**TA**	**ESE**	**Practical**	**CIA**		**ESE**
		-		-	-		50		-

Course Outcomes (COs) : Upon successful completion of this course, the student will be able to:

CO1	**Identify** and describe key elements of cultural heritage including tangible, intangible, and natural heritage with real-life examples.
CO2	**Demonstrate** understanding of regional and national cultural practices through participation in experiential activities.
CO3	**Analyze** the significance of preserving cultural heritage in the context of globalization and modernization.
CO4	**Collaborate** in group projects to creatively document and present cultural themes using various mediums.
CO5	**Reflect** critically on personal and collective cultural identities through journals, discussions, and presentations.

Practice Session

S.No	Contents	CO Mapped
1	**Introduction to Cultural Exploration and Heritage** Understand the meaning of tangible, intangible, and natural heritage, Discuss real-life examples of cultural elements. Reflect on how culture shapes identity.	1,5
2	**Heritage Mapping/ Case Study on a Heritage Site** Choose a local region or community. Identify and locate key cultural sites (temples, festivals, crafts). Create a visual or digital heritage map. Present findings in written or visual format	1,3,4
3	**Vaidik Tal Vadya Songs and Music tradition** Introduction to Vedic Music, Demonstration of Vaidik Tal Vadya, Listening Session of Vedic Chants &Samagana, Group Singing of a Vedic Verse or Traditional Bhajan	2, 5
4	**Folk Dance** Watch or participate in folk dance. Discuss the significance, costumes, and music of each. Compare cultural roots and evolution.	2, 4

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5	**Traditional Music** Dholki ,Tabala, Dhol ,LezimListen to selected regional or classical music samples. Identify the instruments, lyrics, and cultural setting.	**2, 4**
6	**Traditional Instrumental** Taal, Tritaal, Tabala Observe or perform simple rhythms or melodies. Explore the cultural and ceremonial use of instruments.	**1, 2**
7	**Singing** Types of singing, Vocal Singing Introduction to music fundamentals	**2, 4**
8	**Drama** Introduction, Types, Information about acting, Stage information , Present / performance on stage	**4,5**
9	**Classical dance, Western dance** Introduction toclassical, and western dance demonstrations. Different types	**2, 4**
10	**Karaoke Singing** Introduction, Types, Basic music information	**2, 4**
11	**Short film** Prepare short film , Present / performance on stage , Topic concern with Indian Cultural heritage	**3, 4, 5**
12	**Final Showcase** Present all your work in a class exhibition. Explain the cultural significance of each project. Receive peer and teacher feedback.	**4, 5**

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. NrutasaurabhaManjiriShriramDev XII 2015
2. Indian Art and Culture , NitinSinghania McGraw Hill Education IV 2022
3. The Wonder That Was India Picador India Second2004
4. The National Culture of India National Book Trust (NBT), India Second2016

References:

1.Bhattacharyya, Haridas, editor. *The Cultural Heritage of India*. The Ramakrishna Mission Institute of Culture, multiple volumes, revised ed.
2. Singhania, Nitin. *Indian Art and Culture*. 4th ed., McGraw Hill Education, 2022.
3. Basham, A. L. *The Wonder That Was India*. Picador India, 2004.
4. Jokilehto, Jukka. *A History of Architectural Conservation*. 2nd ed., Routledge, 2017.

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