Basaveshwar Engineering College, Bagalkote
Department of Industrial and Production Engineering

Scheme of Teaching and Evaluation

III Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration		Total Hours	Examination Scheme and Evaluation			Credits C= Total Hours/30
				L Hrs./Week (Hrs./Sem.)	T Hrs./Week (Hrs./Sem)	P Hrs./Week (Hrs./Sem.)	Term Work (TW) & Self learning (SL) (TW+SL) Hrs./Sem	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1	BSC	BMAM301C	Mathematic - III for Mechanical Engineering Stream	3(42)	0	0	42	3	3	90	50	50	100	3
2	PCC	BIPA302C	Mechanics of Materials	3(42)	0	0	42	3	3	90	50	50	100	3
3	PCC	BIPA303C	Production Engineering – I	3(42)	0	0	42	3	3	90	50	50	100	3
4	PCC	BIPA304C	An Overview of Emerging Technologies	3(42)	0	0	42	3	3	90	50	50	100	3
5	PCC	BIPA305C	Thermodynamics and Fluid Mechanics	3(42)	0	0	42	3	3	90	50	50	100	3
6	PCC	BIPA308C	Material Science and Metallurgy	3(42)	0	0	42	3	3	90	50	50	100	3
7	MC	BMAB300M	Bridge Course Mathematics-I	3(42)	0	0	45	3	-	90	100	-	100	0
8	PCC	BIPA306L	Production Engineering - I Laboratory	0	0	2(26)	-	2	2	30	50	50	100	1
9	PCC	BIPA307L	Material Testing Laboratory	0	0	2(26)	-	2	2	30	50	50	100	1
10	MC	BHSX360M	Yoga/NSS/Sports/Music	0	0	2(28)	-	2	-	30	100	-	100	0
														20

	Course Code	:	BMAM301C	MATHEMATIC-III FOR MECHANICAL ENGINEERING STREAM (ME, AU, IP)	Semester	:	III
	L: T:P	:	3:0:0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply statistical, probability, joint probability, Markov chain and partial differential equation techniques to effectively solve engineering problems.

Course Outcomes:

After completion of the course student will be able to

CO1. Apply statistical concepts to solve engineering problems.
CO2. Employ the concepts of probability for engineering problems.
CO3. Apply the concepts of joint probability and Markov chains for engineering problems.
CO4. Solve partial differential equations arising in engineering problems.

UNIT-I — **10 Hrs.**

Curve fitting, Correlation and Regressions: Principles of least squares, Curve fitting by the method of least squares in the form $y = a + bx$, $y = a + bx + cx^2$, $y = ab^x$. Correlation, Regression and Rank correlation.

UNIT-II — **11 Hrs.**

Probability: addition rule, conditional probability, multiplication rule, Baye's rule. Binomial distributions, Poisson distributions and Normal distributions (derivations for mean and standard deviation for Binomial and Poisson distributions only).

UNIT–III — **11 Hrs.**

Joint Probability distribution: Joint Probability distribution for discrete and continuous random variables, expectation, covariance and correlation.

Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states.

UNIT–IV — **10 Hrs.**

Partial Differential Equations: Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Solution of homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE, derivation of one-dimensional heat equation and wave equation. Solution of one-dimensional heat and wave equation by the method of separation of variables.

Text Books:

1. Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye "Probability & Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.
2. Peter Bruce, Andrew Bruce & Peter Gedeck "Practical Statistics for Data Scientists" O' Reilly Media, Inc., 2nd edition 2020.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons,9th Edition , 2006.
2. B. S. Grewal "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
3. G Haribaskaran " Probability, Queuing Theory & Reliability Engineering", Laxmi Publication , Latest Edition, 2006
4. Irwin Miller & Marylees Miller, John E. Freund's "Mathematical Statistics with Applications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8th edition, 2014.
5. S C Gupta and V K Kapoor , "Fundamentals of Mathematical Statistics", S Chand and Company , Latest edition.
6. Robert V. Hogg, Joseph W. McKean & Allen T. Craig. "Introduction to Mathematical Statistics", Pearson Education 7thedition, 2013.
7. Jim Pitman. Probability, Springer-Verlag , 1993.
8. Sheldon M. Ross, "Introduction to Probability Models"11th edition. Elsevier, 2014.
9. A.M. Yaglomand I. M. Yaglom, "Probability and Information" D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi,1983.
10. P.G. Hoel , S.C. Portand C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, (Reprint), 2003.
11. S. Ross, "A First Course in Probability", Pearson Education India, 6th Ed.,2002.
12. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1,Wiley, 3rdEd., 1968.
13. N. P. Bali and Manish Goyal , A Text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

14. Veerarajan T, Engineering Mathematics(for semester III),Tata McGraw-Hill, New Delhi
Web links and Video Lectures (E-Resources):
https://drive.google.com/file/d/1KtCtZmnJnOvV1S68wXS9FZPXUFvRktBQ/view?usp=sharing

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3)	-	-	-	-	-	1	-	-	1	-	-	-
CO2	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3)	-	-	-	-	-	1	-	-	1	-	-	-
CO3	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3)	-	-	-	-	-	1	-	-	1	-	-	-
CO4	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3)	-	-	-	-	-	1	-	-	1	-	-	-

Course Code		:	BIPA302C	MECHANICS OF MATERIALS	Semester	:	III
L: T:P		:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply the principles of strength of materials to analyze stresses, strains, bending, torsion, deflection, pressure vessels, and column stability for the safe design and evaluation of engineering structures and machine components.

Course Outcomes:

After completion of the course student will be able to:

CO1. Compute simple stress, strain, and deformation in bars of varied cross sections subjected to different types of loads.
CO2. Compute compound stresses on inclined planes subjected to different stress systems.
CO3. Analyze beams subjected to various loading conditions by drawing shear force and bending moment diagrams and computing bending stress, shear stress, slope, and deflection.
CO4. Analyze cylinders subjected to internal and external pressures by determining the stresses developed and the resulting changes in dimensions.
CO5. Analyze the effects of torsion in circular shafts and evaluate the elastic stability of columns under axial loading.

UNIT-I — **10 Hrs.**

Simple stress and strain – Mechanical properties of materials, stress, strain, stress-strain relation, extension/shortening of a bar, Poisson's ratio, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), elongation due to self weight, principle of superposition, thermal stresses, volumetric strain, Elastic constants, Relation between elastic constants

UNIT - II — **10 Hrs.**

Compound stress - Introduction, plane stress system, sign convention, stresses on an inclined plane, Uniaxial and Biaxial stresses on an element, General 2-D stress system, Principal stresses and planes, Mohr's circle

Shear force and Bending Moment in beams– Introduction, types of beams, loads and reactions, rate of loading, Shear force and bending moment, sign conventions, relationship between shear force and bending moments, shear force and bending moment diagrams for different beams subjected to concentrated loads, uniform distributed load (UDL)and couple.

UNIT - III — **11 Hrs.**

Bending and shear stresses in beams -Theory of simple bending, assumptions in simple bending, relationship between bending stresses and radius of curvature, relationship between bending moment and radius of curvature, moment carrying capacity of a section, shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T- sections.

Deflection of beams - Deflection of beams, equation for deflection, slope and moments, double integration method for cantilever and simply supported beams for point load, UDL, UVL and couple, Macaulay's method.

UNIT - IV — **11 Hrs.**

Thick and thin cylinders - Stresses in thin cylinders, changes in dimensions of cylinder, thick cylinders subjected to internal and external pressures (Lame's equation).

Torsion of circular shafts - Pure torsion, assumptions, derivation of tensional equations, polar modulus, torsional rigidity /stiffness of shafts, power transmitted by solid and hollow circular shafts.

Elastic stability of columns – Introduction to columns, Euler's theory for axially loaded elastic long columns, derivation of Euler's load for various end conditions, limitations of Euler's theory and Rankin's formula.

Reference Books:

1. Bhavikatti S. S, (2022), Strength of Materials(5th edition), Vikas Publications House - Pvt. Ltd
2. Bansal R. K, (2024), A Textbook of Strength of Materials, Laxmi Publications
3. Ferdinand Beer, Jr. Johnston, E. Russell, John De Wolf, David Mazurek, (2017), Mechanits of Materials(7th edition), McGraw-Hill Education

Reference Books:

1. O. P. Khanna, *Strength of Materials*.
2. R. S. Khurmi and J. K. Gupta, *Strength of Materials*.
3. Andrew Pytel and Jaan Kiusalaas, *Mechanics of Materials*.

Web Links and Video Lectures (e-Resources):

1. Strength of materials lectures: https://www.youtube.com/results?search_query=strength+of+materials+lecture
2. Mechanics of materials lectures: https://www.youtube.com/results?search_query=mechanics+of+materials+lecture
3. Shear force and bending moment diagrams: https://www.youtube.com/results?search_query=shear+force+and+bending+moment+diagrams+lecture
4. Torsion of shafts lecture: https://www.youtube.com/results?search_query=torsion+of+shafts+lecture
5. Deflection of beams lecture: https://www.youtube.com/results?search_query=deflection+of+beams+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1)	2 (WK1)	1 (WK2)	-	1 (WK5)	2 (WK1,WK5, WK7)	-	-	-	-	1 (WK9)	2	1	-
CO2	3 (WK2)	3 (WK2)	2 (WK2)	2 (WK2)	2 (WK5)	2(WK1, WK5, WK7)	-	-	-	-	1 (WK9)	2	2	-
CO3	3 (WK2, WK3)	3 (WK2)	3 (WK3)	2 (WK3)	2 (WK5)	2 (WK5, WK7)	-	-	-	1	2 (WK9)	3	2	1
CO4	3 (WK2)	2 (WK2)	2 (WK5)	2 (WK5)	3 (WK6)	2 (WK5,WK7)	1	-	-	1	2 (WK9)	2	3	2
CO5	3 (WK2)	2 (WK2)	2 (WK5)	2 (WK5)	2 (WK6)	2(WK5, WK7)	1	-	-	2	2 (WK9)	2	3	2

	Course Code	:	BIPA303C	PRODUCTION ENGINEERING-I	Semester	:	III
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply the principles of casting, welding, and inspection techniques to select appropriate manufacturing processes, produce quality components, and evaluate defects for industrial engineering applications.

Course Outcomes:

CO1. **After completion of the course student will be able to**

CO2. Explain the principles of manufacturing processes, pattern making, molding materials, cores, gating and rising systems used in casting.

CO3. Analyze casting processes, casting defects, special casting methods, and select suitable casting techniques for manufacturing applications.

CO4. Apply the principles of arc welding, gas welding, and special welding processes for selecting appropriate welding methods in engineering applications.

CO5. Evaluate casting and welding quality using appropriate inspection and non-destructive testing (NDT) methods for defect identification and quality assurance.

UNIT-I — **11 Hrs.**

CASTING PROCESS

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process &steps involved. Varieties of components produced by casting process. advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance, Classification of patterns.

Sand Moulding: Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Binder: Definition, Types of binder used in moulding sand. Additives: Need, Types of additives used and their properties.

UNIT–II — **10 Hrs.**

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers: Principle and types. Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Special moulding Process (Only brief Introduction): No bake moulds, Flask less moulds, Sweep mould, CO_2mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Slush casting and Continuous Casting Processes.

UNIT–III — **11 Hrs.**

WELDING

Welding process: Definition, Principles, Classification, Application, Advantages& limitations of welding.

Arc Welding: Principle, Metal Arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes (AHW).

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gastorch construction &working. Forward and backward welding.

UNIT–IV — **10 Hrs.**

Special types of welding: Resistance welding - principles, Seam welding, Butt welding, Spot welding and projection welding. Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

Inspection Methods: Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

Text Books:

1. Dr. Radhakrishna K., *Manufacturing Process-I*, 5th Edition, Sapna Book House, Bengaluru, 2009.
2. P. N. Rao, *Manufacturing & Technology: Foundry, Forming and Welding*, 3rd Edition, Tata McGraw-Hill, 2003.
3. Roy A., *Processes and Materials of Manufacturing*, 4th Edition, Pearson Education, 2006.

Reference Books:

1. Serope Kalpakjian, Steuen. R.(2006), Manufacturing Technology,(5), Sechmid Pearson Education Asia
2. S. K. Hajra Choudhury, *Elements of Workshop Technology*.

3. R. K. Jain, *Production Technology*.

Web links and Video Lectures (E-Resources):

1. Casting process lectures: https://www.youtube.com/results?search_query=casting+process+lecture
2. Welding process lectures: https://www.youtube.com/results?search_query=welding+process+lecture
3. Foundry and moulding process lectures: https://www.youtube.com/results?search_query=foundry+and+moulding+process+lecture
4. Inspection methods in manufacturing: https://www.youtube.com/results?search_query=inspection+methods+in+manufacturing+lecture
5. NDT methods for casting and welding: https://www.youtube.com/results?search_query=non+destructive+testing+casting+welding+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1)	2 (WK2)	1 (WK3)	–	2 (WK5)	–	–	–	–	–	–	2	1	–
CO2	3 (WK2)	3 (WK2, WK3)	2 (WK3)	2 (WK4)	2 (WK5)	–	–	–	–	–	–	3	2	–
CO3	3 (WK2, WK3)	2 (WK3)	3 (WK3)	–	3 (WK5)	–	–	–	–	–	–	3	2	1
CO4	2 (WK5)	3 (WK4)	–	3 (WK4)	3 (WK5, WK6)	2 (WK6)	–	1	–	–	–	2	3	2

	Course Code	:	BIPA304C	AN OVERVIEW OF EMERGING TECHNOLOGIES	Semester	:	III
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Assess, apply, and ethically integrate emerging technologies like AI, smart materials, and biotechnology into interdisciplinary industrial innovations while evaluating societal impacts and committing to lifelong learning

Course Outcomes:

After completion of the course student will be able to

CO1. Explain fundamental concepts and characteristics of emerging technologies.
CO2. Recognize applications and future potential of AI, smart materials, and bio-tech.
CO3. Evaluate environmental, ethical, and societal impacts of new technologies.
CO4. Prepare to engage with interdisciplinary innovations and life-long learning.

UNIT-I — **11 Hrs.**

Introduction to Emerging Technologies

Ch 1: Fundamentals and Evolution: Definitions and characteristics of emerging technologies, Technology lifecycle: emergence, adoption, maturity, obsolescence, Role of innovation and R&D in technology evolution

Ch 2: Impact on Industry and Society: Drivers of technological change: digital, demographic, sustainability; Socio-economic, environmental, and ethical impacts; Case studies of recent technological disruptions

UNIT–II — **11 Hrs.**

Artificial Intelligence and Data Technologies

Ch 1: Basics of AI and Machine Learning: Difference between AI, ML, DL; Applications in predictive maintenance, quality control, demand forecasting; Limitations and challenges in industrial use.

Ch 2: Data Analytics and Ethical AI: Big Data basics: characteristics, lifecycle; Data-driven decision making; Bias, fairness, transparency, and responsible AI.

UNIT–III — **10 Hrs.**

Advanced Materials and Manufacturing Trends

Ch 1: Smart and Advanced Materials: Nanomaterials, shape memory alloys, self-healing materials; Application areas: aerospace, biomedical, automotive; Environmental and safety concerns.

Ch 2: 4D Printing and Green Manufacturing: Concepts of additive and 4D printing; Smart manufacturing trends; Sustainability and circular economy in manufacturing.

UNIT–IV — **10 Hrs.**

Cross-Disciplinary Technologies

Ch 1: Bioengineering and Healthcare Tech: Wearable devices, biosensors; CRISPR and gene editing overview; AI applications in healthcare.

Ch 2: Quantum and Space Technologies: Basics of quantum computing and potential industrial impact; Satellite internet, LEO constellations; Ethics and international collaboration in frontier tech.

Text Books:

1. M. R. Bhatt, *Introduction to Emerging Technologies in Engineering*, McGraw-Hill Education.
2. T. Williams, *Emerging Technologies: Trends, Challenges and Future Outlook*, Wiley.
3. M. Ratner & D. Ratner, *Nanotechnology: A Gentle Introduction to the Next Big Idea*.

Reference books:

1. Klaus Schwab, *The Fourth Industrial Revolution*.
2. IEEE Spectrum, WEF, McKinsey, and NITI Aayog white papers on emerging technologies.
3. Research articles and case studies on frontier innovations.
4. IET reading list on emerging technologies for additional e-books and journals.

Web Links and Video Lectures (e-Resources):

1. IET Library reading list on emerging technologies: https://www.theiet.org/media/guzdkzc3/iet-library-reading-list-emerging-technologies.pdf
2. Routledge/CRC series on Emerging Technologies: https://www.routledge.com/Emerging-Technologies/book-series/CRCCHETRPA

1. Introduction: Emerging Technologies https://www.youtube.com/watch?v=cgC6V7z-KGo

2. Emerging Technology Course – Chapter 1 (Part 1): Introduction to Emerging Technology https://www.youtube.com/watch?v=1J-M_pxcweI
3. Introduction to Emerging Technologies | Hindi https://www.youtube.com/playlist?list=PLa-HQPc3NQ9oqUFQmzm16iakHr01cs2VL
4. Leaders Speak: Applications of AI and Emerging Technologies https://www.youtube.com/watch?v=wbD8gRCkmDM

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2 (WK1, WK2)	2 (WK1, WK2)	-	-	-	-	-	-	-	1 (WK8)	1 (WK9)	1	-	-
CO2	2 (WK2, WK5)	2 (WK2, WK5)	2 (WK3, WK5)	-	3 (WK5, WK6)	-	-	-	-	1 (WK8)	1 (WK8)	2	1	-
CO3	-	2 (WK2, WK4)	-	3 (WK2, WK4)	-	3 (WK4)	2 (WK4)	3 (WK4)	-	3 (WK9)	2 (WK9)	-	2	1
CO4	-	1 (WK1, WK4)	-	2 (WK4)	-	-	1 (WK4)	2 (WK4)	1 (WK4)	3 (WK7, WK9)	3 (WK9)	1	2	2

	Course Code	:	BIPA305C	THERMODYNAMICS AND FLUID MECHANICS	Semester	:	III
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply the principles of thermodynamics and fluid mechanics to analyze energy interactions, fluid behavior, and flow systems for solving engineering problems and improving the performance of thermal and fluid engineering applications.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain fundamental concepts and characteristics of emerging technologies.
CO2. Recognize applications and future potential of AI, smart materials, and bio-tech.
CO3. Evaluate environmental, ethical, and societal impacts of new technologies.
CO4. Prepare to engage with interdisciplinary innovations and life-long learning.

UNIT- I — **11 Hrs.**

Basic concepts of thermodynamics -Basic definition, thermodynamic systems, macroscopic v/s microscopic point of view, pure substance, thermodynamic equilibrium, thermodynamic properties, path and point functions, quasi static, reversible and irreversible processes.

Energy, work and heat - Definition, sign convention, similarities and dissimilarities of heat and work.

Zeroth law of thermodynamics -Concept of temperature and thermal equilibrium.

First law of thermodynamics- Internal energy, Law of conservation of energy, statement of first law, application of first law to a process, perpetual motion machine of the first kind - PMM-I, application of first law of thermodynamics to closed system and steady state steady flow energy equation.

UNIT - II — **11 Hrs.**

Second law of thermodynamics - Heat reservoir, source and sink, heat engine, refrigerator, heat pump, reversed heat engine, statement of second law of thermodynamics - Kelvin-Planck statement and Clausius statement, equivalence of Clausius statement to the Kelvin-Planck statement, perpetual motion machine of second kind - PMM-II.

Entropy - Definition, Clausius inequality proof, Carnot theorem, principal of increase of entropy, entropy as a quantitative test for irreversibility.

UNIT - III — **10 Hrs.**

Properties of fluids - Introduction to fluid mechanics and its applications, properties of fluids, types of fluids.

Fluid pressure - Pressure variation in a static fluid, absolute, gauge, atmosphere and vacuum pressure.

Manometers - Simple and differential manometers, total pressure and centre of pressure.

UNIT - IV — **10 Hrs.**

Fluid kinematics - Types of fluid flow, continuity equation in three dimensions, velocity and acceleration, velocity potential function and stream function.

Fluid dynamics- Equations of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, limitation of Bernoulli's equation.

Fluid flow measurements - Venturi meter, Orifice meter and Pitot tube.

Flow through pipes - Frictional loss in pipe flow, Darcy-Weisbach equation and Chezy's equation for loss of head due to friction in pipes, hydraulic gradient line and total energy line.

Text Books:

1. P. K. Nag, *Basic and Applied Thermodynamics*, 6th Edition, Tata McGraw-Hill, 2017.
2. R. K. Hegde and Niranjan Murty, *Basic and Applied Thermodynamics*, Sapna Book House, Bengaluru, 2005.
3. R. K. Bansal, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Laxmi Publications Pvt. Ltd., 2009.

Reference Books:

1. Dr, Jagadish Lal (SI unit and MKS unit),1995, Fluid Mechanics and Hydraulics - 9thEdition, Metropolitan Book Co Pvt. Ltd., New Delhi.
2. K. Subramanya 1000 Solved Problems in Fluid Mechanics (Includes Hydraulic Machines), 2005, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.
3. Dr. P. N. Modi, Dr. S. M. Seth, (SI Unit), 2005, Hydraulics and Fluid Mechanics including Hydraulic Machines by Standard Book House, 5th Edition, New Delhi.

Web Links and Video Lectures (e-Resources):
1. Thermodynamics lectures: https://www.youtube.com/results?search_query=thermodynamics+lecture 2. Fluid mechanics lectures: https://www.youtube.com/results?search_query=fluid+mechanics+lecture 3. First and second law of thermodynamics: https://www.youtube.com/results?search_query=first+law+second+law+of+thermodynamics+lecture 4. Bernoulli equation and flow through pipes: https://www.youtube.com/results?search_query=bernoulli+equation+flow+through+pipes+lecture 5. Manometers and fluid pressure: https://www.youtube.com/results?search_query=manometers+fluid+pressure+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1)	2 (WK1)	1 (WK2)	-	1 (WK5)	2 (WK1, WK5, WK7)	-	-	-	-	1 (WK9)	2	1	-
CO2	3 (WK2)	3 (WK2)	2 (WK2)	2 (WK2)	2 (WK5)	2 (WK1, WK5, WK7)	-	-	-	-	1 (WK9)	2	2	-
CO3	3 (WK2)	2 (WK2)	2 (WK3)	2 (WK3)	2 (WK5)	2 (WK5, WK7)	-	-	-	1	2 (WK9)	2	2	1
CO4	3 (WK2)	3 (WK2)	3 (WK3)	2 (WK3)	3 (WK5)	3 (WK5, WK7)	1 (WK9)	-	1	2	2 (WK9)	3	2	2

	Course Code	:	BIPA308C	MATERIAL SCIENCE & METALLURGY	Semester	:	III
	L: T:P	:	3:0:0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply the principles of crystallography, mechanical behaviour, phase transformations, heat treatment, and advanced engineering materials to analyse material properties, select suitable materials, and solve engineering problems in manufacturing and industrial applications.

Course Outcomes:

After completion of the course student will be able to

CO1. Analyze different class of materials their properties, structures and present in them and to understand crystal structures, impacts of defects at the atomic and microstructure scales, atomic diffusion and mechanisms

CO2. Explain various testing procedure to evaluate mechanical properties of materials and their use in the design of materials for engineering applications

CO3. Explain solidification, concepts of solid solution and solubility limits, Identify phase diagrams and be able to predict the phase transformations and interpret Fe-C phase diagram, time temperature transformation curve

CO4. Explain the purpose and select suitable heat treatment process to achieve desired properties of metals and alloys, classify ferrous and non-ferrous metals and study their applications, acquire knowledge about powder metallurgy and its production, composite materials, types and its applications.

UNIT-I — **08 Hrs.**

Crystallography - Concept of UNIT cell, metallic crystal structures, atomic radius, coordination number and calculation of atomic packing factor for different cubic structures,

Crystal imperfections - Point, line, surface and volume defects, **Atomic diffusion** -Phenomenon, Flick's Ist and IInd law of diffusion, factors influencing diffusion, concept of slip and twinning.

UNIT–II — **10 Hrs.**

Mechanical properties of metals - Concepts of stress and strain, tension test - true stress and true strain, compression test, notch impact test - Izod and charpy, hardness test - Brinell, Vickers and Rockwell, **Fatigue** - Fatigue test - fatigue loadings, S-N diagram and fatigue properties, **Failure** - Failure of metals, fracture - fundamentals of fractures, types - ductile &brittle, mechanisms of ductile fracture, Griffith's theory of brittle fracture, **Creep** - Creep curve, mechanism of creep and creep resistant materials.

UNIT–III — **10 Hrs.**

Solidification- Mechanism of solidification, homogeneous and heterogeneous nucleation, crystal growth, cast metal structures, Solid solution - Types, Hume Rothary rules governing the formation of solids solutions, Phase diagrams - basic terms, Gibbs phase rule, construction of phase diagrams, lever rule, different types of invariant reactions, Eutectic, Eutectoid, Peritectic.

Iron – Iron carbide equilibrium diagram - Salient features of Iron – Iron carbide equilibrium phase diagram, allotropic forms of iron, Fe-Fe3C equilibrium diagram, phases in the Fe-Fe3C system, and TTT diagram for Eutectoid Steel.

UNIT–IV — **14 Hrs.**

Heat treatment - Basic concept of heat treatment, different types of heat treatment processes: annealing, Normalizing, Hardening and Tempering. Ferrous and non-ferrous materials - Steel, cast irons, copper and its alloys, aluminum and its alloys,

Powder metallurgy - Concept of powder metallurgy, application and advantages, production of powder, Composite material - Concept and classification of composites, matrix-polymer matrix composites (PMC), metal matrix composites (MMC), ceramic matrix composites (CMC), reinforcement-particle reinforced composites, fiber reinforced composites, reinforcement-matrix interface, applications of various types of composites - automobile, aircrafts, missiles, space hardware, electrical and electronics, marine, recreational and sports equipment.

Text Books:

1. William D. Callister, *Materials Science and Engineering: An Introduction*, 7th Edition, Wiley India Pvt. Ltd., New Delhi.
2. George E. Dieter, adapted by David Bacon, *Mechanical Metallurgy* (SI Metric Edition), McGraw-Hill Book Company.
3. O. P. Khanna, *A Textbook on Material Science and Metallurgy*, Dhanpat Rai Publications (P) Ltd., New Delhi
4.

Reference Books :

1. K. Srinivasan, Composites Materials - Production, Properties, Testing and Applications Narosa Publishing House, New Delhi.
2. James F. Shackel Ford, 2006, Introduction to Material Science for Engineering, 6th Edition Pearson, Prentice Hall, New Jersey
3. V. Raghavan, 2007, Materials Science and Engineering 5thEdition, Prentice Hall, India,
4. Van Vlack, Elements of Material Science and Engineering 6th Edition, Addison Wesley Publishing Company
5. Smith, 1997, Foundation of Material Science and Engineering 3rd Edition Mc Graw Hill.

Web links and Video Lectures (E-Resources):

1. Materials science lectures: https://www.youtube.com/results?search_query=materials+science+and+metallurgy+lecture
2. Crystallography basics: https://www.youtube.com/results?search_query=crystallography+basics+lecture
3. Heat treatment of metals: https://www.youtube.com/results?search_query=heat+treatment+of+metals+lecture
4. Phase diagrams and TTT diagrams: https://www.youtube.com/results?search_query=phase+diagram+TTT+diagram+lecture
5. Composite materials basics: https://www.youtube.com/results?search_query=composite+materials+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3(WK1)	2(WK1)	1(WK2)	-	1(WK5)	1(WK1,5,7)	-	-	-	-	1(WK9)	2	1	-
CO2	3(WK2)	3(WK2)	2(WK2)	2(WK2)	2(WK5)	1(WK7)	-	-	-	-	1(WK9)	2	2	-
CO3	3(WK2,3)	3(WK2)	2(WK3)	2(WK3)	2(WK5)	2(WK5,7)	-	-	-	1	2(WK9)	3	2	1
CO4	2(WK5)	2(WK5)	2(WK5)	2(WK5)	3(WK6)	2(WK5,7)	1	-	-	1	2(WK9)	2	3	2

	Course Code	:	BMAB300M	BRIDGE COURSE MATHEMATICS-I	Semester	:	III
	L:T:P	:	3 : 0 : 0		Course Type	:	MC
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	45 Hrs.		SEE Marks	:	00
	CIE Exam	:	3 Hrs.		Total Marks	:	100
	SEE Exam	:	----				
	Total Hrs.	:	90 Hrs.		Credits	:	00

Professional Competency:

Apply calculus, linear algebra, Laplace transform, and numerical techniques to solve engineering and mathematical problems efficiently.

Course Outcomes:

After completion of the course student will be able to

CO1. Apply the concepts of calculus
CO2. Apply the principles of linear algebra to solve system of linear equations.
CO3. Apply the Laplace transform techniques to solve differential equations.
CO4. Apply the Numerical techniques to solve engineering problems.

Partial Derivatives and Ordinary Differential equations — **11 Hrs.**

Partial differentiation, total derivative –differentiation of composite functions, Jacobian.
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations. Integrating factors on (1/N) ($\partial M / \partial y - \partial N / \partial x$) and (1/M) ($\partial N / \partial x - \partial M / \partial y$).

Linear Algebra — **10Hrs.**

Elementary transformations, Rank of a matrix, consistency of a system of linear equations, solution of homogeneous and non homogeneous equations, Gauss-elimination method, Gauss-seidel method, Eigen values and eigen vectors by Rayleigh's power method.

Laplace Transform — **11Hrs.**

Introduction, Definition of Laplace Transform, Laplace Transform of standard functions, Properties: Shifting, differentiation, Integral and division by t. Periodic function, Heaviside's Unit step function.
Inverse Laplace transform, properties(Shifting, Partial fractions, Logarithmic functions).Solutions of linear differential equations.

Numerical Methods — **10 Hrs.**

Introduction to root finding problems, Newton-Raphson's method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae (Without proof), Lagrange's interpolation formulae (without proof). Simpson's 1/3rd and 3/8th rule(no derivation)-problems. Runge-Kutta 4 th order method -problems.

Text Books :

1. B. S. Grewal: "Higher Engineering Mathematics", Khanna Publishers, 44thEd., 2021.
2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10thEd., 2018.
3. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.

Reference Books:

1. V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C.Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. N.P Bali and Manish Goyal: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.
5. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
7. Gareth Williams: "Linear Algebra with Applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	-	-	-	-	-	1	-	-	1	-	-	-
CO2	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	-	-	-	-	-	1	-	-	1	-	-	-
CO3	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	-	-	-	-	-	1	-	-	1	-	-	-
CO4	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	-	-	-	-	-	1	-	-	1	-	-	-

	Course Code	:	BIPA306L	PRODUCTION ENGINEERING-I LABORATORY	Semester	:	III
	L: T:P	:	0: 0 :1		Course Type	:	Practical
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	04 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Develop the ability to safely perform and apply basic machining operations using lathe, milling, shaping, and rinding machines to manufacture and finish engineering components according to specified dimensions and industrial practices.

Course Outcomes:

After completion of the course, student will be able to:

CO1. Perform basic lathe operations such as facing, plain turning, step turning, taper turning, thread cutting, knurling, and eccentric turning by following standard machining practices and safety procedures.

CO2. Manufacture engineering components using lathe, milling, and shaping machines by selecting appropriate cutting tools, machining parameters, and work-holding methods.

CO3. Inspect the machined components for dimensional accuracy and surface quality, and analyze machining errors to improve product quality.

CO4. Demonstrate professional workshop practices, safe machine operation, teamwork, and proper maintenance of conventional machine tools during machining experiments.

PART-A	20 Hrs.

1. Minimum four jobs using lathe of following machining operations: Plain turning, taper turning, step turning, thread cutting, facing, knurling, eccentric turning.

PART-B	06 Hrs.

1. Cutting of gear teeth using milling machine.
2. Cutting of V – groove / Dovetail / Rectangular groove using shaping machine.
3. Demonstration of surface grinding.

Textbooks:

1. S. S. Bhavikatti, *Strength of Materials*, Vikas Publishing House.
2. R. K. Bansal, *A Textbook of Strength of Materials*, Laxmi Publications.
3. Ferdinand Beer, E. Russell Johnston, John DeWolf, and David Mazurek, *Mechanics of Materials*, McGraw-Hill Education.

Reference Books:

1. O. P. Khanna, *Strength of Materials*.
2. R. S. Khurmi and J. K. Gupta, *Strength of Materials*.
3. Andrew Pytel and Jaan Kiusalaas, *Mechanics of Materials*.

Web Links and Video Lectures (e-Resources):

1. Strength of materials lectures: https://www.youtube.com/results?search_query=strength+of+materials+lecture
2. Mechanics of materials lectures: https://www.youtube.com/results?search_query=mechanics+of+materials+lecture
3. Shear force and bending moment diagrams: https://www.youtube.com/results?search_query=shear+force+and+bending+moment+diagrams+lecture
4. Torsion of shafts lecture: https://www.youtube.com/results?search_query=torsion+of+shafts+lecture
5. Deflection of beams lecture: https://www.youtube.com/results?search_query=deflection+of+beams+lecture

SCHEME OF EXAMINATION

One question from part A	: 20 Marks
One question from part B	: 20 Marks
Viva-voice	: 10 Marks
Total marks	: 50 Marks

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	2 (WK1, WK5)	-	-	3 (WK5, WK7)	2 (WK9)	2	2	2	2	3	1	1
CO2	-	-	3 (WK5)	-	2 (WK5, WK7)	3 (WK9)	2	2	2	2	2	3	1	2
CO3	-	-	-	-	2 (WK2)	3 (WK5, WK7)	2 (WK9)	2	2	2	2	3	1	1
CO4	-	-	2 (WK2, WK4)	-	2 (WK6)	3 (WK5, WK7)	3 (WK9)	2	2	2	2	3	1	1

	Course Code	:	BIPA307L	MATERIAL TESTING LABORATORY	Semester	:	III
	L: T:P	:	0: 0 :1		Course Type	:	Practical
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	04 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Develop the ability to examine the microstructure and mechanical properties of engineering materials, perform standard material testing procedures, and interpret the effects of heat treatment on material behavior for engineering applications

Course Outcomes:

After completion of the course student will be able to

CO1. Prepare metallographic specimens, examine the microstructure of ferrous and non-ferrous materials, and relate microstructure with material properties.

CO2. Perform standard mechanical tests such as tensile, shear, compression, bending, impact, hardness, and torsion tests on engineering materials following relevant testing standards.

CO3. Analyze experimental results obtained from mechanical testing to determine the mechanical properties and failure characteristics of engineering materials

CO4. Evaluate the suitability of engineering materials for industrial applications based on microstructural observations, heat treatment, and mechanical test results while adhering to laboratory safety and professional practices.

PART-A	**08 Hrs.**

1. **Preparation-** Specimen for metallographic examination of engineering materials and study the microstructure of mild steel, plain carbon steel, tool steel, gray cast iron, spheroidal graphite iron, brass, bronze and
2. **Heat treatment-** Annealing, normalizing, hardening and tempering of steel and to study the hardness of heat-treated samples. (Demonstration only).

PART-B	**18Hrs.**

1. Conduct of tensile test on mild steel specimen
2. Shear test on mild steel specimen
3. Compression test on - wooden block and concrete block
4. Bending test on a mild steel specimen
5. Conduct of izod and charpy tests on mild steel specimen
6. Hardness tests
7. Torsion test and
8. Wear and fatigue test (Demonstration only).

Tex tbooks:

1. William D. Callister, *Materials Science and Engineering: An Introduction*.
2. George E. Dieter, *Mechanical Metallurgy*.
3. O. P. Khanna, *A Textbook on Material Science and Metallurgy*.

Reference Books:

1. K. Srinivasan, *Composite Materials: Production, Properties, Testing and Applications*.
2. James F. Shackelford, *Introduction to Materials Science for Engineering*.
3. V. Raghavan, *Materials Science and Engineering*.
4. Van Vlack, *Elements of Material Science and Engineering*.
5. Smith, *Foundations of Materials Science and Engineering*.

Web Links and Video Lectures (e-Resources):

1. Material testing laboratory lectures: https://www.youtube.com/results?search_query=material+testing+laboratory+lecture
2. Tensile test and compression test: https://www.youtube.com/results?search_query=tensile+test+compression+test+lecture
3. Impact test and hardness test: https://www.youtube.com/results?search_query=impact+test+hardness+test+lecture
4. Torsion test lecture: https://www.youtube.com/results?search_query=torsion+test+lecture
5. Wear and fatigue test lecture: https://www.youtube.com/results?search_query=wear+test+fatigue+test+lecture

SCHEME OF EXAMINATION	
One question from part A	: 20 Marks
One question from part B	: 20 Marks
Viva-voice	: 10 Marks
Total marks	: 50 Marks

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2)	2 (WK2)	–	2 (WK4)	2 (WK5)	–	–	–	–	–	–	3	2	–
CO2	3 (WK2)	3 (WK3)	2 (WK3)	2 (WK4)	3 (WK5)	–	–	–	–	–	–	3	2	1
CO3	2 (WK3)	3 (WK4)	2 (WK4)	3 (WK4)	2 (WK5)	–	–	–	–	–	–	2	3	2
CO4	2 (WK5)	2 (WK5)	2 (WK5)	2 (WK4)	3 (WK5, WK6)	2 (WK6)	1 (WK7)	1	–	–	1 (WK6)	2	3	2

	Course Code	:	BHSA360M	YOGA-I	Semester	:	III
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Yoga enables an individual to **understand, perform, demonstrate, and learn Yoga effectively and safely,** contributing to **holistic health, mental peace, and quality of life.**

Course Outcomes:

After completion of the course, student will be able to:

CO1. Explain the meaning, aims, and objectives of Yoga and explain its relevance in daily life.

CO2. Perform and teach Suryanamaskar, demonstrating its correct sequence, technique, and explaining its physical and mental benefits.

CO3. Demonstrate various Asanas by name, including their significance, correct methods of practice, and associated benefits for overall well-being.

CO4. Demonstrate different types of Pranayama, detailing their names, procedures, safety precautions, and therapeutic uses.

UNIT-I	7Hrs.

Yoga, its meaning, definitions, origin, history and development.
Different schools of yoga, aims and objectives of yoga, importance of prayer
Yogic practices for common man to promote positive health
Rules to be followed during yogic practices by practitioner
Yoga- its misconceptions.

UNIT-II	7Hrs.

Difference between yogic and non yogic practices
Suryanamaskar- prayer ,meaning, need, importance and benefits of Suryanamaskar,
Practice of 12 count, 2 rounds.

UNIT-III	7Hrs.

Asana its meaning by name, different types of asana technique, precautionary measures and benefits of each asana
Sitting: 1.Padmasana 2.Vajrasana -Meaning ,Importance, Rules.
Standing: 1.Vrikshana 2. Trikonasana- Meaning ,Importance, Rules.

UNIT-IV	7Hrs.

Prone line: 1.Bhujangasana 2.Shalabhasana- Meaning ,Importance, Rules.
Supine line:1.Utthitadvipadasana 2.Ardhahalasana- It's meaning ,Importance, Rules & Practices session

Reference Books:

1.S.K.Kuppasta, 'Samagra yoga darshaini.'Publication :Vivekananda yoga vignana Kendra ,Bagalkot.2021
2.Ajitkumar, A., *"Yogapravesha in Kannada"*, Karnataka Yoga Publications, 1st Edition, 2012.
3.Iyengar, B. K. S., *"Light on Yoga"*, George Allen & Unwin Ltd., Revised Edition, 1966.
4.Gharote, M. L. and Ganguly, S. K., *"Teaching Methods for Yogic Practices"*, Kaivalyadhama S.M.Y.M. Samiti, 1st Edition, 1980.
5.SVYASA University, *"Yoga Instructor Course Handbook"*, SVYASA University, Edition, 2018.
6.Muthanna, Y., *"Yoga for Children – Step by Step"*, Prasaranga Publications, 1st Edition, 2015.

Web Links and Video Lectures:

https://youtu.be/KB-TYlgd1wE
https://youtu.be/aa-TG0Wg1Ls

Scheme and Assessment for the course		
Sl.No.	**Activity**	**Marks**
1.	Participation of student in all the UNITs	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	-	-	-	-	-	2 (WK6)
CO2	-	-	-	-	-	-	-	-	-	-	2 (WK6)
CO3	-	-	-	-	-	-	-	-	-	-	2 (WK6)
CO4	-	-	-	-	-	-	-	-	-	-	2 (WK6)

	Course Code	:	1BHSB360M	NATIONAL SERVICE SCHEME-I		Semester	:	III
	L:T:P	:	0:0 :2			Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.			CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.			SEE Marks	:	00
	Exam	:	2Hrs.			Total Marks	:	100
	Total Hrs.	:	30Hrs.			Credit	:	00

Professional Competency:

After completing the course, students will be able to responsibly analyze societal and environmental challenges, design and implement sustainable and innovative solutions, contribute to commUNITy welfare, respond effectively to emergencies, and promote national integration and social harmony.

Course Outcomes:

After completion of the course, student will be able to:

CO1**.** Recognize and understand their roles and responsibilities towards society for its betterment.
CO2. Analyze environmental and societal issues and design effective and sustainable solutions.
CO3. Assess existing systems critically and propose practical, innovative solutions to promote sustainable development.
CO4. Plan and implement government-led or self-initiated projects efficiently for commUNITy and societal welfare
CO5. Develop the ability to respond to emergencies and natural disasters, while fostering national integration, socia harmony, and unity.

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
2. State the need for NSS activities and its present relevance in the society and Provide real-life examples.
3. Support and guide the students for self-planned activities.
4. Course instructor will also be responsible for assigning homework, grading assignments and quizzes, and documenting students progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills

Topics/Activities to be Covered

1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.
2. Waste management–Public, Private and Govtorganization,5R's.
3. Setting of the information imparting club for women leading to contribution in social and economic issues.

Pedagogy–Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl. No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	May be individual or team	Farmers land/Villages/ roadside /commUNITy area/ College campus etc…..	Site selection/proper consultation/Continuous monitoring/Information board	Report should be submitted by the individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Wastemanagement–Public, Private and Govt organization,5 R's.	May be individual or team	Villages/City Areas/Grama panchayat/public associations/Government Schemes officers/ campus etc…..	Site selection/proper consultation/Continuous monitoring/Information board	Report should be submitted by the individual to the concerned evaluation authority.	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
3.	Setting of the information imparting club for women leading to	May be individual or team	Women empowerment groups/ Consulting NGOs & Govt	Group selection/proper consultation/Continuous		Evaluation as per the rubrics Of scheme and syllabus by NSS officer

	contribution in social And economic issues.		Teams /College campus etc…..	monitoring/Information board		

Plan of Action Execution of Activities For Each Semester

1.Practice Session Description
2.Lecture session by NSS Officer
3.Students Presentation on Topics
4.Presentation- 1,Selectionoftopic,PHASE-1
5.Commencement of activity and its progress-PHASE- 2
6.Execution of Activity
7.Execution of Activity
8.Execution of Activity
9.Execution of Activity
10. Case study based Assessment, Individual performance
11.Sector wise study and its consolidation
12. Video based seminar for 10minutes by each student At the end of semester with Report.

- **In every semester from 3rd semester to 6th semester, each student should carry out activities according to the scheme and syllabus.**
- **At the end of every semester, student performance has to be evaluated by the NSS coordinator for the assigned activity progress and its completion.**
- **Finally, in the 6th semester, a consolidated report of all activities from 3rd to 6th semester, compiled as per the instructions.**

Assessment Details for CIE

Weightage	**CIE– 100%**	**Implementation strategies of the project (NSS work).** **The final report should be signed by the NSS Officer, the HoD, and the Principal.** **At last, the report should be evaluated by the NSS Officer of the institute.** **Finally, the consolidated marks sheet should be sent to the University and also made available during the LIC visit.**
Presentation -1 Selection of topic,PHASE-1	15Marks	
Commencement of activity and its progress – PHASE-2	15Marks	
Case study–based assessment Individual performance	15Marks	
Sector-wise study and its consolidation	15Marks	
Video-based seminar for 10 minutes by each student at the end of the semester with report.	40Marks	
Total marks for the course in each semester	**100Marks**	

"The 100 marks CIE entry will be entered in the CIE marks portal at the end of each semester (3rd to 6th semester). The report and assessment copies should be maintained semester-wise and made available in the department."

"Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general.

Reference Books:

1.NSS Cell, VTU Belagavi. (n.d.). *NSS course manual* (Edition unknown). Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS Cell. (n.d.). *Activity reports and manual*. Government of Karnataka.
3. Government of India, NSS Cell. (n.d.). *Activity reports and manual*. Government of India.

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1						1(WK 6)		2	2	1	
CO2						3(WK 6)		2	2	1	
CO3						1 (WK6)		2	2	1	
CO4						1(WK6)		2	2	1	
CO5						1(WK 6)		2	2	1	

	Course Code	:	1BHSC360M	Physical Education and Sports-I	Semester	:	III
	L:T:P	:	0: 0: 2		Course Type	:	MC
Hours/Sem.	Practical	:	28 Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0 Hrs.		SEE Marks	:	00
	Exam	:	2Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	00

Professional Competency:

After completing the course, students will be able to demonstrate physical fitness and sporting proficiency by correcting postural deformities, managing stress, performing aerobic exercises, and applying proper skills and techniques in games and athletic events while participating confidently in competitive sports.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:**Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
CO2**:** Familiarization of health-related Exercises, Sports for overall growth and development
CO3**:** Create a foundation for the professionals in Physical Education and Sports
CO4**:** Participate in the competition at regional/state / national / international levels.
CO5**:** Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.
CO6**:** Understand and practice of Traditional Games

UNIT-I **7Hrs.**

1. Lifestyle
2. Health & Wellness
3. Pre-Fitness test.

UNIT-II **7Hrs.**

General Fitness & Components of Fitness

1. Warming up (Free Hand exercises)
2. Strength–Push-up/ Pull-ups
3.Speed–30Mtr Dash

UNIT-III **7Hrs.**

Specific games (Any one to be selected by the student)

Kabaddi–Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.

UNIT -IV **7Hrs.**

BKho-Kho–GivingKho,Single Chain,Pole dive,Pole turning,3-6Up.

Reference Books:

1. Bandopadhyay, K. (n.d.). *Sarir Siksha Parichay*. Classic Publishers.
2. Dharma, P. N. (n.d.). *Fundamentals of Track and Field*. Khel Sahitya Kendra.
3. Dubey, H. C. (n.d.). *Basketball*. Discovery Publishing House.
4. Jain, N. (n.d.). *Play and Learn Basketball*. Khel Sahitya Kendra.
5. Jain, R. (n.d.). *Play and Learn Cricket*. Khel Sahitya Kendra.
6. Kus, S. (n.d.). *Coaching Volleyball Successfully*. Human Kinetics.
7. Petipus, et al. (n.d.). *Athlete's Guide to Career Planning*. Human Kinetics.
8. Saha, A. K. (n.d.). *Sarir Siksher Rititiniti*. Rana Publishing House.
9. Thani, V. (n.d.). *Coaching Cricket*. Khel Sahitya Kendra.
10. Rachana, J. (n.d.). *Teach Yourself Basketball*. Sports Publication

Scheme and Assessment for the course :

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	-	-	2 (WK6)	-	-	-
CO2	-	-	-	-	-	-	-	2 (WK6)	-	-	-
CO3	-	-	-	-	-	-	-	2 (WK6)	-	-	-
CO4	-	-	-	-	-	-	-	2 (WK6)	-	-	-
CO5	-	-	-	-	-	-	-	2 (WK6)	-	-	-
C06	-	-	-	-	-	-	-	2 (WK6)	-	-	-

	Course Code	:	1BHSD360M	MUSIC-I	Semester	:	III
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate foundational professional competency in Indian music by applying knowledge of its historical evolution and core musical concepts such as Shruthi, Nada, Swara, Laya, Raga, Tala, and Mela in analysis, performance, and musical interpretation

Course Outcomes:

CO1**: To understand the origin and evolution of the Indian music system** and trace its historical development and cultural significance.

CO2**: To develop a foundational understanding of the core concepts of Indian music**, including Shruthi, Nada, Swara, Laya, Raga, Tala, and Mela, and their role in musical practice and performance.

Content : **28Hrs.**

Introduction: Contents of the curriculum intend to promote music as language to develop an analytical, Creative, and intuitive Understanding. For this the student must experience music through study and direct participation in improvisation and composition. Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara,Laya,RagaTala,Mela.

Textbooks:

1. Vidushi Vasantha Madhavi, " Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.

Reference Books:

1. Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige", Tranqueber 2018.
2. R.Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, " The Story of Indian Music and Its Istruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4. Carnatic Music, National Institute of Open Schooling, 2019.178" EC Proceedings dated 17.07.2024 2/2

Scheme and Assessment for the course

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	25
2.	Quizzes–2,eachof15marks	25
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-

Basaveshwar Engineering College, Bagalkote
Department of Industrial and Production Engineering

Scheme of Teaching and Evaluation

IV Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration		Total Hours	Examination Scheme and Evaluation			Credits C= Total Hours/30
				L Hrs./Week (Hrs. /Sem.)	T Hrs./Week (Hrs. /Sem.)	P Hrs. /Week (Hrs./Sem.)	Term Work (TW) & Self learning (SL) (TW+SL) Hrs. /Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1	BSC	BBTA402C	Biology for Engineers	3(42)	0	0	42	3	3	90	50	50	100	3
2	PCC	BIPA403C	Theory of Machines	3(42)	0	0	42	3	3	90	50	50	100	3
3	PCC	BIPA404C	Production Engineering - II	3(42)	0	0	42	3	3	90	50	50	100	3
4	PCC	BIPA405C	Industry 4.0	3(42)	0	0	42	3	3	90	50	50	100	3
5	PCC	BIPA406C	Industrial Engineering and Management	3(42)	0	0	42	3	3	90	50	50	100	3
6	HSMC	BHSA424C	Universal Human Values	1(14)	0	0	13	2	1	30	50	50	100	1
7	PCC	BIPA407L	Computer Aided Component Drawing Laboratory	1(14)	0	1(26)	12	5	3	60	50	50	100	2
8	PCC	BIPA408L	Production Engineering - II Lab	0	0	2(26)	-	2	2	30	50	50	100	1
9	PCC	BIPA409L	Spreadsheet for Engineers Lab	0	0	2(26)	-	2	2	30	50	50	100	1
10	MC	BHSX460M	Yoga/NSS/Sports/Music	0	0	2(28)	-	2	-	30	100	-	100	0
														20

	Course Code	:	BBTA402C	BIOLOGY FOR ENGINEERS	Semester	:	IV
	L: T:P	:	3:3 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Understanding fundamentals of biological processes and apply to solve engineering problems, bridging the technical engineering with living systems.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain the structure and functions of cells and biomolecules, properties and applications of special biomolecules in engineering and industrial contexts.

CO2. Interpret bio-inspired models and natural mechanisms and correlate them with engineering designs and technological innovations.

CO3. Analyze the functional architecture of human organ systems as models to design and evaluate engineering solutions**.**

CO4. Apply the concept of bio printing, artificial intelligence, and microbial processes in the design and development of innovative solutions for healthcare, food science, and sustainable infrastructure.

UNIT-I **10 Hrs.**

Introduction to Biology:

The cell: Structure, and functions of a cell. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins and Lipids. Importance of special biomolecules: Enzymes, vitamins and hormones -properties and functions.

Biomolecules and their Applications:

Carbohydrates in bioplastics production, Proteins in food production, Lipids in biodiesel.

UNIT–II **11 Hrs.**

Bio Inspiration Models Used in Engineering:

Bio inspiration - Introduction, Alliance between Engineering and Biology, Biomimicry - Science mimicking nature. Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Gecko Feet, Plant burrs (Velcro), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train), Fire fly LED.

Nature Bioinspired Mechanisms:

BioEcholocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Respiration (MFCs) .

UNIT–III **10 Hrs.**

Human Organ Systems and Bio Designs

Brain as a CPU system -architecture, CNS and Peripheral Nervous System, signal transmission, EEG. Engineering solutions for Parkinson's disease.

Heart as a pump system -architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators.

Lungs as purification system gas exchange mechanisms, spirometry, Ventilators.

Eye as a Camera system, bionic eye. **Kidney** as a filtration system - dialysis systems.

UNIT–IV **11Hrs.**

Trends In Bioengineering

Bioprinting techniques and materials, 3D printing of ear, bone and skin, electrical tongue and electrical nose in food science, Self-healing bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes), Biomining via microbial surface adsorption. Artificial Intelligence for disease diagnosis. Biochips & their applications. Biosensors & their applications.

Reference Books:

1. Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao, "Biology for Engineers" N Publishing, Bengaluru, 2023.
2. S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., *Biology for Engineers*, Tata McGraw-Hill, New Delhi, 2012.
3. Arthur T. Johnson, *Biology for Engineers*, 2nd Edition, CRC Press, Taylor & Francis Group, Boca Raton, FL, 2019.
4. Sohini Singh and Tanu Allen, *Biology for Engineers*, Vayu Education of India, New Delhi, 2014.
5. Yoseph Bar-Cohen, *Biomimetics: Nature-Based Innovation*, 1st edition, CRC Press., 2012
6. Ibrahim Ozbolat, *3D Bioprinting: Fundamentals, Principles and Applications*, Academic Press (Elsevier), 2016.

7. Rodríguez Méndez, M. L. (Ed.), *Electronic Noses and Tongues in Food Science*, 1st Edition, Academic Press (Elsevier), Cambridge, MA, USA, 2016.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
- https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009
- https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
- https://www.coursera.org/courses?query=biology
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview
- https://www.classcentral.com/subject/biology
- https://www.futurelearn.com/courses/biology-basic-concepts

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, and WK4)	3 (WK1, WK2, WK3, and WK4)	3 (WK5)	2 (WK8)	2 (WK2, WK6)	2 (WK1, WK5, WK7)	2 (WK9)	2	-	-	3 (WK8)	3	2	2
CO2	3 (WK1, WK2, WK3, and WK4)	3 (WK1, WK2, WK3, and WK4)	3 (WK5)	2 (WK8)	3 (WK2, WK6)	3 (WK1, WK5, WK7)	2 (WK9)	2	-	-	3 (WK8)	3	2	2
CO3	3 (WK1, WK2, WK3, and WK4)	3 (WK1, WK2, WK3, and WK4)	3 (WK5)	2 (WK8)	3 (WK2,WK 6)	3 (WK1, WK5, WK7)	3 (WK9)	2	-	-	3 (WK8)	3	2	2
CO4	3 (WK1, WK2, WK3, and WK4)	3 (WK1, WK2, WK3, and WK4)	3 (WK5)	2 (WK8)	3 (WK2,WK 6)	3 (WK1, WK5, WK7)	3 (WK9)	2	-	-	3 (WK8)	3	2	2

	Course Code	:	BIPA403C	THEORY OF MACHINES	Semester	:	IV
	L: T:P	:	3:0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to analyze and apply the principles of mechanisms, motion analysis, gears, gear trains, and cam-follower systems for the design and performance evaluation of mechanical power transmission systems.

Course Outcomes:

After completion of the course student will be able to

CO1. Describe kinematic pairs, chains, mechanisms, and their inversions, and classify quick-return, straight-line, and intermittent motion mechanisms.

CO2. Analyze velocity and acceleration in planar mechanisms using vector polygon and relative motion methods, including the Coriolis component.

CO3. Apply gear geometry and kinematic principles to calculate velocity ratio, torque, and contact parameters in spur, helical, bevel, worm gears, and gear trains.

CO4. Design cam profiles for various follower motions and evaluate the motion characteristics for different cam-follower systems.

UNIT-I — **11 Hrs.**

Introduction: Definitions; Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine. Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain and their inversions

Mechanisms: Quick return motion mechanisms- Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism.

UNIT–II — **11 Hrs.**

Velocity and acceleration analysis of mechanisms: Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links.

UNIT–III — **10 Hrs.**

Gears : Gear terminology, Law of gearing, Characteristics of involute action, Path of contact, Arc of contact, Contact ratio of Spur, Helical, Bevel and Worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth.

Gear trains: Types of Gear trains, velocity ratio, Train value, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

UNIT–IV — **10 Hrs.**

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

Text Books:

1. S. S. Rattan, *Theory of Machines* (4th ed.), McGraw-Hill Education (India), 2014.
2. S. Singh, *Theory of Machines: Kinematics and Dynamics* (3rd ed.), Pearson Education India, 2014.
3. J. J. Uicker, G. R. Pennock, and J. E. Shigley, *Theory of Machines and Mechanisms* (5th ed.), Oxford University Press, 2017.

Reference Books :

1. R. K. Bansal and J. S. Brar, *A Textbook of Theory of Machines* (6th ed.), Laxmi Publications, 2016.

Web links and Video Lectures (E-Resources):

1. Theory of machines lectures: https://www.youtube.com/results?search_query=theory+of+machines+lecture
2. Kinematics of mechanisms: https://www.youtube.com/results?search_query=kinematics+of+mechanisms+lecture

3. Gear train and gear terminology: https://www.youtube.com/results?search_query=gear+train+theory+of+machines+lecture
4. Cam and follower systems: https://www.youtube.com/results?search_query=cam+and+follower+lecture
5. Velocity and acceleration analysis of mechanisms: https://www.youtube.com/results?search_query=velocity+and+acceleration+analysis+of+mechanisms+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	2 (WK5)	-	-	2 (WK1,WK5, WK7)	2 (WK9)	2	2	2	2	1	-	-
CO2	2 (WK2)	-	3 (WK5)	-	2 (WK2, WK4)	2 (WK5, WK7)	-	2	2		2	2	1	-
CO3	2 (WK2)	-	3 (WK5)	-	3 (WK2, WK6)	2 (WK1,WK5, WK7)	-		3		2	1	1	-
CO4	-	-	2 (WK5)	-	2 (WK6)	3 (WK5,WK7)	2 (WK9)	2	2		2	-	-	-

	Course Code	:	BIPA404C	PRODUCTION ENGINEERING-II	Semester	:	IV
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to understand, select, and apply casting and welding processes, identify defects, and use appropriate inspection techniques to manufacture and evaluate engineering components in accordance with industrial practices.

Course Outcomes:

After completion of the course student will be able to

CO1 Describe and compare various manufacturing processes and their applications.

CO2 Select appropriate patterns, moulds, moulding machines, and moulding processes based on material and production requirements.

CO3 Explain the principles, equipment, and process steps involved in welding and forging operations.

CO4 Apply knowledge of welding to select suitable joining processes and joint configurations for engineering applications.

UNIT-I **11 Hrs.**

CASTING PROCESS

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process &steps involved. Varieties of components produced by casting process. advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance, Classification of patterns.

Sand Moulding: Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Binder: Definition, Types of binder used in moulding sand. Additives: Need, Types of additives used and their properties.

UNIT–II **11 Hrs.**

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand molding.

Concept of Gating & Risers: Principle and types. Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Special molding Process (Only brief Introduction): No bake moulds, Flask less moulds, Sweep mould, CO_2mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Slush casting and Continuous Casting Processes.

UNIT–III **10 Hrs.**

WELDING

Welding process: Definition, Principles, Classification, Application, Advantages& limitations of welding.

Arc Welding: Principle, Metal Arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes (AHW).

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gastorch construction &working. Forward and backward welding.

UNIT–IV **10 Hrs.**

Special types of welding: Resistance welding - principles, Seam welding, Butt welding, Spot welding and projection welding. Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

Inspection Methods: Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

Text Books:

1. Dr. Radhakrishna K., *Manufacturing Process-I* (5th ed.), Sapna Book House, Bengaluru, 2009.
2. P. N. Rao, *Manufacturing & Technology: Foundry, Forming and Welding* (3rd ed.), Tata McGraw-Hill, 2003.
3. A. Roy, *Process and Materials of Manufacturing* (4th ed.), Pearson Education, 2006.

Reference Books:

1. Serope Kalpakjian and Steven R. Schmid, *Manufacturing Technology* (5th ed.), Pearson Education Asia, 2006.
2. S. K. Hajra Choudhury, *Elements of Workshop Technology*.
3. R. K. Jain, *Production Technology*.

Web links and Video Lectures (E-Resources):

1. Casting process lectures: https://www.youtube.com/results?search_query=casting+process+lecture
2. Welding process lectures: https://www.youtube.com/results?search_query=welding+process+lecture
3. Foundry and moulding process lectures: https://www.youtube.com/results?search_query=foundry+and+moulding+process+lecture
4. Inspection methods in manufacturing: https://www.youtube.com/results?search_query=inspection+methods+in+manufacturing+lecture
5. NDT methods for casting and welding: https://www.youtube.com/results?search_query=non+destructive+testing+casting+welding+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3(WK1)	-	2(WK2)	-	-	2(WK4)	-	-	-	-	2	1	2	3
CO2	3(WK2)	-	2(WK2,WK4)	-	2(WK5)		-	-	-	-	2	1	1	1
CO3	2(WK2)	-	3(WK4,WK5)	-	2(WK5)	2(WK4)	-	-	-	-	2	-	-	-
CO4	2(WK1)	-	2(WK5)	-	3(WK6)	2(WK5,WK7)	-	-	-	-	2	1	1	1

	Course Code	:	BIPA405C	INDUSTRY 4.0	Semester	:	IV
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Implement Industry 4.0 technologies to design, integrate, and optimize smart manufacturing systems for real-time data-driven production efficiency in industrial settings.

Course Outcomes:

After completion of the course student will be able to

CO1. Describe the evolution and core concepts of Industry 4.0.
CO2. Explain the role of enabling technologies like IoT, CPS, and cloud computing.
CO3. Illustrate the integration of data and communication systems in smart manufacturing.
CO4. Analyze implementation challenges and foresee future trends in Industry 4.0 and beyond.

UNIT-I — **11 Hrs.**

Foundation of Industry 4.0

Ch 1: Evolution of Industrial Revolutions: Industry 1.0 to 3.0: Milestones and limitations; Industry 4.0: Definition, drivers, and scope; Characteristics: Decentralization, real-time capability, service orientation.

Ch 2: Smart Manufacturing and Digital Transformation: Difference between traditional and smart manufacturing; Role of digitization, interconnectivity, and intelligent automation; Benefits and barriers to adoption.

UNIT–II — **11 Hrs.**

Key Enabling Technologies

Ch 1: Internet of Things (IoT) and Industrial IoT (IIoT): Basics of IoT architecture and components; Sensors, actuators, gateways in industrial context; Applications in predictive maintenance and production monitoring.

Ch 2: Cyber-Physical Systems (CPS): Introduction and architecture of CPS; CPS in robotics, automation, and quality control; Real-time data exchange between physical and digital worlds.

UNIT–III — **10 Hrs.**

Unit 3: Data Integration and Communication Technologies

Ch 1: Cloud Computing and Big Data: Cloud deployment models: public, private, hybrid; Data collection, storage, and processing in cloud; Role of big data analytics in manufacturing insights.

Ch 2: Communication Protocols & Interoperability: Industrial communication standards: MQTT, OPC-UA, 5G; Horizontal and vertical integration; Need for interoperability in connected factories.

UNIT–IV — **10 Hrs.**

Unit 4: Industry 4.0 Implementation & Future Trends

Ch 1: Challenges and Organizational Readiness: Workforce readiness, skill gap, and change management; Cybersecurity and data privacy in Industry 4.0; Cost, ROI, and technology standardization issues.

Ch 2: Future of Manufacturing & Industry 5.0: Introduction to Industry 5.0 and its distinction from 4.0; Human-centric and sustainable manufacturing vision; Social, environmental, and economic implications,

Text Books :

1. "Design Principles for Industry 4.0" – Sameer Madan, Wiley
2. "Smart Manufacturing: Concepts and Methods" – Thomas Bauernhansl, Springer
3. IEEE, McKinsey & WEF white papers on digital industry and manufacturing
4. NASSCOM & MEITY reports on Industry 4.0 readiness in India
5. **Mario Hermann, Tobias Pentek, and Boris Otto, *Design Principles for Industry 4.0*.**
   Link: https://link.springer.com/book/10.1007/978-3-319-70868-1
6. **Kaushik Kumar and Divya Zindani, *Industry 4.0*.**
   Link: https://link.springer.com/book/10.1007/978-981-13-8165-2
7. **A. F. M. A. B. Al-... / Industry 4.0 overview texts on O'Reilly**
   Link: https://www.oreilly.com/library/view/industry-4-0/9781786304827/toc.xhtml

Reference Books:

1. **Thomas Bauernhansl et al., *Smart Manufacturing: Concepts and Methods*.**
   Link: https://link.springer.com/search?query=Smart%20Manufacturing%20Concepts%20and%20Methods
2. **A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development.**
   Link: https://link.springer.com/book/10.1007/978-3-030-14544-6
3. **IEEE, McKinsey, and WEF white papers on digital industry and manufacturing.**
   Link: https://www.weforum.org/focus/fourth-industrial-revolution/

Link: https://www.mckinsey.com/capabilities/operations/our-insights
Link: https://spectrum.ieee.org/

4. **NASSCOM and MeitY reports on Industry 4.0 readiness in India.**
   Link: https://www.nasscom.in/
   Link: https://www.meity.gov.in/

Web links and Video Lectures (E-Resources):

1. **ndustry 4.0 basics and smart manufacturing overview**
   Link: https://www.youtube.com/watch?v=wbD8gRCkmDM
   This is a good lecture-style video on emerging technologies and AI applications relevant to Industry 4.0.
2. **Industry 4.0 introduction and concepts**
   Link: https://www.youtube.com/watch?v=cgC6V7z-KGo
   Useful for introductory understanding of Industry 4.0-type technology evolution and digital transformation.
3. **Industry 4.0 and IIoT course material**
   Link: https://www.mlritm.ac.in/themes/custom/mlritm/includes/syllabus/mtech/CAD-CAM/R24/I-II/2424018_IOT_&_Industry_4.0.pdf
4. **Industry 4.0 module notes**
   Link: https://www.sist.sathyabama.ac.in/sist_coursematerial/uploads/SEEA1403.pdf

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	2 (WK1, WK4)	2 (WK1, WK4)	-	-	-	-	-	-	-	1 (WK8)	1 (WK9)	1	-	-
CO2	2 (WK2, WK4)	3 (WK2, WK4)	2 (WK4)	-	3 (WK4, WK6)	-	-	-	-	1 (WK8)	1 (WK9)	2	1	-
CO3	2 (WK2, WK4)	3 (WK2, WK4)	2 (WK4)	2 (WK4)	3 (WK4, WK6)	-	-	-	-	2 (WK8)	1 (WK11)	2	2	1
CO4	-	2 (WK4, WK9)	-	2 (WK4, WK9)	1 (WK8)	2 (WK7)	2 (WK7)	1 (WK8)	1 (WK9)	3 (WK8, WK9)	3 (WK9)	1	2	2

	Course Code	:	BIPA406C	INDUSTRIAL ENGINEERING AND MANAGEMENT	Semester	:	IV
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply industrial engineering and management principles to plan, organize, and optimize production systems for enhanced productivity, operational efficiency, and sustainability in industrial environments.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain the scope and functions of industrial engineering in enhancing productivity and efficiency.
CO2. Analyze sustainable practices in industrial systems and apply sustainability principles in engineering decisions.
CO3. Describe and apply key functions of management including planning, organizing, staffing, and directing.
CO4. Apply tools and techniques of control and coordination in managing industrial operations effectively.

UNIT-I — **11 Hrs.**

Introduction to Industrial Engineering

Definition, scope, and history of Industrial Engineering; Productivity: Definition, measurement, and improvement techniques; Work study: Method study and work measurement; Time and motion study – charts and diagrams; Principles of ergonomics and workplace design; Concepts of lean manufacturing and waste elimination; Introduction to Value Engineering.

UNIT–II — **11 Hrs.**

Sustainability in Industrial Engineering

Principles of sustainable development; Triple Bottom Line (TBL) – Environmental, Economic, and Social sustainability; Sustainable manufacturing practices; Energy conservation and green technologies; Circular economy and waste minimization strategies; Life Cycle Assessment (LCA) basics; Role of IE in achieving Sustainable Development Goals (SDGs).

UNIT–III — **10 Hrs.**

Fundamentals of Management

Evolution of management thought; Management vs. Administration; Levels of management and managerial skills; Planning: Objectives, types, steps, and decision-making; Organizing: Structure, authority, delegation, and departmentation; Staffing: Recruitment, selection, training, and performance appraisal.

UNIT–IV — **10 Hrs.**

Functions of Management (continued)

Directing: Leadership styles, motivation theories (Maslow, Herzberg), communication; Controlling: Process, types, techniques (PERT, CPM, Budgeting, Audits);Coordination: Importance and methods; Strategic and operational management; Introduction to Quality Management Systems (QMS); Industrial relations and labor laws overview; Case studies on successful management practices in industry.

Text Books :

1. Harold Koontz and Heinz Weihrich, *Essentials of Management*, McGraw Hill.
2. O. P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai Publications.
3. Martand Telsang, *Industrial Engineering and Production Management*, S. Chand.

Reference Books:

1. Ralph M. Barnes, *Motion and Time Study*.
2. E. S. Buffa, *Modern Production/Operations Management*.
3. Joseph G. Monks, *Operations Management*.
4. James A. Tompkins, *Facilities Planning*.
5. R. Srinivasan, *Organizational Behavior*, PHI.

Web links and Video Lectures (E-Resources):

1. Industrial Engineering and Management lecture resources: https://www.youtube.com/results?search_query=industrial+engineering+and+management+lecture
2. Work study and productivity lectures: https://www.youtube.com/results?search_query=work+study+industrial+engineering+lecture
3. Industrial engineering basics lectures: https://www.youtube.com/results?search_query=industrial+engineering+management+lecture
4. Open-access IE resources: https://libguides.northwestern.edu/c.php?g=114833&p=9124420

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2)	2 (WK1, WK2)	1 (WK3)	-	1 (WK1, WK2)	-	1 (WK7)	-	-	1 (WK10)	1 (WK11)	2	1	1
CO2	2 (WK7, WK8)	2 (WK7, WK8)	-	2 (WK7)	1 (WK7, WK8)	2 (WK7)	3 (WK7, WK8)	1 (WK8)	-	1 (WK8)	1 (WK9)	1	2	1
CO3	2 (WK1, WK3)	1 (WK3)	3 (WK3, WK9)	-	1 (WK3)	-	-	1 (WK7)	1 (WK9)	2 (WK8)	1 (WK9)	2	1	2
CO4	1 (WK3, WK9)	1 (WK3, WK9)	2 (WK3, WK9)	2 (WK3, WK9)	2 (WK9)	-	-	1 (WK7)	3 (WK9)	2 (WK8)	2 (WK9)	2	2	2

	Course Code	:	BHSA424C	UNIVERSAL HUMAN VALUES	Semester	:	IV
	L: T:P	:	1:0:0		Course Type	:	Theory
Hours/Sem.	Teaching	:	14 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	13 Hrs.		SEE Marks	:	50
	Exam	:	03 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

After completing the course, students will be able to understand and apply value-based principles to achieve personal harmony, nurture ethical relationships, promote sustainable and responsible living in personal, social, and professional life.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Understand the need and role of value education for holistic development

CO2**:** Differentiate between self and body, needs, and practice harmony within the human being.

CO3**:** Analyze relationship dynamics based on trust, respect, and justice within families and society.

CO4**:** Recognize harmony in nature and existence, and explore ethical practices and professional conduct within personal and professional contexts.

Unit-I	**3Hrs.**

Introduction to Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations

Unit-II	**4Hrs.**

Harmony in the Human Being :

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Program to ensure self-regulation and Health

Unit-III	**3Hrs.**

Harmony in the Family and Society :

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Valuein Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order

Unit-IV	**4Hrs.**

Harmony in the Nature/Existence Implications of the Holistic Understanding – a Look at Professional Ethics :

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis forHumanistic Education, Humanistic Constitution and Universal Human Order, Competence inProfessional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

Reference Books:

1. Gaur R R, Asthana,R.G, Bagaria G P (2019).A Foundation Course in Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi,
2. The Teacher‟s Manual for A Foundation Course in Human Values and ProfessionaEthics, R R Gaur, R Asthana, G
3. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
4. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
5. The Story of Stuff (Book).
6. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
7. Small is Beautiful - E. F Schumacher.
8. Andrews Cecile, Slow is Beautiful
9. Kumarappa J C ,Economy of Permanence

10. Pandit Sunderlal ,Bharat Mein Angreji Raj
11. Dharampa l, Rediscovering India
12. Gandhi Mohandas K ,Hind Swaraj or Indian Home Rule.
13. Maulana Abdul Kalam Azad :India Wins Freedom -
14. Romain Rolland (English) Vivekananda
15. Romain Rolland (English), Gandhi
16. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
17. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972,Limits to Growth – Club of Rome's report, Universe Books.
18. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
19. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
20. A N Tripathy, 2003, Human Values, New Age International Publishers.
21. SubhasPalekar, 2000, How to practiceNatural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
22. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers ,Oxford University Press
23. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including HumanValues), Eastern Economy Edition, Prentice Hall of India Ltd.
24. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
25. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow.Reprinted 2008.

Web Links and Video Lectures:

Suggested Web Links:

1. Value Education websites,
2. https://www.uhv.org.in/uhv-ii,
3. http://uhv.ac.in,
4. http://www.uptu.ac.in
5. Story of Stuff,
6. http://www.storyofstuff.com
7. Al Gore, An Inconvenient Truth, Paramount Classics, USA
8. Charlie Chaplin, Modern Times, United Artists, USA
9. IIT Delhi, Modern Technology – the Untold Story
10. Gandhi A., Right Here Right Now, Cyclewala Productions
11. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
12. https://fdp-si.aicte-india.org/8dayUHV_download.php
13. https://www.youtube.com/watch?v=8ovkLRYXIjE
14. https://www.youtube.com/watch?v=OgdNx0X923I
15. https://www.youtube.com/watch?v=nGRcbRpvGoU
16. https://www.youtube.com/watch?v=sDxGXOgYEKM

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-		2 (WK9)	-	-	-	3
CO2	-	-	-	-	-	2 (WK5&7)	-	-	-	-	3
CO3	-	-	-	-	2 (WK5&7)	-	-	-	-	3	2 (WK5&7)
CO4	-	-	-	-	2 (WK5&7)	-	-	-	-	3	2 (WK5&7)

	Course Code	:	BIPA407L	COMPUTER AIDED COMPONENT DRAWING LABORATORY	Semester	:	IV
	L: T:P	:	1: 0 :1		Course Type	:	Practical
Hours/Sem.	Teaching	:	40 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	12 Hrs.		SEE Marks	:	50
	Exam	:	08 Hrs.		Total Marks	:	100
	Total Hrs.	:	60 Hrs.		Credits	:	03

Professional Competency:

Utilize CAD software to engineer precise 2D/3D models, assemblies, sectional views, orthographic/isometric projections, and BOMs adhering to engineering drawing standards for manufacturable machine components.

Course Outcomes:

After completion of the course student will be able to

CO1. Use CAD software to create 2D component and sectional views using proper drawing standards.
CO2. Create 3D models of machine components using CAD tools.
CO3. Develop isometric and orthographic views from 3D models.
CO4. Assemble and annotate multi-part models including BOM generation.

Part - A — **20 Hrs.**

Experiments

2D Component Drawing (Using CAD Software)

1. Drawing standards: ISO/IS conventions, title block, dimensioning styles.
2. Orthographic projection of simple machine components.
3. Screw threads and fasteners — bolt, nut, washer, locking arrangements.
4. Keys, cotter joints, knuckle joints — 2D representation.

Part - B — **20 Hrs.**

3D Modeling and Isometric Views

1. 3D solid modeling of machine components.
2. Isometric views from orthographic drawings and vice versa.
3. Assembly drawing (minimum two components) — exploded and constrained assemblies.
4. Plotting, exporting drawings in PDF/technical format.

Recommended Software and Tools:

Solid Edge # SolidWorks # CATIA # Fusion 360 # Free CAD

Text Books:

1. Bhatt N. D., *Machine Drawing*, Charotar Publishing.
2. K. R. Gopalakrishna, *Machine Drawing*, Subhas Publications.
3. Sham Tickoo, *AutoCAD/Creo/SolidWorks Practice Workbooks*, CADCIM Technologies.

Reference Books:

1. Online tutorials and manuals from CAD software developers.

Web links and Video Lectures (E-Resources):

1. SolidWorks tutorials: https://www.youtube.com/results?search_query=SolidWorks+tutorials
2. Fusion 360 tutorials: https://www.youtube.com/results?search_query=Fusion+360+tutorials
3. CATIA tutorials: https://www.youtube.com/results?search_query=CATIA+tutorials
4. CAD drawing basics: https://www.youtube.com/results?search_query=engineering+drawing+and+CAD+tutorials

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK3)	2 (WK1, WK3)	2 (WK1, WK3)	1 (WK3)	-	-	-	-	-	1 (WK9)	-	2	1	1
CO2	3 (WK1, WK3)	2 (WK1, WK3)	3 (WK3)	2 (WK3)	-	-	-	-	-	1 (WK9)	-	2	2	1
CO3	2 (WK1, WK3)	2 (WK1, WK3)	2 (WK3)	2 (WK3)	-	-	-	-	-	1 (WK8)	-	1	2	1
CO4	2 (WK1, WK3)	2 (WK1, WK3)	3 (WK3)	2 (WK3)	1 (WK3)	-	-	-	1 (WK9)	2 (WK9)	-	2	2	2

Course Code		:	BIPA408L	PRODUCTION ENGINEERING-II LABORATORY	Semester	:	IV
L: T:P		:	0: 0 :1		Course Type	:	Practical
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	04 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Develop the ability to prepare moulds, fabricate basic welded and forged components, and perform standard moulding and core sand tests to evaluate material properties and ensure quality in foundry and fabrication practices.

Course Outcomes:

After completion of the course student will be able to:

CO1. Demonstrate various skills of sand preparation and different molding methods.
CO2. Ability to prepare different types of mold cavities and different sand testing methods
CO3. Able to know manufacturing process that in turn provides the student with the capacity to better understand and realization of engineering products and system.
CO4. Aware of importance of manufacturing process in an industry and the applications.

PART-A — **13 Hrs.**

1. Preparation of molds using two molding boxes using patterns or without patterns. by using foundry tools and other equipment.
2. Preparation of simple welded joints like Lap, Butt, T-welds, L-welds using Arc and Gas welding process.
3. Preparing minimum three forged models involving upsetting, drawing and bending operations. Out of these three models, at least one model is to be prepared by using Power Hammer

PART-B — **13 Hrs.**

Testing of Moulding Sand and Core Sand:

Preparation of sand specimens and conduction of the following tests:

1. Compression, Shear and Tensile tests on Universal Sand Testing Machine.
2. Permeability test
3. Core hardness &Mould hardness tests.
4. Sieve Analysis to find Grain Finest number of Base Sand
5. Clay content determination in Base Sand

Textbooks:

1. Dr. Radhakrishna K., *Manufacturing Process-I* (5th ed.), Sapna Book House, Bengaluru, 2009.
2. P. N. Rao, *Manufacturing & Technology: Foundry, Forming and Welding* (3rd ed.), Tata McGraw-Hill, 2003.
3. A. Roy, *Process and Materials of Manufacturing* (4th ed.), Pearson Education, 2006.

Reference Books:

1. Serope Kalpakjian and Steven R. Schmid, *Manufacturing Technology* (5th ed.), Pearson Education Asia, 2006.
2. S. K. Hajra Choudhury, *Elements of Workshop Technology*.
3. R. K. Jain, *Production Technology*.

Web links and Video Lectures (E-Resources):

1. Casting process lectures: https://www.youtube.com/results?search_query=casting+process+lecture
2. Welding process lectures: https://www.youtube.com/results?search_query=welding+process+lecture
3. Foundry and moulding process lectures: https://www.youtube.com/results?search_query=foundry+and+moulding+process+lecture
4. Inspection methods in manufacturing: https://www.youtube.com/results?search_query=inspection+methods+in+manufacturing+lecture

SCHEME OF EXAMINATION

One question from part A	: 20 Marks
One question from part B	: 20 Marks
Viva-voice	: 10 Marks
Total marks	: 50 Marks

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3(WK1)	-	2(WK2)	-	-	2(WK4)	-	-	-	-	2	1	-	-
CO2	3(WK2)	-	2(WK2,WK4)	-	2(WK5)	-	-	-	-	-	2	2	-	-
CO3	2(WK2)	-	3(WK4,WK5)	-	2(WK5)	2(WK4)	-	-	-	-	2	2	-	-
CO4	2(WK1)	-	2(WK5)	-	3(WK6)	2(WK5,WK7)	-	-	-	-	2	2	-	-

	Course Code	:	BIPA409L	SPREADSHEET FOR ENGINEERS	Semester	:	III
	L:T:P	:	0: 0: 2		Course Type	:	Laboratory
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	- Hrs.		SEE Marks	:	50
	Exam	:	04Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Students will develop the professional competency to model, analyze, and solve engineering and data-driven problems using spreadsheet tools by creating effective visualizations, applying mathematical and statistical functions, performing regression and optimization analyses, executing matrix and numerical methods, and developing automated solutions through VBA, macros, and user-defined functions for efficient engineering decision-making.

Course Outcomes:

After successful completion of the laboratory, students will be able to:

1. Apply spreadsheet functions and charting tools to compute engineering data, perform unit conversions, and create effective visualizations such as multi-axis charts, error bars, and combination plots for data interpretation.
2. Analyze engineering problems using conditional functions, regression techniques, and forecasting tools in spreadsheets to model relationships, predict outcomes, and support data-driven decisions.
3. Apply iterative, optimization, and matrix operations using spreadsheet tools such as Goal Seek, Solver, and matrix functions to solve roots, optimization, and system-based engineering problems.
4. Analyze and automate numerical and engineering computations by developing VBA user-defined functions and macros, and by implementing numerical integration and differential equation solution methods using spreadsheet environments.

S. NO	Experiments	26
1	Charting: Create an XY scatter graph, XY chart with two Y-Axes, add error bars to your plot, create a combination chart	
2	Functions: Computing Sum, Average, Count, Max and Min, Computing Weighted Average, Trigonometric Functions, Exponential Functions, Using The CONVERT Function to Convert Units	
3	Conditional Functions: Logical Expressions, Boolean Functions, IF Function, Creating a Quadratic Equation Solver, Table VLOOKUP Function, AND, OR and XOR functions.	
4	Regression Analysis: Trendline, Slope and Intercept, Interpolation and Forecast, The LINEST Function,Multilinear Regression.	
5	Iterative Solutions Using Excel: Using Goal Seek in Excel, Using The Solver To Find Roots, Finding Multiple Roots, Optimization Using The Solver.	
6	Matrix Operations Using Excel: Adding Two Matrices, Multiplying a Matrix by a Scalar, Multiplying Two Matrices.	
7	VBA User-Defined Functions (UDF): The Visual Basic Editor (VBE), The IF Structure, The Select Case Structure, The For Next Structure.	
8	VBA Subroutines or Macros: Recording a Macro, Coding a Macro Finding Roots by Bisection, Using Arrays,Adding a Control and Creating User Forms.	
	Demonstration Experiments (For CIE)	
9	Numerical Integration Using Excel: The Rectangle Rule, The Trapezoid Rule, The Simpson's Rule, Creating a User-Defined Function Using the Simpson's Rule.	
10	Differential Equations: Euler's Method, Modified Euler's Method, The Runge Kutta Method, Solving a Second OrderDifferential Equation	

Text Books :

1. **Mc Fedries Paul Microsoft Excel 2019 Formulas And Functions Microsoft Press, U.S, 2019 Edition**

Reference Books:

1. Michael Alexander and Dick Kusleika Excel Bible
2. Michael Alexander, Richard Kusleika, Excel 2021 Bible, 2021,Wiley

3. Ken Bluttman, Excel Formulas and Functions For Dummies,2023, Wiley
4. Michael Alexander, Excel Dashboards and Reports For Dummies,2022, Wiley

Web links and Video Lectures (E-Resources):

https://www.youtube.com/watch?v=Vl0H-qTclOg
https://www.youtube.com/watch?v=VlprXLxeVm8
https://www.youtube.com/@LeilaGharani
https://www.youtube.com/@MyOnlineTrainingHub

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2 (WK1, WK2, WK4)	2 (WK1,WK 3 WK4)	1 (WK5)	--	1 (WK2, WK6)	--	--	1	--	--	--	2	2	--
CO2	2 (WK1, WK2, WK4)	2 (WK1, WK3 WK4)	2 (WK5)	2 (WK8)	2 (WK2, WK6)	--	--	--	--	--	--	2	2	--
CO3	2 (WK1, WK2, WK4)	1 (WK1 WK3, WK4)	3 (WK5)	--	1 (WK2, WK6)	--	--	2	--	--	--	3	3	--
CO4	1 (WK1, WK2, WK4)	2 (WK1 WK3, WK4)	3 (WK5)	2 (WK8)	2 (WK2, WK6)	--	--	2	--	--	--	2	2	--

	Course Code	:	BHSA460M	YOGA-II	Semester	:	IV
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	2Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credits	:	00

Professional Competency:

Yoga enables an individual to **understand, perform, demonstrate, and learn Yoga effectively and safely**, contributing to **holistic health, mental peace, and quality of life**.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Explain the meaning, aims, and objectives of Yoga and explain its relevance in daily life.

CO2**:** Perform and Teach Suryanamaskar, demonstrating its correct sequence, technique, and explaining It's physical and mental benefits.

CO3**:** Identify, Demonstrate, and Teach Various Asanas by name, including their significance, correct methods of practice, and associated benefits for overall well-being

CO4**:** Instruct and Explain Kapalabhati, including its purpose, technique, precautions, and health benefits Teach Different Types of Pranayama, detailing their names, procedures, safety precautions, and therapeutic uses.

UNIT-I	**7Hrs.**

Patanjali's Ashtanga Yoga, its need and importance.
Yama : Ahimsa, satya, asteya, brahmacarya, aparigraha
Niyama :shoucha, santosh, tapa, svaadhyaya, Eshvarapranidhan

UNIT -II	**7Hrs.**

Suryanamaskar12 counts- 4 rounds of practice Asana, benefits, Importance of Asana.
Asana its meaning by name, types,technique, precautionary measures and benefits of each asana
Sitting : 1.Sukhasana 2. Paschimottanasana- Meaning ,Importances, Rules.

UNIT -III	**7Hrs.**

Asana its meaning by name, technique, precautionary measures and benefits of each asana
Standing Asana:1. Ardhakati Chakrasana2. Parshva Chakrasana- meaning , Importance, Rules.
Prone line: Dhanurasana- It's meaning ,Importances, Rules.
Supine line:1. Halasana 2. Karna Peedasana- Meaning , Importance, Rules.

UNIT -IV	**7Hrs.**

Meaning, importance and benefits of Kapalabhati.40 strokes/min 3 rounds
Pranayam Meaning, Need, importance of Pranayama. Different types. technique,precautionary measures and benefits of each pranayama
Types of Pranayama **:**1.Suryanuloma-Viloma 2. Chandranuloma-Viloma 3. Suryabhedana 4.Chandra Bhedana 5. Nadishodhana

Reference Books:

1.S.K.Kuppasta, 'Samagra yoga darshaini.'Publication :Vivekananda yoga vijnana Kendra ,Bagalkot.2021
2.Ajitkumar, A.**, *"Yogapravesha in Kannada"*, Karnataka Yoga Publications,** 1st Edition, 2012**.**
3.Iyengar, B. K. S.**, *"Light on Yoga"*, George Allen & Unwin Ltd.,** Revised Edition, 1966**.**
4.Gharote, M. L. and Ganguly, S. K.**, *"Teaching Methods for Yogic Practices"*, Kaivalyadhama S.M.Y.M. Samiti,** 1st Edition, 1980**.**
5.SVYASA University**, *"Yoga Instructor Course Handbook"*, SVYASA University,** Edition, 2018**.**
6.Muthanna, Y.**, *"Yoga for Children – Step by Step"*, Prasaranga Publications,** 1st Edition, 2015**.**

Web Links and Video Lectures:

https://youtu.be/KB-TYlgd1wE
https://youtu.be/aa-TG0Wg1Ls

Scheme and Assessment for the course		
Sl.No.	**Activity**	**Marks**
1.	Participation of student in all the modules	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	-	2 (WK 7)	-	-	-	1
CO2	-	-	-	-	-	-	2 (WK7)	-	-	-	1
CO3	-	-	-	-	-	-	2 (WK7)	-	-	-	1
C04	-	-	-	-	-	-	2 (WK7)	-	-	-	1

Course Code		**:**	**BHSB460M**	**NATIONAL SERVICE SCHEME-II**	**Semester**	**:**	**IV**
L:T:P		**:**	**0:0 :2**		**Course Type**	**:**	**MC**
Hours/Sem.	**Teaching**	**:**	**28Hrs.**		**CIE Marks**	**:**	**100**
	Learning (TW+SL)	**:**	**0Hrs.**		**SEE Marks**	**:**	**00**
	Exam	**:**	**2Hrs.**		**Total Marks**	**:**	**100**
	Total Hrs.	**:**	**30Hrs.**		**Credit**	**:**	**00**

Professional Competency:

After completing the course, students will be able to responsibly analyze societal and environmental challenges, design and implement sustainable and innovative solutions, contribute to commUNITy welfare, respond effectively to emergencies, and promote national integration and social harmony.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Recognize and understand their roles and responsibilities towards society for its betterment.

CO1**:** Analyze environmental and societal issues and design effective and sustainable solutions

CO1**:** Assess existing systems critically and propose practical, innovative solutions to promote sustainable development

CO1**:** Plan and implement government-led or self-initiated projects efficiently for commUNITy and societal welfare

CO1**:** Develop the ability to respond to emergencies and natural disasters, while fostering national integration, socia harmony, and UNITy.

Topics/Activities to be Covered

Water conservation techniques – Role of different stakeholders – Implementation.

Preparing an actionable business proposal for enhancing village income and its approach for implementation.

Helping local schools to achieve good results and enhance their enrolment in higher, technical, and vocational education

Pedagogy–Guidelines, it may differ de pending on local resources avail able for the study as well as environment and climatic differences, location and time of execution.

Sl. No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Water conservation techniques – Role of different take holders– Implementation.	May be individual or team	Villages/City Areas/ Grama Panchayat /public associations/Government Schemes officers/ campus etc…..	Group selection/proper consultation/Continuous monitoring/Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Preparing an action able business proposal for enhancing the village income and approach for implementation.	May be individual or team	Villages/City Areas/Grama panchayat/public associations/Government Schemes officers/ campus etc…..	Group selection/proper consultation/Continuous monitoring/Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
3.	Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/vocational education.	May be individual or team	Local government /private/ aided schools/Government Schemes officers/ etc…..	School selection/proper consultation/Continuous monitoring/Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action Execution of Activities For Each Semester

1.Practice Session Description

2.Lecture session by NSS Officer

3.Students Presentation on Topics

4.Presentation- 1,Selectionoftopic,PHASE-1

5.Commencement of activity and its progress-PHASE- 2

6.Execution of Activity
7.Execution of Activity
8.Execution of Activity
9.Execution of Activity
10. Case study based Assessment, Individual performance
11.Sector wise study and its consolidation
12. Video based seminar for 10minutes by each student At the end of semester with Report.

- In every semester from 3rd semester to 6th semester, each student should carry out activities according to the scheme and syllabus.
- At the end of every semester, student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.
- Finally, in the 6th semester, a consolidated report of all activities from 3rd to 6th semester, compiled as per the instructions

Assessment Details for CIE

Weightage	**CIE– 100%**	**Implementation strategies of the project (NSS work).** **The final report should be signed by the NSS Officer, the HoD, and the Principal.** **At last, the report should be evaluated by the NSS Officer of the institute.** **Finally, the consolidated marks sheet should be sent to the University and also made available during the LIC visit.**
Presentation -1 Selection of topic,PHASE-1	15Marks	
Commencement of activity and its progress – PHASE-2	15Marks	
Case study–based assessment Individual performance	15Marks	
Sector-wise study and its consolidation	15Marks	
Video-based seminar for 10 minutes by each student at the end of the semester with report.	40Marks	
Total marks for the course in each semester	**100Marks**	

"The 100 marks CIE entry will be entered in the CIE marks portal at the end of each semester (3rd to 6th semester). The report and assessment copies should be maintained semester-wise and made available in the department."

"Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general.

Reference Books:

1.NSS Cell, VTU Belagavi. (n.d.). *NSS course manual* (Edition unknown). Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS Cell. (n.d.). *Activity reports and manual*. Government of Karnataka.
3. Government of India, NSS Cell. (n.d.). *Activity reports and manual*. Government of India.

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	**Programme Outcomes (POs)**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	1 WK5	-	2	2	1	-
CO2	-	-	-	-	-	3 WK5	-	2	2	1	-
CO3	-	-	-	-	-	1 WK5	-	2	2	1	-
C04	-	-	-	-	-	1 WK5	-	2	2	1	-
CO5	-	-	-	-	-	1 WK5	-	2	2	1	-

	Course Code	:	BHSC460	Physical Education and Sports-II (Common to All Branches)	Semester	:	IV
	L:T:P	:	0:0 :2		Course Type	:	MC
Hours/Sem.	Teaching	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	2Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

After completing the course, students will be able to demonstrate physical fitness and sporting proficiency by correcting postural deformities, managing stress, performing aerobic exercises, and applying proper skills and techniques in games and athletic events while participating confidently in competitive sports.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Understand the ethics and moral values in sports and athletics

CO2**:** Perform in the selected sports or athletics of student's choice.

CO3**:** Understand the roles and responsibilities of organisation and administration of sports and games.

UNIT-I	**7Hrs.**
Ethics in Sports Moral Values in Sports and Games	
UNIT -II	**7Hrs.**
Volley ball–Attack, Block, Service, Upper Hand Pass and Lower hand Pass.	
UNIT -III	**7Hrs.**
Athletics (TrackEvents) –Any event as per availability of Ground	
UNIT -IV	**7Hrs.**
Role of Organisation and administration	

Reference Books:

1. Bandopadhyay, K. (n.d.). *Sarir Siksha Parichay*. Classic Publishers, Kolkata.
2. Dharma, P. N. (n.d.). *Fundamentals of Track and Field*. Khel Sahitya Kendra, New Delhi.
3. Dubey, H. C. (n.d.). *Basketball*. Discovery Publishing House, New Delhi.
4. Jain, N. (n.d.). *Play and Learn Basketball*. Khel Sahitya Kendra, New Delhi.
5. Jain, R. (n.d.). *Play and Learn Cricket*. Khel Sahitya Kendra, New Delhi.
6. Petipus, et al. (n.d.). *Athlete's Guide to Career Planning*. Human Kinetics.
7. Rachana Jain. (n.d.). *Teach Yourself Basketball*. Sports Publication.
8. Saha, A. K. (n.d.). *Sarir Siksher Ritiniti*. Rana Publishing House, Kalyani.
9. Thani, V. (n.d.). *Coaching Cricket*. Khel Sahitya Kendra, New Delhi.

Scheme and Assessment for the course

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	1(WK7)	-	2	-	-	3
CO2	-	-	-	-	-	1(WK7)	-	2	-	-	3
CO3	-	-	-	-	-	1(WK5)	-	2	-	-	3
C04	-	-	-	-	-	1(WK7)	-	2	-	-	3
CO5	-	-	-	-	-	1(WK7)	-	2	-	-	3

	Course Code	:	BHSD460M	MUSIC-II	Semester	:	IV
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate competency in understanding, analyzing, and interpreting Carnatic music compositions, notation systems, and the contributions of eminent composers to appreciate and apply the fundamentals of Carnatic music.

Course Outcomes:

CO1. CO1**:** Explain the characteristics and structural features of major Carnatic music compositions such as Geethe, Jathi, Swara, Swarajathi, Varna, Krithi, and Thillana.
CO2. CO2**:** Interpret and apply the Carnatic music notation system for reading and understanding musical compositions.
CO3. CO3**:** Differentiate among various forms of Carnatic compositions based on their musical structure, purpose, and performance practice.
CO4. CO4**:** Describe the life, contributions, and musical legacy of Purandara Dasa, Tyagaraja, and Mysore Vasudevacharya.

Content **28Hrs.**

Compositions: Introduction to the types of composition in Carnatic Music- Geethe, Jath i, Swara, Swarajathi, Varna, Krithi, and Thillana, Notation System.
Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysoro Vasudlevacharya.

Textbooks:

1. Vidushi Vasantha Madhavi, " Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.

Reference Books:

1. Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige", Tranqueber 2018.
2. R.Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, " The Story of Indian Music and Its Istruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4. Carnatic Music, National Institute of Open Schooling, 2019. 178" EC Proceedings dated 17.07.2024 2/2

Scheme and Assessment for the course

Sl. No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,eachof15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-
C04	-	-	-	-	-	2	-	-	-	-	-

Basaveshwar Engineering College, Bagalkote
Department of Industrial and Production Engineering

Scheme of Teaching and Evaluation

V Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration		Total Hours	Examination Scheme and Evaluation			Credits C= Total Hours/30
				L Hrs./Week (Hrs./Sem.)	T Hrs./Week (Hrs./Sem.)	P Hrs./Week (Hrs./Sem.)	Term Work (TW) & Self learning (SL) (TW+SL) Hrs./Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1	PCC	BIPA501C	Operations Research	3(42)	0	0	42	3	3	90	50	50	100	3
2	PCC	BIPA502C	Industrial Metrology and Quality Control	3(42)	0	0	42	3	3	90	50	50	100	3
3	PCC	BIPA503C	Industrial Product Design	2(28)	0	0	26	3	3	60	50	50	100	2
4	PEC	BIPAXXXE	Professional Elective - I	3(42)	0	0	42	3	3	90	50	50	100	3
5	OEC	BIPAXXXN	Open Elective – I	3(42)	0	0	42	3	3	90	50	50	100	3
6	AEC	BHSA522C	Quantitative Aptitude and Professional Skills	2(28)	0	0	26	3	3	60	50	50	100	2
7	HSMC	BBTA523C	Environmental Studies	1(14)	0	0	13	2	1	30	50	50	100	1
8	PCC	BIPA505L	Decision Making Laboratory	0	0	2 (26)	-	2	2	30	50	50	100	1
9	PROJ	BIPA504P	Mini Project	4 Contact hours/week for interaction between faculty and students				1	3	60	50	50	100	2
10	MC	BHSX560M	Yoga/NSS/Sports/Music	0	0	2(28)	-	2	-	30	100	-	100	0
														20

	Course Code	:	BIPA501C	OPERATIONS RESEARCH	Semester	:	V
	L: T:P	:	3:0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to formulate and solve engineering and managerial decision-making problems using operations research techniques such as linear programming, transportation and assignment models, network analysis, replacement analysis, and game theory with appropriate software tools.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain the role of Operations Research in solving industrial and managerial decision-making problems.
CO2. Formulate and solve linear programming, transportation, assignment, and travelling salesman problems using appropriate optimization techniques.
CO3. Apply CPM, PERT, replacement, and game theory techniques to analyze, plan, schedule, and optimize engineering projects and decision problems.
CO4. Apply appropriate software tools to develop mathematical models and obtain optimal solutions for Operations Research problems.

UNIT-I — **10 Hrs.**

Introduction - Definition of operation research, application of OR to engineering and managerial problems, features of OR models, limitations of OR and models of OR.

Linear programming (LP) - Definition, mathematical formulation of LP problems, standard form, Matrix form of LPP, solution-feasible, basic feasible, optimal, Graphical method, simplex method, variants of simplex algorithm- artificial basis techniques.

UNIT–II — **11 Hrs.**

Transportation problem (TP) - Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods. Unbalanced transportation problem,

Assignment problem (AP) - Formulation of the assignment problem, unbalanced assignment problem, difference between TP and AP

UNIT–III — **10 Hrs.**

Project management-using network analysis - Introduction, **Critical Path Method (CPM) -** Rules for Network construction, determination of critical path and duration, floats, Time Analysis - ES, EF, LS, LF and types floats.

Programme Evaluation and Review Technique (PERT) - Estimation of project duration and variance.

UNIT–IV — **11 Hrs.**

Replacement analysis - Introduction, reasons for replacement, Individual replacement of Machinery or equipment with / without value of money, group replacement policies, problems.

Game theory - Introduction, Pay-off, Types of games, The Maximin - Minimax principles Formulations of games, two-person zero sum game, games with and without saddle point, Graphical solutions (2xn,mx2game) and dominance property.

Assignments - Students have to submit their assignments using OR software packages

Text Books:

1. H. A. Taha, *Operations Research: An Introduction* (6th ed.), Prentice Hall of India, 1999.
2. Phillips, Ravindran, and Solberg, *Principles of Operations Research* (2nd ed.), PHI, 2007.

Reference Books :

1. Kanti Swarup and others, *Operations Research* (14th ed.), Sultan Chand and Sons, 2009.
2. F. S. Hillier and G. J. Lieberman, *Introduction to Operations Research* (6th ed.), McGraw-Hill, 2009.

Web links and Video Lectures (E-Resources):

1. Operations research lectures: https://www.youtube.com/results?search_query=operations+research+lecture
2. Linear programming and simplex method: https://www.youtube.com/results?search_query=linear+programming+simplex+method+lecture
3. Transportation and assignment problems: https://www.youtube.com/results?search_query=transportation+assignment+problem+lecture
4. CPM and PERT: https://www.youtube.com/results?search_query=CPM+PERT+lecture

5. Game theory and replacement analysis:
https://www.youtube.com/results?search_query=game+theory+replacement+analysis+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	2(WK1)	3(WK2)	-	2(WK4)	2(WK5)	-	-	-	-	-	2	2	-
CO2	-	-	2(WK2)	3(WK3)	2(WK4)	2(WK5)	-	-	2	-	-	2	2	-
CO3	-	-	-	2(WK3)	2(WK4)	3(WK5)	2(WK7)	-	2	2	-	2	1	-
CO4	2(WK2)	-	-	-	2(WK6)	2(WK5)	2(WK7)	2(WK8)	2	2	-	2	2	-

	Course Code	:	BIPA502C	INDUSTRIAL METROLOGY AND QUALITY CONTROL	Semester	:	V
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to apply engineering metrology, measurement, and statistical quality control techniques to inspect, analyze, and ensure the dimensional accuracy and quality of manufactured components and processes.

Course Outcomes:

After completion of the course, the student will be able to:

CO1. Explain the principles of engineering metrology, standards, limits, fits, tolerances, and precision measuring instruments used in manufacturing.

CO2. Apply dimensional measurement techniques using linear, angular, comparators, surface finish, thread, and gear measuring instruments for inspection and quality assessment.

CO3. Analyze measurement data and apply statistical quality control techniques, control charts, process capability, and acceptance sampling for quality improvement.

CO4. Evaluate quality management systems and recommend appropriate quality assurance and continuous improvement practices in manufacturing industries.

UNIT-I — **11 Hrs.**

Basic Principles of engineering metrology - Introduction, metrology, need for inspection, accuracy, and precision, objectives of metrology and measurements, general measurement concepts, errors in measurements and methods of measurement. **Limits, fits, and tolerances -** Introduction, principle of interchangeability, tolerances, maximum and minimum metal conditions, fits, system of limits and fits, plain plug gauges, snap gauges.

Linear measurement - Introduction, design of linear measurement instruments, surface plate, V-blocks, graduated scales, scaled instruments, vernier instruments, micrometer instruments, slip gauges, numerical examples.

UNIT - II — **11 Hrs.**

Angular measurement - Introduction, protractor, sine bar, angle gauges, spirit level, optical instruments for angular measurement.

Comparators - Introduction, functional requirements, classification of comparators, mechanical comparators, mechanical optical comparator, electrical comparators, pneumatic comparators.

Metrology of surface finish - Introduction, surface metrology concepts, terminology, analysis of surface traces, methods of measuring surface finish, stylus System of measurement, stylus probe instruments, wavelength, frequency and cut-off, other methods for measuring surface roughness.

UNIT - III — **10 Hrs.**

Basic concepts of quality - The meaning of "quality", quality of design, quality of conformance, quality of performance, quality function, quality control, quality characteristics, cost of quality, optimum cost of performance, quality control and inspection, quality policy, SQC.

Basic statistical concepts-The concept of variation, the distinction between variables and attributes data, the frequency distribution, graphical representation of frequency distribution, quantitative description of distribution and the normal curve.

Control chart for variables - The general theory of control chart, definition of control chart, some possible objectives of control chart, the relationship between $\bar{X}$, σ', and the values of $\bar{X}$, relationship between σ' and σ, relationship between σ' and R, choice of variables, basics of subgrouping, size and frequency of subgroups, control limits, drawing preliminary conclusions from control charts, run sum test, control limits on σ chart, revising the control limits, process capability analysis, why does a capable manufacturing process give defects?

UNIT - IV — **10 Hrs.**

Control charts for attributes: Practical limitations of the control chart for variables, comparison of X and R chart with P chart, control limits on P chart, choice between 'p' chart and 'np' chart, periodic review and revision of p', control charts for defects, comparison between attribute charts and variable chars.

Acceptance sampling - Introduction, sampling methods, the operating characteristics (OC) curve, producer's risk and consumer's risk, quality indices for acceptance sampling plans, AOQL, steps in the design of an acceptance plan, types of sampling plans, design item by item sequential sampling plans, ATI curve.

Text Books:

1. N.V. Raghavendra and L. Krishnamurthy, "Engineering Metrology and Measurements", Oxford University Press, ISBN-13: 978-0-19-808549-2, ISBN-10: 0-19-808549-4
2. M Mahajan "Statistical Quality Control" Dhanpat Rai and Company.

Reference Books:

1. R.K. Jain, "Engineering Metrology", Khanna Publishers, Twentieth Edition, ISBN:81-7409-153-X
2. Douglas C. Montgomery, "Introduction to Quality Control", John Wiley and Sons, Inc978-0-470-16992-6.
3. Mechanical Measurements, Beckwith Marangoni, Pearson Education, 6th Ed., 2006.
4. Engineering Metrology, R.K. Jain, Khanna Publishers, 1994
5. Engineering Metrology, I.C. Gupta, Dhanpat Rai Publications Mechanical Measurements, R.K. Jain, Khanna Publishers

Web links and Video Lectures (E-Resources):

- https://www.youtube.com/watch?v=7ZteZ5UTW6E
- https://www.youtube.com/watch?v=U8y48L_qn6E
- https://www.youtube.com/watch?v=3pNqYFCMdpA
- https://www.youtube.com/watch?v=4fPW-SMABwY
- https://www.youtube.com/watch?v=eQB63tMz8SI
- https://www.youtube.com/watch?v=saoOUXYXde0
- https://www.youtube.com/watch?v=A3sPqnczDLQ
- https://www.youtube.com/watch?v=a2zzBnyxv1E
- https://www.youtube.com/watch?v=7ZteZ5UTW6E
- https://www.youtube.com/watch?v=5wqaGZICdTI
- https://www.youtube.com/watch?v=BxVzeeMy00c
- https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_me16
- https://www.youtube.com/watch?v=Zan5d6j0s5A&list=PLim9gWjsjN-PrliJxhTAx2H93rJi1vLNm
- https://www.youtube.com/watch?v=uz1qCjDm6Ok&list=PLTUO2J9MZQt1WUhHQ66a744alWJeyt8PB
- https://www.youtube.com/watch?v=t_Q1LINurts&list=PLTUO2J9MZQt1WUhHQ66a744alWJeyt8PB&index=2

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1)	2 (WK2)	–	–	2 (WK5)	–	–	–	–	1	1	1	2	-
CO2	3 (WK2)	3 (WK3)	2 (WK4)	2 (WK5)	3 (WK5)	–	–	–	2	1	1	2	2	-
CO3	2 (WK3)	3 (WK4)	3 (WK5)	3 (WK4)	3 (WK5)	2 (WK6)	2 (WK7)	–	2	2	2	3	3	-
CO4	2 (WK4)	3 (WK4)	2 (WK5)	2 (WK6)	3 (WK5)	2 (WK6)	2 (WK7)	2 (WK8)	3	3	3	3	3	-

	Course Code	:	BIPA503C	INDUSTRIAL PRODUCT DESIGN	Semester	:	V
	L: T:P	:	2:0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	28 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	26 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	60 Hrs.		Credits	:	02

Professional Competency:

Develop the ability to plan, design, evaluate, and refine industrial products by integrating user needs, ergonomics, creativity, manufacturability, sustainability, and cost considerations to create functional, reliable, and market-oriented products.

Course Outcomes:

After completion of the course, the student will be able to:

CO1. Explain the principles, scope, and stages of industrial product design and development.
CO2. Analyze user needs, ergonomics, market expectations, and product design specifications for industrial products.
CO3. Develop and evaluate product concepts using suitable creativity, functional analysis, and concept selection methods.
CO4. Integrate materials, manufacturing, assembly, sustainability, safety, and cost considerations while preparing product design documentation.

UNIT-I — **7 Hrs.**

Introduction to Industrial Product Design: Meaning, importance and scope; product design in industrial context; characteristics of a good product; product life cycle; phases of product development; relationship among form, function, ergonomics, aesthetics and manufacturability; role of industrial and production engineers in product design.

UNIT - II — **7 Hrs.**

Product Planning and User-Centered Design: Customer need identification; market survey and product benchmarking; product design specifications; basics of quality function deployment; anthropometry and ergonomics; user safety, convenience and usability; value addition through functional and visual design.

UNIT - III — **7 Hrs.**

Concept Generation and Evaluation: Creativity in design; brainstorming and morphological analysis; functional decomposition; concept sketching and visualization; screening and scoring of concepts; selection of best concept; introduction to prototyping and design refinement; design for manufacturability and assembly basics.

UNIT - IV — **7 Hrs.**

Design Integration and Product Detailing: Selection of materials and manufacturing processes; cost considerations in product design; sustainability and eco-design; reliability, maintenance and serviceability; packaging and product identity; industrial product case studies; preparation of product design report and presentation.

Text Books :

1. A. K. Chitale and R. C. Gupta, *Product Design and Manufacturing*, 6th Edition, PHI Learning, 2019.
2. Karl T. Ulrich, Steven D. Eppinger and Maria C. Yang, *Product Design and Development*, 7th Edition, McGraw-Hill, 2020.
3. George E. Dieter and Linda C. Schmidt, *Engineering Design*, 5th Edition, McGraw-Hill, 2020.

Reference Books:

1. Nigel Cross, *Engineering Design Methods: Strategies for Product Design*, 5th Edition, Wiley, 2021.
2. Yousef Haik, Tamer M. Shahin and Jaber Abu Qudeiri, *Engineering Design Process*, 3rd Edition, Cengage, 2019.
3. Kevin Otto and Kristin Wood, *Product Design: Techniques in Reverse Engineering and New Product Development*, Revised Edition, Pearson, 2020.

Web links and Video Lectures (E-Resources):

1. Product design basics: https://www.youtube.com/results?search_query=product+design+basics
2. Concept generation and evaluation: https://www.youtube.com/results?search_query=concept+generation+product+design
3. Design for manufacturability and assembly: https://www.youtube.com/results?search_query=design+for+manufacturability+and+assembly
4. Industrial product design lectures: https://www.youtube.com/results?search_query=industrial+product+design+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK3)	2 (WK1, WK3)	2 (WK3)	-	-	-	-	-	-	1 (WK8)	1 (WK9)	2	1	1
CO2	2 (WK2, WK8)	3 (WK2, WK8)	2 (WK2, WK8)	-	-	-	2 (WK7)	-	-	1 (WK8)	1 (WK9)	1	2	1
CO3	2 (WK3, WK9)	3 (WK3, WK9)	3 (WK3, WK9)	2 (WK3, WK9)	1 (WK3)	-	-	-	1 (WK9)	2 (WK8)	1 (WK9)	2	2	2
CO4	2 (WK4, WK7)	2 (WK4, WK7)	2 (WK4, WK7)	2 (WK4, WK7)	2 (WK4, WK7)	1 (WK7)	3 (WK7)	-	1 (WK9)	2 (WK9)	2 (WK9)	2	1	2

Course Code	:	BHSSA522C	QUANTITATIVE APTITUDE AND PROFESSIONAL SKILLS	Semester	:	V
L:T:P	:	2:0:0		Course Type	:	AEC
Hours/Sem. Teaching	:	28Hrs.		CIE Marks	:	50
Learning (TW+SL)	:	26Hrs.		SEE Marks	:	50
Exam	:	06Hrs.		Total Marks	:	100
Total Hrs.	:	60Hrs.		Credit	:	00

Professional Competency:

Demonstrate competency in enhancing vocabulary, improving verbal ability, analyzing problems systematically, and solving quantitative problems using appropriate language and numerical techniques.

Course Out comes :

At the end of the course student will be able to

CO1**: Enhance** vocabulary and apply techniques to further improve word usage and language proficiency.
CO2**: Apply** techniques to improve verbal ability in communication and comprehension tasks.
CO3**: Analyze** problems step-by-step and **develop** appropriate methods for solving them effectively.
CO4**: Solve** quantitative problems by applying appropriate concepts and techniques to improve numerical ability.

UNIT-I **7Hrs.**

VocabularyDevelopment: VocabularyBuildingTechniques,RootWords,Antonyms&Synonyms, Sentence Completion, Error Detection & Correction, Reading Comprehension

UNIT-II **7Hrs.**

Numbers,Proportion&Finance: NumberSystem,Factors&Multiples,TheGodofMath–Linear Equations, Ratio-Proportion-Variation, Percentages, Profit & Loss, Interest,Averages &Alligations

UNIT-III **7Hrs.**

Time&Probability: Time&Work,TimeSpeed,&Distance,Permutations&Combinations, Probability

UNIT-IV **7Hrs.**

Verbal,Analytical,andVisualReasoning: HumanRelations,DirectionTests,CodingDecoding, Clocks and Calendars, Visual Reasoning, Analytical Puzzles, Mathematical, Arrangement & Classification Puzzles

Reference Books:

1. R.S.Aggarwal,"A Modern Approach to Verbal and Non–Verbal Reasoning" ,Sultan Chand and Sons, New Delhi, 2018
2. R. S.Aggarwal, "Quantitative Aptitude", Sultan Chand and Sons, New Delhi, 2018
3. Chopra, "Verbal and Non–Verbal Reasoning", Mac Millan India
4. MTyra,"MagicalBookonQuickerMaths",BSCPublications,2018
5. GeorgeJSummers,"TheGreatBookofPuzzles&Teasers",JaicoPublishingHouse,1989
6. ShakuntalaDevi,"PuzzlestoPuzzleYou",OrientPaperBacks,NewDelhi,1976
7. R.S.Aggarwal,"AModernApproachtoLogicalReasoning",SultanChandandSons,New Delhi, 2018
8. Cambridge Advanced Learner's Dictionary, Cambridge University Press. Kaplan's GRE guide

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	3	-	-	-	-	-	-	-	2	-
CO2	-	3	-	-		-	-	-	-	2	-
CO3	-	-	3 WK2	-	2	-	-	-	-	-	-
CO4	-	-	3 WK2	-	2	-	-	-	-	-	-

	Course Code	:	BBTA523C	ENVIRONMENTAL STUDIES	Semester	:	IV
	L: T:P	:	1:0:0		Course Type	:	Theory
Hours/Sem.	Teaching	:	14 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	13 Hrs.		SEE Marks	:	50
	Exam	:	03 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Develop the ability to analyze environmental issues and implement sustainable solutions by applying environmental science principles, pollution control measures, and environmental legislation.

Course Outcomes:

CO1. Identify natural resources and its uses.
CO2. Understand pollution and its effects on environment and to implement sustainable future in the work place.
CO3. Analyze current environmental issues.
CO4. Apply the waste management techniques in various fields.

UNIT-I **04 Hrs.**

Natural Resources:

Human activities and their impacts. Environmental Impact Assessment, **Renewable Energy**: Solar, Wind, Hydropower, Tidal, Ocean thermal, Geo thermal, Biomass energy, Biogas, Biodiesel, Bioethanol, Hydrogen as fuel. **Non- renewable Energy**: Coal, Petroleum, Natural gas, Nuclear energy.

UNIT–II **04 Hrs.**

Environmental Pollution:

Water pollution, water quality standards, water borne diseases, Fluoride problem, Air pollution, Noise pollution. Effect of electromagnetic waves.

Sustainable future: Concept of sustainable development, threats to sustainability, strategies for sustainable development, Sustainable development goals (SDGs). Environment economics – concept of green building, Circular Economy.

UNIT–III **03 Hrs.**

Current Environmental Issues of concern:

Greenhouse Effect- Greenhouse gases and Global Warming, Climate change, ozone layer depletion, Acid rain, Eutrophication

Environmental policy legislation rules & regulations

UNIT–IV **03 Hrs.**

Fundamentals of Waste management:

Solid waste management: Sources, classification, characteristics, collection & transportation, disposal, and processing methods. Hazardous waste management and handling.

Concept of waste water treatment, Bioremediation.

Industrial waste management (Case studies: Cement, plastic, chemical, E–waste, food & construction industry waste management).

Text books:

1. Benny Joseph, ***Environmental Studies***, 3rd Edition, McGraw Hill Education (India) Pvt. Ltd., 2017.
2. Manjunath, D. L., ***Environmental Studies***, 1st Edition, Pearson Education, New Delhi, 2007.
3. Anubha Kaushik and C. P. Kaushik, *Perspectives in Environmental Studies*, 8th Edition, New Age International (P) Ltd., New Delhi, 2025.
4. **P. Meenakshi, *Elements of Environmental Science and Engineering*, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2012.**

Question Paper Pattern for SEE:

Question is of Objective type
Duration of exam is 1 hour
50 questions covering all the four units. Each question carries one mark.

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**01**	**02**	**03**
CO1	2 (WK1, WK2, WK3, and WK4)	-	2 (WK5)	-	-	3 (WK1, WK5 and WK7)	-	-	-	-	3 (WK8)	3	-	3
CO2	2 (WK1, WK2, WK3, and WK4)	-	2 (WK5)	-	-	3 (WK1, WK5 and WK7)	-	-	-	-	3 (WK8)	3	-	3
CO3	2 (WK1, WK2, WK3, and WK4)	-	2 (WK5)	-	-	3 (WK1, WK5 and WK7)	-	-	-	-	3 (WK8)	3	-	3
CO4	2 (WK1, WK2, WK3, and WK4)	-	2 (WK5)	-	-	3 (WK1, WK5 and WK7)	-	-	-	-	3 (WK8)	3	-	3

	L: T:P	:	0:0 :1	DECISION MAKING LABORATORY	Course Type	:	Laboratory
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	04 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Develop the ability to analyze business and industrial decision-making problems using statistical techniques, optimization models, and project management tools, and recommend data-driven solutions for effective managerial decision-making.

Course Outcomes:

After completion of the course students will be able to:

CO1. Apply statistical tools such as measures of central tendency, dispersion, correlation, regression, interval estimation, and hypothesis testing to analyze data and support decision-making.

CO2. Analyze inventory classification, depreciation methods, and resource allocation problems using ABC analysis, depreciation models, and Linear Programming techniques.

CO3. Analyze and solve optimization problems involving transportation, assignment, and travelling salesman models to identify efficient operational decisions.

CO4. Analyze project scheduling and control problems using CPM and PERT techniques to determine critical paths, estimate project completion times, and evaluate project crashing alternatives.

	Experiments:	**26 Hrs.**
1	Determining the measures of central tendency and dispersion of a given process.	
2	Conduction of simple linear regression analysis, Construction of scatter plot and determination of Karl Pearson's correlation coefficient	
3	Interval estimation and hypothesis testing on single population mean	
4	Classification of items based on ABC analysis	
5	Depreciation analysis using Various methods of Depreciation	
6	Solving & sensitivity analysis of LPP models.	
7	Solving & analysis of transportation models.	
8	Solving of assignment models.	
9	Solving of Travelling Sales men models.	
10	Determination of Critical path for CPM model and crashing of activities using CPM model.	
11	Determination of Critical path for PERT model and its estimation.	

Any Statistical Package like SPSS, Minitab, and OR packages can be used for experiments

Text Books:

1. H. A. Taha Operations Research and Introduction , Pearson Education Ltd., 2017
2. Manuals of any statistical package used

Reference Books:

1. Philips, Ravindram and Soleberg, (2007), Principles of Operations Research, (Edition: 2), Theory and Practice, PHI
2. Hiller and Libermann, (2009), Introduction to Operation Research, (Edition:6), McGraw Hill
3. Kanthi Swarup & others,(2009), Operations Research, (Edition:14), Sultan Chand and Sons.

Web links and Video Lectures (E-Resources):

1. https://www.youtube.com/watch?v=cNsBm1TVwH8&list=PLCNil-8hF776gPMaQDEIFZVmEOUOyrnXA

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	01	02	03
CO1	3 (WK2, WK8)	3 (WK2, WK8)	-	3 (WK8)	2 (WK6)	-	-	-	-	-	2 (WK6)	3	3	-
CO2	2 (WK6)	2 (WK6)	2 (WK6)	2 (WK6)	2 (WK6)	-	-	-	-	-	2 (WK5, WK6)	3	3	-
CO3	3 (WK2, WK4)	3 (WK2, WK4)	3 (WK5)	2 (WK8)	3 (WK6)	-	-	-	-	-	2 (WK5, WK6)	3	3	-
CO4	3 (WK2, WK4)	3 (WK2, WK4)	3 (WK5)	2 (WK8)	3 (WK6)	-	-	-	-	-	3 (WK5, WK6)	3	3	-

	L: T:P	:	0:0 :2	MINI PROJECT	Course Type	:	Mini Project
Hours/Sem.	Teaching (Contact Hours)	:	56 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	04 Hrs.		Total Marks	:	100
	Total Hrs.	:	60 Hrs.		Credits	:	02

Professional Competency:

Develop the ability to identify, analyze, design, implement, and evaluate engineering solutions to real-world Industrial and Production Engineering problems through project-based learning while demonstrating teamwork, project management, communication, and professional ethics.

Course Outcomes:

After completion of the course student will be able to:

CO1. **Apply** engineering principles, modern engineering tools, and appropriate methodologies to identify and formulate a real-life Industrial and Production Engineering problem.

CO2. **Analyze** alternative engineering solutions using appropriate analytical, computational, experimental, or statistical techniques to develop a feasible solution.

CO3. **Evaluate** the effectiveness, feasibility, sustainability, and practical implications of the developed solution considering technical, economic, environmental, and societal aspects.

CO4. **Demonstrate** effective project planning, teamwork, technical documentation, presentation, and communication skills while executing and presenting the mini project.

56 Hrs.

Number of students per batch: Maximum2

CIE Evaluation

Evaluation : 15 Marks
Review : 15 Marks
Guide : 20 Marks

Evaluations will be done by a department committee consisting of

- HOD or his Nominee
- Guide
- Project Coordinator

SEE Evaluation

Students have to submit project diary.

The evaluation of the SEE will be based on write-up (10marks) +Demo (15marks) +Presentation (15marks) and Viva- Voce(10marks)

Evaluation Committee

- HOD or his nominee
- External Examiner
- Project Coordinator

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Course Outcomes (Cos)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3(WK2, WK3)	3(WK2, WK3)	–	2(WK4)	3(WK6)	–	–	–	–	–	2(WK6)	3	3	–
CO2	2(WK3)	3(WK3, WK4)	2(WK4)	3(WK4, WK6)	2(WK6)	–	–	–	–	–	2(WK6)	3	3	–
CO3	2(WK4)	3(WK4, WK5)	3(WK5)	3(WK5)	2(WK6)	2(WK7)	2(WK7)	2(WK8)	–	–	3(WK5, WK6)	3	3	–
CO4	2(WK4)	2(WK4)	2(WK5)	2(WK5)	2(WK6)	–	–	2(WK8)	3(WK8)	3(WK8)	3(WK5, WK8)	3	3	–

Scheme of evaluation for Mini-Project,

Rubrics for Project V Semester

SEMESTER V

Rubrics for	Phase	Period (Duration)	Rubric #	Marks	Evaluation by
CIE	Evaluation-I	Before first one and half month in V semester of BE Program	R1	15	Committee consisting of HOD/Nominee + Project Coordinator/Nominee of Project Coordinator + Guide(s)
	Evaluation-II	Before 15 days from the last working day of V semester of BE Program	R2	15	
	Evaluation by guide	In the last week of working days of V semester	R3	20	Guide(s)
SEE	Semester End Examination	During SEE of V semester of BE Program	R4	50	Committee consisting of HOD/Nominee + External Examiner

The evaluation criteria may vary *marginally* (maximum of 5%) from the perspective of different disciplines but the structure/stages of evaluation and allotted marks for each stage of evaluation in 7th or 8th semesters must be same for all the branches across the institute.

R1. Synopsis presentation (Before the end of the first one and half months in the V semester of the BE Program): Total Marks of 15

Evaluation Criteria	Score/Marks			Total Marks	Evaluation By
	Poor (Needs Improvement) (1)	Average (Acceptable) (2)	Very good (Proficient) (3)		
Motivation And Rationale behind the project	• Less motivated and has less desire to achieve a goal, accomplish a task, or work • Need for the process /product that offers viable solutions to accomplish a work towards expectations in a challenging and interesting area is not good	• Moderately motivated and has some interest to achieve a goal, accomplish a task, or work • Need for the process /product that offers viable solutions to accomplish work towards expectations in a challenging and interesting area is okay and acceptable	• Highly motivated and desirous to achieve a goal, accomplish a task, or work • Need for the process /product that offers viable solutions to accomplish work towards expectations in a challenging and interesting area is good	15	Committee consisting of HOD/Nominee +Project Coordinator + Guide(s) Each will be evaluated for 15 marks and the average of all three is the marks awarded
Literature review	• Less than 3 technical papers are reviewed and less relevant	• Three to five technical papers are reviewed and moderately relevant	• More than 5 technical papers from reputed journals are made and reviews are quite relevant to the project work		

Objectives, Project plan	• Only some objectives of the proposed work are well defined and ill-defined project plan	• Incomplete justification to the objectives proposed and moderately defined project plan	• Good justification to the objectives and well-defined project plan		
Proposed methodology	• Division of project work into modules but improper selection of design approaches and design methodology and not properly justified	• Division of project work into modules with proper selection of design approaches and design methodology but not properly justified	• Division of project work into modules and good selection of design approaches, appropriate design methodology with proper justification		
Presentation	• Contents of presentations are not appropriate and not well arranged • Very less eye contact and unclear voice	• Contents of presentations are appropriate but not well arranged • Eye contact with few people and unclear voice	• Contents of presentations are appropriate and well arranged • Satisfactory demonstration, clear voice with good spoken language and good non-verbal communication		

R2. Project Complete presentation (Before 15 days of the end of the Last month in the V semester of the BE Program): Total Marks of 15

Evaluation Criteria	Score/Marks			Total Marks	Evaluation By
	Poor (Needs Improvement) (1)	**Average (Acceptable) (2)**	**Very good (Proficient) (3)**		
Involvement in the work and ability to work in a team	• Less involved in the work	• Would have involved still more	• Sincerely involved in the work and very hard working and has good interest	15	Committee consisting of HOD/Nominee +Project Coordinator + Guide(s) Each will be evaluated for 15 marks and the average of all three is the marks awarded
Incorporation of Suggestions made in the previous review	• Some changes are made as per modifications suggested during previous evaluation	• All major changes are made as per modifications suggested during previous evaluation	• Changes are made as per modifications suggested during previous evaluation and good justification		
Results and Discussion	• Results are not presented properly, Project work is not summarized and concluded	• Results presented are not much satisfactory, Project work summary and conclusion not very appropriate	• Results are presented in good manner, Project work summary and conclusion not very appropriate		

	• Future extensions in the project are not specified	• Future extensions in the project are not specified	• Future extensions in the project are specified		
Demonstration/ Conclusion	• Modules are not in proper working form that further leads to failure of integrated system, Contents of presentations are not appropriate and not well delivered	• Modules are working well in isolation and properly demonstrated, Modules of project are not properly integrated, Contents of presentations are appropriate but not well delivered	• Each module working well and properly demonstrated, Integration of all modules done and system working is very satisfactory		
Presentation	• Contents of presentations are not appropriate and not well arranged • Very less eye contact and unclear voice	• Contents of presentations are appropriate but not well arranged • Eye contact with few people and unclear voice	• Contents of presentations are appropriate and well arranged • Satisfactory demonstration, clear voice with good spoken language and good eye contact		

R3: Evaluation by the guide (In the last week of working days of VII semester): Total Marks of 20

Evaluation Criteria	Score/Marks				Total Marks	Evaluated by
	Needs improvement (Poor) (2)	Acceptable (Average) (3)	Satisfactory (Good) (4)	Proficient (Excellent) (5)		
Technical Knowledge gained through project work	• Poor knowledge and no awareness related to project	• Lacks sufficient knowledge and Awareness	• Fair knowledge and awareness related to the project	• Extensive knowledge and awareness related to the project	**20**	**Guide(s)**
Regularity and Attendance	• Irregular and inconsistent in work	• Reports to the guide but lacks Consistency	• Reports to the guide very often but not very consistent	• Reports to the guide regularly and consistent in work		
Incorporation of Suggestions made periodically	• Major changes are not made as per modifications suggested	• Few changes are made as per modifications suggested	• Changes are made as per modifications suggested	• Changes are made as per modifications suggested and innovations are added		
Organization and structure of Project Report	• Project report not prepared according to the specified format, References and citations	• Project report is according to the specified format but some mistakes, Insufficient	• Project report is according to the specified format, References and citations are appropriate	• Project report is according to the specified format, References and citations are appropriate and well mentioned		

	are not appropriate	references and citations	but not mentioned well			

R4: SEE Evaluation for Project Phase (During SEE of V semester of BE Program): Total Marks of 50

Evaluation Criteria	Score				Total Marks	Evaluation By
	Needs improvement (Poor) (4)	Acceptable (Average) (6)	Satisfactory (Good) (8)	Proficient (Excellent) (10)		
Presentation	• Contents of presentations are not appropriate and not well delivered, Poor eye contact with audience and unclear voice	• Contents of presentations are appropriate but not well delivered, Eye contact with only few people and unclear voice	• Contents of presentations are appropriate and well delivered, Clear voice with good spoken language but less eye contact with audience	• Contents of presentations are appropriate and well delivered, Proper eye contact with audience and clear voice with good spoken language	50	Internal Examiner + External Examiner Each will evaluate for 50 marks and average of two will be taken
Designs and implementation	• Proper design methodology is not followed resulting into poor design , No modern tools are used to implement, Work contributes very less to the world	• Proper design methodology is followed, Design lacks, very less modern tools are used to implement, the work contributes to the world in little way	• Proper design methodology is followed, Design is done but not perfect, few modern tools are used to implement, the work contributes to the world in some way	• Proper design methodology is followed, Design is perfect, Modern tools are used to implement, the work contributes to the world in greater way		
Results and Demonstration	• Some of the defined objectives are achieved • Modules are not in proper working form that further leads to failure of integrated system	• All defined objectives are achieved • Modules are working well in isolation and properly demonstrated • Modules of project are not properly integrated	• All defined objectives are achieved and working well and demonstrated • Integration of all modules done and system working is not very satisfactory	• All defined objectives are achieved and evident from the results • Each module working well and properly demonstrated • All modules of project are well integrated and system working is accurate		

Project report	• Project report not prepared according to the specified format • References and citations are not appropriate	• Project report is according to the specified format with mistakes • In-sufficient references and citations	• Project report is according to the specified format • References and citations not mentioned well	• Project report is according to the specified format • References and citations are appropriate and well mentioned		
Viva - Voce	• Answered 25% of questions related to design, implementation and applications of project work	• Answered 50% of questions related to design, implementation and applications of project work	• Answered 75% of the questions related to design, implementation and applications of project work	• Answered more than 90% of the questions related to design, implementation and applications of project work		

	Course Code	:	BHSA560M	YOGA-III	Semester	:	V
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate proficiency in practicing and teaching Yoga techniques, including Suryanamaskar, Asanas, Kapalabhati, and Pranayama, to promote physical, mental, and holistic well-being

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Understand the meaning, aims, objectives, and importance of Yoga and explain its relevance in daily life.

CO2**:** Perform and Teach Suryanamaskar, demonstrating the correct sequence, technique, and explaining its physical and mental benefits.

CO3**:** Identify, Demonstrate, and Teach Various Asanas, including their significance, correct methods of practice, precautions, and benefits for overall well-being.

CO4**:** Demonstrate and Teach Kapalabhati and Different Types of Pranayama, explaining their purpose, techniques, safety precautions, therapeutic uses, and health benefits.

UNIT-I	**7Hrs.**

Patanjali'sAshtanga Yoga its need and importance.
Ashtanga Yoga 1.Asana 2.Pranayama 3.Pratyahara
Asana its meaning by name, technique, precautionary measures and benefits of each asana

UNIT-II	**7Hrs.**

Sitting Asanas :1.Ardha Ushtrasana 2.Vakrasana 3.Yogamudr a in Padmasana
StandingAsanas:1.UrdhvaHastothanasana,2.Hastapadasa,3.ParivrittaTrikonasana,4.Utkatasana

UNIT-III	**7Hrs.**

Prone line:1.Padangushtha Dhanurasana 2.Poorna Bhujangasana/ Rajakapotasan- It's meaning ,Importance, Rules.
Supine line:1.Sarvangasana 2.Chakraasan 3.Navasana/Noukasana 4.Pavanamuktasana- It's meaning ,Importance, Rules.

UNIT-IV	**7Hrs.**

Kapalabati Revisi on of practice 60 strokes/min 3 rounds
Meaning by name, technique, precautionary measures and benefits of each Pranayama
1.Ujjayi 2.Sheetali 3.Sheektari

Reference Books:

1. **Ajitkumar.***Yogapravesha* (in Kannada).2017
2. **Iyengar, B. K. S***Light on Yoga*. London: Unwin Paperbacks. (1966).
3. **Gharote, M. L., & Ganguly, S. K.** *Teaching methods for yogic practices*. Lonavla: Kaivalyadhama S.M.Y.M. Samiti. (1988).
4. **SVYASA University.** *Yoga Instructor Course handbook*. Bengaluru: Swami Vivekananda Yoga Anusandhana Samsthana. 2018
5. **Muthanna, Y.** *Yoga for children: Step by step*. Mumbai: Vakils, Feffer and Simons Ltd.(2012)

Web links and Video Lectures (E-Resources):

https://youtu.be/KB-TYlgd1wE
https://youtu.be/aa-TG0Wg1Ls

Scheme and Assessment for the course :

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	-	**2 (WK 7)**	-	-	-	-
CO2	-	-	-	-	-	-	**2 (WK 7)**	-	-	-	-
CO3	-	-	-	-	-	-	**2 (WK 7)**	-	-	-	-
CO4	-	-	-	-	-	-	**2 (WK 7)**	-	-	-	-

	Course Code	:	1BHSB560M	National Service Scheme-III	Semester	:	V
	L:T:P	:	0:0 :2		Course Type	:	MC
Hours/Sem.	Teaching	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	2Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate social responsibility, environmental awareness, leadership, and problem-solving skills to contribute effectively to sustainable commUNITy development and societal well-being

Course Outcomes:

CO1: Recognize and understand individual roles and responsibilities towards society and contribute positively to its welfare and development.

CO2: Analyze environmental and societal issues and design practical, innovative, and sustainable solutions for community development.

CO3: Critically assess existing systems and effectively plan and implement government-led or self-initiated Projects for social and sustainable development.

CO4: Develop the ability to respond to emergencies and natural disasters while fostering national integration, social harmony, Unity, and community resilience.

Topics/Activities to be Covered

1. Developing sustainable water management systems for rural areas and approaches for effective implementation.
2. Contributing to national-level initiatives of the Government of India (e.g., Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharat, Make in India, MUDRA Scheme, Skill Development Programs, etc.).
3. Spreading public awareness under rural outreach programs (minimum of 5 programs).
4. Social connect and responsibilities.

Pedagogy–Guidelines, it may differ de pending on local resources avail able for the study as well as environment and climatic differences, location and time of execution.

Sl. No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
	Developing Sustainable Water management system for rural areas and implementation approaches.	May be individual or team	Villages/City Areas/ Grama panchayat/ public associations/ Government Schemes officers/ campus etc	Site selection/proper consultation/Continuous monitoring/Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atma nirbhar Bharath, Make in India,Mudra scheme, Skill development programs etc.	May be individual or team	Villages/City Areas/Grama panchayat/public associations/Government Schemes officers/ campus etc	Group selection/proper consultation/Continuous monitoring /Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

3.	Spreading public awareness under rural out reach programs.(mini mum5programs) ./////Social connect and responsibilities.	May be individual or team	Villages/City Areas/Grama panchayat/public associations/Gove rnment Schemes officers/ campus etc…..	Group selection/proper consultation/Cont inuous monitoring /Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

	Plan of Action (Execution of Activities For Each Semester
Sl.	**Practice Session Description**
1	Lecture session by NSS Officer
2	Students Presentation on Topics
3	Presentation- 1,Selectionoftopic,PHASE-1
4	Commencement of activity and its progress-PHASE- 2
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Execution of Activity
9	Execution of Activity
10	Case study based Assessment, Individual performance
11	Sector wise study and its consolidation
12	Video based seminar for 10minutes by each student At the end of semester with Report.

- **In every semester from 3rd semester to 6th semester, each student should carry out activities according to the scheme and syllabus.**
- **At the end of every semester, student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.**
- **Finally, in the 6th semester, a consolidated report of all activities from 3rd to 6th semester, compiled as per the instructions,**

Assessment Details for CIE

Weightage	**CIE– 100%**	**Implementation strategies of the project (NSS work).** **The final report should be signed by the NSS Officer, the HoD, and the Principal.** **At last, the report should be evaluated by the NSS Officer of the institute.** **Finally, the consolidated marks sheet should be sent to the University and also made available during the LIC visit.**
Presentation -1 Selection of topic,PHASE-1	15Marks	
Commencement of activity and its progress – PHASE-2	15Marks	
Case study–based assessment Individual performance	15Marks	
Sector-wise study and its consolidation	15Marks	
Video-based seminar for 10 minutes by each student at the end of the semester with report.	40Marks	
Total marks for the course in each semester	**100Marks**	

"The 100 marks CIE entry will be entered in the CIE marks portal at the end of each semester (3rd to 6th semester). The report and assessment copies should be maintained semester-wise and made available in the department."

"Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general.

Text Books:

1.NSS Cell, VTU Belagavi. (n.d.). *NSS course manual* (Edition unknown). Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS Cell. (n.d.). *Activity reports and manual*. Government of Karnataka.
3. Government of India, NSS Cell. (n.d.). *Activity reports and manual*. Government of India.

Reference Books:

1.NSS Cell, VTU Belagavi. (n.d.). *NSS course manual* (Edition unknown). Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS Cell. (n.d.). *Activity reports and manual*. Government of Karnataka.
3. Government of India, NSS Cell. (n.d.). *Activity reports and manual*. Government of India.

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	1 (WK 5)	-	2	2	1	-
CO2	-	-	-	-	-	3 (WK 5)	-	2	2	1	-
CO3	-	-	-	-	-	1 (WK 5)	-	2	2	1	-
CO4	-	-	-	-	-	1 (WK 5)	-	2	2	1	-

	Course Code	**:**	**1BHSC560M**	**Physical Education and Sports-III**	**Semester**	**:**	**V**
	L:T:P	**:**	**0:0 :2**		**Course Type**	**:**	**MC**
Hours/Sem.	**Teaching**	**:**	**28Hrs.**		**CIE Marks**	**:**	**100**
	Learning (TW+SL)	**:**	**0Hrs.**		**SEE Marks**	**:**	**00**
	Exam	**:**	**2Hrs.**		**Total Marks**	**:**	**100**
	Total Hrs.	**:**	**30Hrs.**		**Credit**	**:**	**00**

Professional Competency:

Demonstrate competence in physical education, health, fitness, sports, and athletic activities to promote holistic development and achieve excellence in competitive and professional sports.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Understand the fundamental concepts and skills of Physical Education, Health, Food, Nutrition and general fitness

CO2**:** Familiarization of health-related Exercises, Sports for overall growth and development

CO3**:** Create a foundation for the professionals in Physical Education and Sports

CO4**:** Participate in the competition at regional/state / national / international levels.

UNIT-I	**7 Hrs.**
Fitness; Food & Nutrition	
UNIT -II	**7 Hrs.**
Agility–Shuttle Run; Flexibility–Sit and Reach; Cardiovascular Endurance–Harvard step Test	
UNIT -III	**7 Hrs.**
Badminton (Fore hand low/high service, back hand service, smash, drop); Basketball (Dribbling, passing, shooting etc.)	
UNIT -IV	**7 Hrs.**
Athletics (Field events–Throws)	

Reference Books:

1. **Bandopadhyay, K.** *Sarir Siksha Parichay*. Kolkata: Classic Publishers. (2024)
2. **Dharma, P. N.** *Fundamentals of Track and Field*. New Delhi: Khel Sahitya Kendra. (2010)
3. **Dubey, H. C.** *Basketball*. New Delhi: Discovery Publishing House. (2002)
4. **Jain, N.** *Play and Learn Basketball*. New Delhi: Khel Sahitya Kendra. (2004)
5. **Jain, R.**. *Play and Learn Cricket*. New Delhi: Khel Sahitya Kendra. (2005)
6. **Petitpas, A. Champagne, D., & Chartrand, J.**. *Athlete's Guide to Career Planning*. Champaign, IL: Human Kinetics. (1997)
7. **Jain, Rachana.**. *Teach Yourself Basketball*. New Delhi: Sports Publication. (2003)
8. **Saha, A. K.** *Sarir Siksher Ritiniti*. Kalyani: Rana Publishing House. (n.d.).
9. **Thani, V.** *Coaching Cricket*. New Delhi: Khel Sahitya Kendra. (2006).

Scheme and Assessment for the course

Sl.No.	**Activity**	**Marks**
1.	Participation of student in all the modules	20
2.	Quizzes–2,eachof15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	**Programme Outcomes (POs)**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	-	-	-	-	**2 (WK6)**	-
CO2	-	-	-	-	-	-	-	-	-	**2 (WK6)**	-
CO3	-	-	-	-	-	-	-	-	-	**2 (WK6)**	-
CO4	-	-	-	-	-	-	-	-	-	**2 (WK6)**	-

	Course Code	:	1BHSD560M	Music-III	Semester	:	V
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate competency in classifying, analyzing, and understanding the construction, functioning, and acoustic properties of Indian musical instruments across string, wind, percussion, and idiophone categories.

Course Outcomes:

CO1. Classify Indian musical instruments into string, wind, percussion, and idiophone (Ghana Vaadya) categories based on their sound production methods.

CO2. the basic construction and working principles of different types of musical instruments used in Indian music.

CO3. and differentiate the structural and functional features of string, wind, percussion, and idiophone instruments through examples.

CO4. Demonstrate an understanding of the acoustic and musical properties of various instrument Families and their role in performance practice.

Content **28Hr.**

Music Instruments: Classification and construction of string instruments, wind instruments, percussion instruments, Idiophones (Ghana Vaadya), Examples of each class of Instruments

Textbooks:

1. Vidushi Vasantha Madhavi, " Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.

Reference Books:

1. Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige", Tranqueber 2018.
2. R.Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; 3rd edition, 2019.
3. Ethel Rosenthal, " The Story of Indian Music and Its Istruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4. Carnatic Music, National Institute of Open Schooling, 2019. 178" EC Proceedings dated 17.07.2024 2/2

Scheme and Assessment for the course

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,eachof15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-

Basaveshwar Engineering College, Bagalkote
Department of Industrial and Production Engineering

Scheme of Teaching and Evaluation

VI Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs./Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs./Week (Hrs./Sem.)	T Hrs./Week (Hrs./Sem.)	P Hrs./Week (Hrs./Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs./Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1	AEC	BHSA600C	Indian Knowledge Systems	1 (14)	0	0	13	02	01	30	50	50	100	1
2	PCC	BIPA601C	Operations Management	3 (42)	0	0	42	03	03	90	50	50	100	3
3	PCC	BIPA602C	Artificial Intelligence & Manufacturing	3 (42)	0	0	42	03	03	90	50	50	100	3
4	PCC	BIPA603C	Digital Design and Manufacturing	3 (42)	0	0	42	03	03	90	50	50	100	3
5	PCC	BIPA604C	Design of Machine Elements	3 (42)	0	0	42	03	03	90	50	50	100	3
6	PCC	BIPA605L	Digital Design and Manufacturing Laboratory	0	0	1 (24)	-	03	03	30	50	50	100	1
7	PEC	BIPAXXXE	Professional Elective - II	3 (42)	0	0	42	2	2	90	50	50	100	3
8	OEC	BIPAXXXN	Open Elective - II	3 (42)	0	0	42	2	2	90	50	50	100	3
9	MC	BHSX660M	Yoga/NSS/Sports/ Music	0	0	2(28)	-	2	-	30	100	-	100	0
													Total	20

Course Code		:	BHSA600C	INDIAN KNOWLEDGE SYSTEM	Semester	:	VI
L:T:P		:	01:0:0		Course Type	:	AEC
Hours/Sem.	Teaching	:	14Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	13Hrs.		SEE Marks	:	50
	Exam	:	03Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	01

Professional Competency:

Apply the principles of the Indian Knowledge System to appreciate, preserve, and utilize traditional knowledge for addressing contemporary societal and professional challenges.

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Provide an overview of the concept of the Indian Knowledge System and its importance
CO2**:** Appreciate the need and importance of protecting traditional knowledge.
CO3**:** Recognize the relevance of Traditional knowledge in different domains.
CO4**:** Establish the significance of Indian Knowledge systems in the contemporary world

UNIT-I	3 Hrs.

Indian Knowledge Systems (IKS)

Overview, Vedic Corpus, Philosophy in Indian Knowledge system.

UNIT-II	4 Hrs.

Traditional Knowledge in Mathematics

Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their contribution. Number Systems and UNITs of Measurement.

UNIT-III	4Hrs.

Traditional Knowledge in Science

Measurements for time, distance and weight, Astronomy, Indian contributions in astronomy, Astrology, The celestial coordinate system, Elements of the Indian calendar, Notion of years and month, Panchanga – The Indian calendar system

UNIT-IV	4 Hrs.

Traditional Knowledge in Professional domain

Town Planning and Architecture, Agriculture, Governance and Public Administration

Text Books:

1. Mahadevan. B. Bhat Vinayak Rajat, Nagendra Pavana R.N. "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi (2022**).** Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi

Reference Books:

1. Sampad and Vijay "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry. (2011).
2. Acarya. P.K. Indian Architecture, Munshiram Manoharlal Publishers, New Delhi. (1996).
3. Kapoor Kapil, Singh Avadhesh "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H.P. (2021).
4. Dasgupta,S. A History of Indian Philosophy- Volume 1, Motilal Banarsidass, New Delhi. (1975).
5. PLofker. K. (1963). Mathematics in India, Princeton University Press, New Jeresy, USA"

Web Links and Video Lectures:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/
3. http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63
   (Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
4. https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5. https://unctad.org/system/files/official-document/ditcted10_en.pdf
6. http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
   development goals/?gclid=EAIaIQobChMInpJtb_p8gIVTeN3Ch2
7. https://unfoundation.org/what-we-do/issues/sustainable_developmenttgoals/?gclid=EAIaIQobChMInp-

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	2 WK1	2 WK2&7	-	1 WK4	-	2 WK7	1	3	-	2 WK10	2 WK11	2	1	-
CO2	1 WK1	2 WK2&7	-	-	-	3 WK7	2 WK8	3 WK9	-	1 WK10	2 WK11	2	2	-
CO3	2 WK1	2 WK2&7	1 WK3&8	-	1	3 WK7	3 WK8	3 WK9	-	2 WK10	2 WK11		1	-
CO4	2 WK1	2 WK2&7	2 WK3&8	-	1	3 WK7	2 WK8	3 WK9	1 WK10	2 WK10	3 WK11	2	2	-

	Course Code	:	BIPA601C	OPERATIONS MANAGEMENT	Semester	:	VI
	L:T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	6 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Students will develop the capability to design, analyze, and optimize integrated production and service operations by applying quantitative models and structured decision-making techniques to enhance system efficiency and organizational performance.

Course Outcomes:

After completion of the course student will be able to:

CO1. Analyze operations system decisions, facility location alternatives, and layout strategies using break-even and qualitative factors to determine cost-effective operational solutions.

CO2. Analyze forecasting methods, aggregate planning approaches, and master scheduling techniques to evaluate their suitability for varying demand and production environments.

CO3. Apply Material Requirements Planning concepts and service system design tools such as service positioning and blueprinting to plan resource allocation and improve capacity utilization.

CO4. Apply scheduling techniques—Gantt charts, priority rules, Johnson's algorithm, and heuristic procedures—to develop feasible production schedules for single machine, flow shop, and job shop environments.

UNIT-I — **11 Hrs.**

Operations Management Concepts: Introduction, Historical developments, Operations management, Environment of operations, Operations system decisions.

System Design and Capacity Planning: Introduction, Manufacturing and service systems, Design and system capacity, Capacity planning

Facility Location and Layout: Introduction, Location planning for goods and services. Economic analysis (Location break-even analysis, Cost minimization using transportation linear programming), and Qualitative factor analysis.

Facility layout: Analysis and selection of layout (minimizing cost in job shop layout). Determination of layout, types of layouts

UNIT–II — **11 Hrs.**

Forecasting: Forecasting objectives and uses, forecasting variables, Forecasting methodology, Opinion and Judgemental methods, Time series methods, Exponential smoothing, Regression and correlation methods

Aggregate Planning: Introduction, Objective of aggregate planning, Aggregate planning methods - policy guidelines, graphic and charting methods, transportation method of solving APP, master scheduling objective, master scheduling methods

UNIT–III — **10 Hrs.**

Material requirements planning: Introduction, Underlying concepts, System parameters, MRP Logic, MRP implementation

Design of service systems: Characteristic aspects, Customer Contact in Service Systems, Complexity and Divergence in Service Systems, Service Positioning, Service Blueprinting, Other Aspects of Addressing Capacity Issues in Services, Service Quality

UNIT–IV — **10 Hrs.**

Scheduling and Controlling: Introduction, objectives of scheduling, scheduling strategies, scheduling and loading guidelines. Brief discussion on scheduling, methodology - Gantt charts, schedule boards and priority decision rules. Priority and Capacity control

Single Machine Scheduling: Concept, measures of performance, SPT rules. Weighted mean flow time, EDD rules, minimizing total tardiness

Flow Shop Scheduling: Introduction, Johnson's problem, CDS heuristic, Palmer's heuristic.

Job shop scheduling: Types of schedules, heuristic procedure, 2 jobs M machine scheduling.

Text Books:

1. Monks, J.G., (1987), Operations Management- McGraw-Hill International Editions, 1987. ISBN 0-07-100579-X
2. Pannerselvam. R, Production and Operations Management- , 2nd edition PHI. ISBN-978-81-203- 2767-2
3. B.Mahadevan , Operations Management Theory and Practice- , 3rd Edition, Pearson ISBN 978-96-325-4109-2

Reference Books:

1. Adam & Ebert Productions & Operations management – .5th edition PHI
2. Buffa, Modern Production/Operations Management- Wiely Eastern Ltd., 4th edition
3. Chary, S.N Production and Operations Management- , Tata-McGraw Hill., 3rd edition
4. James Dilworth. Operations management – PHI, 3rd edition
5. Lee J Karjewski and Larry P Ritzman, Operations Management – strategy and Analysis, 6th Edn, Pearson Education Asia

Web Links and Video Lectures (e-Resources):

1. Operations Management by Prof. B. Mahadevan (IIM Bangalore): *
   Link: https://nptel.ac.in/courses/110106045
2. Production and Operation Management by Prof. Rajat Agrawal (IIT Roorkee):
   Link: https://nptel.ac.in/courses/110107141
3. Operations and Supply Chain Management by Prof. G. Srinivasan (IIT Madras):
   Link: https://nptel.ac.in/courses/110106046
4. edX (IIMBx) - Operations Management:
   Link: https://www.edx.org/course/operations-management
5. https://www.youtube.com/watch?v=loB763q1f0s
   http://bookboon.com/en/operations-management-ebook

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	2 (WK5)	-	-	-	-	1	-	-	1 (WK8)	2	3	-
CO2	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	3 (WK5)	-	3 (WK6)	1 (WK1, and WK7)	1 (WK9)	1	1	-	1 (WK8)	2	3	-
CO3	-	2 (WK1, WK2, WK3, and WK4)	3 (WK5)	-	3 (WK6)	1 (WK1, and WK7)	-	1	1	-	1 (WK8)	2	2	-
CO4	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	2 (WK5)	-	-	-	-	1	1	-	1 (WK8)	3	3	-

	Course Code	:	BIPA602C	ARTIFICIAL INTELLIGENCE AND MANUFACTURING	Semester	:	VI
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply artificial intelligence methods and manufacturing-domain knowledge to analyze, monitor, optimize, and support intelligent industrial production systems.

Course Outcomes:

After completion of the course students will be able to

CO1. Explain the fundamentals of modern manufacturing, Industry 4.0, and artificial intelligence applications in manufacturing.

CO2. Analyze AI-based methods for process monitoring, control, and digital manufacturing environments.

CO3. Apply AI approaches for design space exploration, production planning, and flexible manufacturing decision-making.

CO4. Describe AI applications in robotics and automated material handling systems used in intelligent manufacturing.

UNIT-I — **10 Hrs.**

Introduction to Modern Manufacturing and AI Based Applications: Introduction to modern manufacturing process; evolution/historical development of manufacturing; overview of traditional vs. modern manufacturing; key concepts and terminology; Industry 4.0; definition and components; impact on manufacturing; introduction to AI and its applications in manufacturing; basics of AI; case studies of AI in manufacturing; design in manufacturing and AI requirements; design principles in manufacturing; AI requirements for design optimization.

UNIT - II — **10 Hrs.**

AI based Methods for Process Control and Monitoring: Machine learning methods; introduction to machine learning; supervised vs. unsupervised learning; AI based monitoring and control of discrete manufacturing process; techniques for process control; real-time monitoring systems; online process monitoring in additive manufacturing; additive manufacturing overview; online monitoring techniques; industrial machine vision; basics of machine vision; applications in manufacturing; development of digital twins; concept of digital twins; benefits and applications.

UNIT - III — **11 Hrs.**

AI based Design Space Exploration and AI & Robotics: Multi-objective heuristic search for design space exploration; heuristic search methods; multi-objective optimization; algorithms for customizable manufacturing; customization in manufacturing; relevant algorithms; allocation and layout; principles of allocation; layout design techniques; scheduling for flexible manufacturing systems; scheduling methods; flexibility in manufacturing systems; AI based robot architecture and applications in automated manufacturing; robot architecture; applications in manufacturing; robot vision and motion; vision systems for robots; motion planning; multi-agent and swarm robotics; basics of multi-agent systems; swarm robotics principles.

UNIT - IV — **11 Hrs.**

Advanced AI Robotics and Automated Material Handling Storage: Robot to robot and robot to human coordination (cobots); collaborative robots and coordination techniques; reliable and trusted AI in robotics; ensuring reliability and trust in AI systems; material functions and types of material handling equipment; analysis of material handling systems; design of system; conveyor system; automated guided vehicle systems; automated storage/retrieval systems; overview of systems and integration with manufacturing.

Text Books:

1. Reza Vaezi, Seeram Ramakrishna, and Paulo Davim, Handbook of Artificial Intelligence in Manufacturing, Elsevier.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing, Wiley.
3. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Pearson.

Reference Books:

1. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
2. Yaochu Jin and Jürgen Branke, Evolutionary Optimization in Uncertain Environments, Springer.
3. Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, Pearson.

Web Links and Video Lectures (e-Resources):

1. AI in manufacturing overview: https://www.youtube.com/watch?v=dJ6JCJtZEpc
2. Artificial intelligence in manufacturing book page: https://shop.elsevier.com/books/artificial-intelligence-in-manufacturing/soroush/978-0-323-99134-6

3. Springer open-access book on AI in manufacturing: https://link.springer.com/book/10.1007/978-3-031-46452-2
4. Artificial Intelligence in Manufacturing by Springer/OAPEN: https://library.oapen.org/handle/20.500.12657/87623
5. AI and robotics in manufacturing: https://www.routledge.com/Artificial-Intelligence-and-Robotics-in-Manufacturing-A-Sustainable-Future/Oza-Kishore-Sharma-Babbar/p/book/9781032384515

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK4)	2 (WK1, WK4)	1 (WK4)	-	-	-	-	-	-	1 (WK10)	1 (WK11)	2	1	1
CO2	2 (WK2, WK4)	3 (WK2, WK4)	2 (WK4)	-	3 (WK4, WK6)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	1
CO3	2 (WK2, WK3)	3 (WK2, WK3)	3 (WK3, WK5)	2 (WK3, WK5)	3 (WK3, WK5, WK6)	-	-	-	-	2 (WK10)	1 (WK11)	2	3	2
CO4	2 (WK4)	2 (WK4)	2 (WK4)	1 (WK4)	1 (WK4)	2 (WK7)	1 (WK7)	1 (WK8)	1 (WK9)	2 (WK10)	2 (WK11)	2	1	2

	Course Code	:	BIPA603C	DIGITAL DESIGN AND MANUFACTURING	Semester	:	VI
	L: T:P	:	0:0 :1		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop digital product designs using CAD/CAM/CNC systems and Industry 4.0 technologies to produce optimized 2D/3D models, G/M-code programs, and sustainable additive manufacturing prototypes for efficient smart production.

Course Outcomes:

After completion of the course student will be able to

CO1. Describe the principles of digital design and apply CAD tools to create 2D and 3D models for product development.

CO2. Explain CAM systems and smart manufacturing concepts including Industry 4.0 technologies such as IoT, CPS, and cloud-based production.

CO3. Develop and interpret CNC part programs using G and M codes for turning and milling operations.

CO4. Analyze additive manufacturing processes and propose sustainable digital manufacturing practices.

UNIT-I **11 Hrs.**

Fundamentals of Digital Design and CAD Tools

Ch 1: Introduction to Digital Design *(5 hours)*

- Digital product lifecycle
- Concepts of digital twins and digital thread
- Introduction to digital prototyping
- Role of digital design in smart manufacturing

Ch 2: Computer-Aided Design (CAD) *(5 hours)*

- 2D and 3D modeling techniques
- Parametric modeling and feature-based design
- Assembly modeling and constraints
- Basics of computer-aided engineering (CAE) integration

UNIT–II **11 Hrs.**

Digital Manufacturing Systems and Industry 4.0 Integration

Ch 1: Computer-Aided Manufacturing (CAM) *(5 hours)*

- Process planning and computer-aided process planning (CAPP)
- Toolpath generation and simulation
- Post-processing and G-code generation
- Introduction to robotics in manufacturing

Ch 2: Smart Manufacturing and Industry 4.0 *(5 hours)*

- Cyber-Physical Systems (CPS)
- Internet of Things (IoT) in manufacturing
- Cloud manufacturing
- Role of AI and data analytics in digital factories

UNIT–III **10 Hrs.**

NC and CNC Programming

Ch 1: Introduction to NC and CNC Systems *(5 hours)*

- Fundamentals of Numerical Control (NC)
- Classification of NC systems: open-loop and closed-loop
- Introduction to CNC
- Components of CNC machines: machine control UNIT, drives, feedback devices
- Applications and benefits of CNC machines

Ch 2: CNC Programming and Tooling *(5 hours)*

- Coordinate systems and axes
- G-codes and M-codes
- Manual part programming for turning and milling
- Tool path generation, offsets, and tool selection
- Introduction to DNC and adaptive control

UNIT–IV	10 Hrs.

Additive Manufacturing and Sustainable Digital Practices

Ch 1: Additive Manufacturing (3D Printing) ***(5 hours)***

- Principles and classification of additive manufacturing
- Materials used in 3D printing
- File formats and slicing
- Applications in prototyping and production

Ch 2: Sustainable Digital Manufacturing ***(5 hours)***

- Sustainable product design concepts
- Digital solutions for waste minimization and energy efficiency
- Life Cycle Assessment (LCA)
- Green manufacturing and circular economy in digital context

Text Books

1. Ibrahim Zeid, *CAD/CAM: Theory and Practice*, McGraw-Hill.
2. P. N. Rao, *CAD/CAM Principles and Applications*, McGraw-Hill.
3. Mikell P. Groover, *Automation, Production Systems, and Computer-Integrated Manufacturing*, Pearson.

Reference Books:

1. Venkataraman, *Additive Manufacturing*, PHI Learning.
2. Kalpakjian and Schmid, *Manufacturing Processes for Engineering Materials*, Pearson.
3. Chua Chee Kai, *3D Printing and Additive Manufacturing: Principles and Applications*, World Scientific.
4. Saad Aslam, *Smart and Sustainable Manufacturing Systems*, Elsevier.

Web Links and Video Lectures (e-Resources):

1. CAD/CAM and digital manufacturing overview: https://onlinelibrary.wiley.com/doi/book/10.1002/9781119667889
2. Digital manufacturing and assembly systems: https://www.routledge.com/Digital-Manufacturing-and-Assembly-Systems-in-Industry-4.0/Kumar-Zindani-Davim/p/book/9780367779474
3. A comprehensive approach to digital manufacturing: https://www.ernster.com/fr/detail/ISBN-9783031253539/Sirinterlikci-ArifErtekin-Yalcin/A-Comprehensive-Approach-to-Digital-Manufacturing
4. Additive manufacturing processes: https://www.accessengineeringlibrary.com/content/book/9780071799485/chapter/chapter10
5. Digital manufacturing reading list: https://www.studocu.com/en-gb/document/university-of-greenwich/computer-aided-manufacturing/reading-list-for-geen1059-computer-aided-manufacturing-resources

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK3)	2 (WK1, WK3)	3 (WK3)	1 (WK3)	-	-	-	-	-	1 (WK10)	1 (WK11)	2	1	1
CO2	2 (WK2, WK4)	3 (WK2, WK4)	2 (WK2, WK4)	2 (WK4)	3 (WK4, WK6)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	1
CO3	2 (WK3, WK5)	3 (WK3, WK5)	2 (WK3, WK5)	2 (WK5)	3 (WK5)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	2
CO4	2 (WK4, WK7)	2 (WK4, WK7)	2 (WK4, WK7)	1 (WK4, WK7)	1 (WK7)	2 (WK7)	2 (WK7)	1 (WK8)	1 (WK9)	2 (WK10)	2 (WK11)	2	1	2

	Course Code	:	BIPA604C	DESIGN OF MACHINE ELEMENTS	Semester	:	VI
	L: T:P	:	3:0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to analyze stresses, apply failure theories, and design machine elements such as threaded fasteners, shafts, keys, springs, and spur gears for safe, reliable, and fatigue-resistant mechanical systems in accordance with engineering standards.

Course Outcomes:

After completion of the course student will be able to

- **CO1.** Summarize the terminologies and preliminary concepts related to normal, shear, biaxial, triaxial and principal stresses
- **CO2.** Apply the concepts of stress analysis, theories of failure and material science to select commonly used machine components under different condition of failure.
- **CO3.** Design the shafts and keys subjected to static and dynamic load failures
- **CO4.** Design the springs, gears by identifying the failure modes under different load conditions

UNIT-I — **12 Hrs.**

Introduction

Definitions: Normal, Shear, Biaxial and Triaxial Stresses, Stress Tensor, Principal Stresses Engineering Materials and their Mechanical properties, Stress-Strain diagrams, Stress Analysis, Design considerations: Codes and Standards.

Design for Static strength

Static loads and Factor of Safety, Theories of failure. Maximum Normal Stress Theory, Maximum Shear Stress Theory, Distortion Energy Theory Failure of Brittle Materials, Failure of Ductile Materials, Stress Concentration, Determination of Stress Concentration Factor.

UNIT–II — **08 Hrs.**

Design for Fatigue strength

Design For Fatigue Strength: Introduction- S-N Diagram, Low Cycle Fatigue, High Cycle Fatigue, Endurance Limit, Endurance Limit Factors: Size effect, Surface effect, Stress Concentration effects. Fluctuating Stresses, Goodman and Soderberg relationship, Stresses due to Combined Loading

Design of Threaded Fasteners:

Stresses in Threaded Fasteners, Effect of Initial Tension, Design of Threaded Fasteners under Static, Dynamic and Impact loads, Design of Eccentrically loaded Bolted Joints.

UNIT–III — **10 Hrs.**

Torsion of Shafts, Design for strength and Rigidity with Steady loading, ASME & BIS codes for Power Transmission shafting, Shafts under Fluctuating loads and Combined loads

Design of Keys: Design of Keys-Stresses in Keys (Rectangle and Square key)

UNIT–IV — **12 Hrs.**

Design of Springs:

Definitions, Types of springs, Stresses in helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Energy stored in springs, Torsion, Belleville and Rubber springs.

Design of Spur Gears: 06 Hours

Spur Gears: Definitions, Stresses in gear tooth: Lewis's equation and form factor, Design for strength, Dynamic load and wear load.

Text Books:

1. V.B. Bhandari (2007), Design of Machine Elements, (2nd Edition) Tata McGraw Hill Publishing Company Ltd
2. S. C. Sharma (2002), Design of Machine Elements, PHI Learning Pvt. Ltd

Reference Books :

1. Robert L. Norton (2018) Machine Design, 5th edition Pearson Education Asia
2. M. F. Spotts, T. E. Shoup, L. E. Hornberger, (2019), Design of Machine Elements, 8th Edition Pearson Education
3. Robert C. Juvinall and Kurt M Marshek, (2017) Fundamentals of Machine Component Design (3rd Edition), Wiley India Pvt. Ltd., New Delhi
4. Joseph E Shigley and Charles R. Mischke (2018), Mechanical Engineering Design (9thEdition). McGraw Hill International edition

Web Links and Video Lectures (e-Resources):

1. Stress Analysis & Failure Theories : https://www.youtube.com/results?search_query=NPTEL+Stress+Analysis+Failure+Theory
2. Fatigue Failure & Goodman Diagramhttps://www.youtube.com/results?search_query=NPTEL+Fatigue+Failure+Machine+Design
3. Threaded Fasteners: https://www.youtube.com/results?search_query=Threaded+Fasteners+Machine+Design+NPTEL
4. Shaft Design: https://www.youtube.com/results?search_query=Shaft+Design+Machine+Design+NPTEL
5. Key Design: https://www.youtube.com/results?search_query=Machine+Design+Keys+NPTEL
6. Helical Spring Design: https://www.youtube.com/results?search_query=Helical+Spring+Design+NPTEL
7. Spur Gear Design: https://www.youtube.com/results?search_query=Spur+Gear+Design+NPTEL

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2, WK3)	2 (WK2, WK3)	–	–	1 (WK6)	–	–	–	–	–	–	2		-
CO2	3 (WK2, WK3, WK4)	3 (WK3, WK4)	2 (WK5)	2 (WK8)	2 (WK6)	–	–	–	–	–	–	1	2	-
CO3	3 (WK3, WK4)	3 (WK4)	3 (WK5)	2 (WK8)	3 (WK6)	–	–	–	–	–	–	1	-	-
CO4	3 (WK3, WK4)	3 (WK4)	3 (WK5)	2 (WK8)	3 (WK6)	1 (WK7)	1 (WK7)	–	–	1 (WK7)	–	2	2	-

	Course Code	:	BIPA605L	DIGITAL DESIGN AND MANUFACTURING LABORATORY	Semester	:	VI
	L: T:P	:	0:0 :1		Course Type	:	Laboratory
Hours/Sem.	Teaching	:	0 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	24 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Design CAD models, generate CAM toolpaths and CNC G-code, simulate machining processes, and fabricate prototypes using digital manufacturing tools to produce precision components for industrial applications.

Course Outcomes:

After completion of the course student will be able to

CO1. Demonstrate the ability to model components using CAD software.
CO2. Generate tool paths and CNC code using CAM tools.
CO3. Fabricate simple components using digital manufacturing tools such as 3D printers.
CO4. Interpret and simulate CNC machining processes digitally.

Experiments	24 Hrs.

1. **Introduction to digital design workflow:** CAD → CAM → Simulation → Production
2. **3D modeling of a basic mechanical component using CAD software** (SolidWorks/Fusion 360/Creo)
3. **CAM toolpath generation:** Contour milling, pocketing, drilling using CAM software
4. **CNC code (G & M) simulation** using NC viewer or integrated CAM simulators
5. **3D printing lab:** Slicing, support generation, and fabrication of simple model
6. **Laser cutting or CNC plotter demo** (optional, based on availability)
7. **Reverse engineering demo** using 3D scanning/photo-based modeling *(if applicable)*

Text Books:

1. Rao, P.N., CAD/CAM Principles and Applications, McGraw-Hill.

Reference Books:

1. Groover, M.P. – Automation, Production Systems, and Computer-Integrated Manufacturing
2. Farag, M.M. – Materials and Process Selection for Engineering Design

Web Links and Video Lectures (e-Resources):

Online tutorials from Autodesk, Dassault Systèmes, or MIT Open Course Ware

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK3)	2 (WK1, WK3)	3 (WK3)	1 (WK3)	-	-	-	-	-	1 (WK10)	-	2	1	1
CO2	2 (WK2, WK4)	3 (WK2, WK4)	2 (WK2, WK4)	2 (WK4)	3 (WK4, WK6)	-	-	-	-	1 (WK10)	-	2	2	1
CO3	2 (WK4, WK7)	2 (WK4, WK7)	2 (WK4, WK7)	1 (WK4, WK7)	1 (WK7)	-	-	-	-	1 (WK10)	-	2	1	2
CO4	2 (WK3, WK5)	3 (WK3, WK5)	2 (WK3, WK5)	2 (WK5)	3 (WK5)	-	-	-	-	1 (WK10)	-	2	2	1

	Course Code	:	BHSA660M	YOGA-IV	Semester	:	VI
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate proficiency in practicing and teaching Yoga techniques, including Suryanamaskar, Asanas, Kapalabhati, and Pranayama, to promote physical, mental, and holistic well-being

Course Outcomes:

After completion of the course, student will be able to:

CO1**:** Understand the meaning, aims, objectives, and importance of Yoga and explain its relevance in daily life.

CO2**:** Perform and Teach Suryanamaskar, demonstrating the correct sequence, technique, and explaining its physical and mental benefits.

CO3**:** Identify, Demonstrate, and Teach Various Asanas, including their significance, correct methods of practice, precautions, and benefits for overall well-being.

CO4**:** Demonstrate and Teach Kapalabhati and Different Types of Pranayama, explaining their purpose, techniques, safety precautions, therapeutic uses, and health benefits.

UNIT-I **7Hrs.**

Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi

Asana by name, technique, precautionary measures and benefits of each asana

Different types of Asanas

Sitting Asanas :1.Bakasana 2.Hanumanasana 3.Ekapada Rajakapotasana 4.Yogamudra in Vajrasana- Meaning ,Importance Rules.

Standing Asanas :1.Vatayanasana 2.Garudasana- It's meaning ,Importance, Rules.

UNIT-II **7Hrs.**

Balancing:1.Veerabhadrasana 2. Sheershasana It's meaning, Importance, Rules. -

Supine line:1.Setubandha 2.Sarvangasana 3. Shavasanaa (Relaxation poisture).- It's meaning ,Importance, Rules.

Revision of Kapalabhati practice 80 strokes/min - 3 rounds

UNIT-III **7Hrs.**

Different types. Meaning by name, Technique, Precautionary measures and Benefits of eachPranayama 1. Bhastrika 2. Bhramari- Meaning ,Importance Rules.

UNIT-IV **7Hrs.**

Meaning, Need, importance of Shatkriya. Different types. Meaning by name, technique, precautionary measures and benefits of each Kriya

1. Jalaneti & sutraneti
2. Nouli (only formen)
3. Sheetkarma Kapalabhati

Reference Books:

. 1.S.K.Kuppasta, 'Samagra yoga darshaini.'Publication :Vivekananda yoga vijnana Kendra ,Bagalkot.2021

2.Ajitkumar, A., *"Yogapravesha in Kannada"*, Karnataka Yoga Publications, 1st Edition, 2012.

3.Iyengar, B. K. S., *"Light on Yoga"*, George Allen & Unwin Ltd., Revised Edition, 1966.

4.Gharote, M. L. and Ganguly, S. K., *"Teaching Methods for Yogic Practices"*, Kaivalyadhama S.M.Y.M. Samiti, 1st Edition, 1980.

5.SVYASA University, *"Yoga Instructor Course Handbook"*, SVYASA University, Edition, 2018.

6.Muthanna, Y., *"Yoga for Children – Step by Step"*, Prasaranga Publications, 1st Edition, 2015.

Web links and Video Lectures (E-Resources):

https://youtu.be/KB-TYlgd1wE

https://youtu.be/aa-TG0Wg1Ls

Scheme and Assessment for the course		
Sl.No.	**Activity**	**Marks**
1.	Participation of student in all the modules	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	**Programme Outcomes (POs)**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	-	2 WK 7	-	-	-	-
CO2	-	-	-	-	-	-	2 WK 7	-	-	-	-
CO3	-	-	-	-	-	-	2 WK 7	-	-	-	-
CO4	-	-	-	-	-	-	2 WK 7	-	-	-	-

	Course Code	:	BHSB660M	National Service Scheme-IV	Semester	:	VI
	L:T:P	:	0:0 :2		Course Type	:	MC
Hours/Sem.	Teaching	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	2Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate social responsibility, environmental awareness, leadership, and problem-solving skills to contribute effectively to sustainable commUNITy development and societal well-being

Course Outcomes:

CO1: Recognize and understand individual roles and responsibilities towards society and contribute positively to its welfare and development.

CO2: Analyze environmental and societal issues and design practical, innovative, and sustainable solutions for commUNITy development.

CO3: Critically assess existing systems and effectively plan and implement government-led or self-initiated projects for social and sustainable development.

CO4: Develop the ability to respond to emergencies and natural disasters while fostering national integration, social harmony, UNITy, and commUNITy resilience.

National Service Scheme (NSS)–Contents

1. **Organic Farming and Indian Agriculture (Past, Present, and Future): Connectivity for Marketing**
2. Waste Management – Role of Public, Private, and Government Organizations; The 5Rs
3. Establishing an Information-Imparting Club for Women: Contributions to Social and Economic Issues
4. Water Conservation Techniques – Role of Different Stakeholders and Implementation
5. Preparing an Actionable Business Proposal for Enhancing Village Income and Its Implementation Approach
6. Helping Local Schools Achieve Better Results and Improve Enrollment in Higher/Technical Education
7. **Developing a Sustainable Water Management System for Rural Areas – Implementation Approaches**
8. **Contribution to Any National-Level Initiative of the Government of India** (e.g., Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharat, Make in India, MUDRA Scheme, Skill Development Programs, etc.)

Topics/Activities to be Covered

1.Plantation and adoption of plants. Know your plants.
2.Organize Nation all integration and social harmony events/workshops/seminars. (Minimum02programs).
3.Govt.school Rejuvenation and helping them to achieve good infrastructure.

Sl. No	Topic	Groupsize	Location	Activity execution	Reporting	Evaluation of the Topic
1.	Plantation and adoption of plants. Know your plants.	May be individual or team activity	Villages/City Areas/Grama panchayat/ public associations/ Government Schemes officers/ campus etc…..	Place selection/proper consultation/Continuous monitoring /Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Organize National integration and social harmony events /workshops /seminars. (Minimum02 programs).	May be individual or team	Villages/City Areas/Grama panchayat/public associations/Government Schemes of ficers/ campus etc…..	Place selection/proper consultation/Continuous monitoring /Information board	Report should be submitted by the individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
3.	Govt. school	May be individual	Villages/City Areas/Grama	Place selection/prop	Report should be submitted by	Evaluation as per the rubrics Of

	Rejuvenation and helping them to achieve good infrastructure.	or team	panchayat/public associations/Government Schemes officers/ campus etc…..	er consultation/Continuous monitoring /Information board	individual to the concerned evaluation authority	scheme and syllabus by NSS officer

	Plan of Action (Execution of Activities For Each Semester)
Sl. NO	**Practice Session Description**
1	**Lecture session by NSS Officer**
2	**Students Presentation on Topics**
3	**Presentation- 1,Selectionof topic,PHASE-1**
4	**Commencement of activity and its progress-PHASE- 2**
5	**Execution of Activity**
6	**Execution of Activity**
7	**Execution of Activity**
8	**Execution of Activity**
9	**Execution of Activity**
10	**Case study based Assessment, Individual performance**
11	**Sector wise study and its consolidation**
12	**Video based seminar for 10minutes by each student At the end of semester with Report.**
	• **In every semester from 3rd semester to 6th semester, each student should carry out activities according to the scheme and syllabus.** • **At the end of every semester, student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.** • **Finally, in the 6th semester, a consolidated report of all activities from 3rd to 6th semester, compiled as per the instructions.**

Assessment Details for CIE

Weightage	**CIE– 100%**	**Implementation strategies of the project (NSS work).** **The final report should be signed by the NSS Officer, the HoD, and the Principal.** **At last, the report should be evaluated by the NSS Officer of the institute.** **Finally, the consolidated marks sheet should be sent to the University and also made available during the LIC visit.**
Presentation -1 Selection of topic,PHASE-1	15Marks	
Commencement of activity and its progress – PHASE-2	15Marks	
Case study–based assessment Individual performance	15Marks	
Sector-wise study and its consolidation	15Marks	
Video-based seminar for 10 minutes by each student at the end of the semester with report.	40Marks	
Total marks for the course in each semester	**100Marks**	

"The 100 marks CIE entry will be entered in the CIE marks portal at the end of each semester (3rd to 6th semester). The report and assessment copies should be maintained semester-wise and made available in the department."

"Students should present the progress of the activities as per the schedule in the prescribed practical session in the

field. There should be positive progress in the vertical order for the benefit of society in general.

Reference Books:

1. NSS Cell, VTU Belagavi.. *NSS course manual* (Edition unknown). Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS Cell.). *Activity reports and manual*. Government of Karnataka.
3. Government of India, NSS Cell. *Activity reports and manual*. Government of India.

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	-	-	-	1 WK 5	-	2	2	1	-
CO2	-	-	-	-	-	3 WK 5	-	2	2	1	-
CO3	-	-	-	-	-	1 WK 5	-	2	2	1	-
CO4	-	-	-	-	-	1 WK 5	-	2	2	1	-

Course Code	:	BHSC660M	PHYSICAL EDUCATION AND SPORTS-IV	Semester	:	VI
L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem. Teaching	:	28Hrs.		CIE Marks	:	100
Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
Exam	:	2Hrs.		Total Marks	:	100
Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate competence in physical education, health, fitness, sports, and athletic activities to promote holistic development and achieve excellence in competitive and professional sports.

Course Outcomes:

CO1**:** Understand the Postural deformities and Stress management in sports and athletics
CO2**:** Participate in the competition at regional/state / national / international levels.
CO3**:** Understand and practice of specific games and athletic Jumping events.
CO4**:** Understand and practice of Aerobics.

UNIT-I	**7 Hrs.**
Postural deformities. Stress management	
UNIT -II	**7 Hrs.**
Throw ball, Table Tennis	
UNIT -III	**7 Hrs.**
Athletics (Field Events-Jumps)–Any event as per availability of Ground.	
UNIT -IV	**7 Hrs.**
Arobics	

Reference Books:

1. Bandopadhyay, K. Sarir Siksha Parichay. Kolkata: Classic Publishers. (2024)
2. Dharma, P. N. Fundamentals of Track and Field. New Delhi: Khel Sahitya Kendra. (2010)
3. Dubey, H. C. Basketball. New Delhi: Discovery Publishing House. (2002)
4. Jain, N. Play and Learn Basketball. New Delhi: Khel Sahitya Kendra. (2004)
5. Jain, R.. Play and Learn Cricket. New Delhi: Khel Sahitya Kendra. (2005)
6. Petitpas, A. Champagne, D., & Chartrand, J.. Athlete's Guide to Career Planning. Champaign, IL: Human Kinetics. (1997)
7. Jain, Rachana.. Teach Yourself Basketball. New Delhi: Sports Publication. (2003)
8. Saha, A. K. Sarir Siksher Ritiniti. Kalyani: Rana Publishing House. (n.d.).
9. Thani, V. Coaching Cricket. New Delhi: Khel Sahitya Kendra. (2006).

Scheme and Assessment for the course

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,eachof15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	-	-	2 (WK8)	-	-	-
CO2	-	-	-	-	-	-	-	2(WK8)	-	-	-
CO3	-	-	-	-	-	-	-	2(WK8)	-	-	-
CO4	-	-	-	-	-	-	-	2(WK8)	-	-	-

	Course Code	:	BHSD660M	Music-IV	Semester	:	VI
	L:T:P	:	0:0:2		Course Type	:	MC
Hours/Sem.	Practical	:	28Hrs.		CIE Marks	:	100
	Learning (TW+SL)	:	0Hrs.		SEE Marks	:	00
	Exam	:	02Hrs.		Total Marks	:	100
	Total Hrs.	:	30Hrs.		Credit	:	00

Professional Competency:

Demonstrate competency in performing basic Carnatic swara exercises, applying notation skills, and rendering Geethe, Jathi Swara, and Krithi with correct pitch, rhythm, and adherence to raga and tala structures.

Course Outcomes:

CO1**:** Perform basic swara exercises (Sarale Varase) accurately in Mayamalavagowla Raga with proper pitch and rhythm.
CO2**:** Apply notation writing skills for Sarale Varase and Suladi Saptha Tala to accurately represent rhythmic and melodic structures.
CO3**:** Sing prescribed Geethe in Malahari Raga with correct swara alignment and tala adherence.
CO4**:** Perform Jathi Swara and one Krithi in a Mela raga with proper expression, laya, and adherence to composition structure.

Content **28Hrs.**

Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Botation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethe in M allahari, and one jathi Swara, One Krithi in a Mela raga

Textbooks

1. Vidushi Vasantha Madhavi, " Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.

Reference Books:

1. Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige", Tranqueber 2018.
2. R.Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, " The Story of Indian Music and Its Istruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4. Carnatic Music, National Institute of Open Schooling, 2019.
178" EC Proceedings dated 17.07.2024 2/2

Scheme and Assessment for the course

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes–2,eachof15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-

Basaveshwar Engineering College, Bagalkote
Department of Industrial and Production Engineering
Scheme of Teaching and Evaluation
(THE STUDENTS ADMITTED TO FIRST YEAR IN THE ACADEMIC YEARS 2024-25)

VII Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs./Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs./Week (Hrs./Sem.)	T Hrs./Week (Hrs./Sem.)	P Hrs./Week (Hrs./Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs./Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1	HSMC	BHSA711C	Research Methodology & IPR	3 (42)	0	0	42	03	03	90	50	50	100	3
2	PCC	BIPA712C	Supply Chain Management	3 (42)	0	0	42	03	03	90	50	50	100	3
3	PCC	BIPA713C	Project Management	3 (42)	0	0	42	03	03	90	50	50	100	3
4	PEC	BIPAXXXE	Professional Elective - III	3 (42)	0	0	42	03	03	90	50	50	100	3
5	PEC	BIPAXXXE	Professional Elective - IV	3 (42)	0	0	42	03	03	90	50	50	100	3
6	Proj.	BIPA714P	Project	18 contact Hrs./week			-	03	03	270	50	50	100	9
													Total	24

	Course Code	:	BHSA711C	RESEARCH METHODOLOGY AND IPR	Semester	:	VII/VIII
	L:T:P	:	03:0:0		Course Type	:	AEC
Hours/Sem.	Teaching	:	42Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42Hrs.		SEE Marks	:	50
	Exam	:	06Hrs.		Total Marks	:	100
	Total Hrs.	:	90Hrs.		Credits	:	03

Professional Competency:

Ability to apply research methodology and reflective thinking in engineering sciences, while effectively utilizing modern tools to protect intellectual creations through appropriate forms of IPR, and demonstrating the skills required to qualify as a patent agent at national and international levels.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Integrate research methodology in engineering sciences in relevant trades.
CO2: Exhibit reflective thinking in problem solving exercises.
CO3: Identify criteria to fit one's own intellectual work in particular form of IPRs
CO4: Develop skill of making search using modern tools and techniques and also student is able to become patent agent by cracking patent agent exam

UNIT-I — 10 Hrs.

Introduction to Engineering Research

Fundamentals of Research: Meaning, objectives, and motivation in engineering research.
Types of Engineering Research: Basic, applied, and translational research; identifying and solving Worthwhile problems.
Research Ethics: Ethics in engineering research and practice, types of research misconduct, and ethical issues in authorship...

UNIT-II — 10 Hrs.

Literature Review and Citations

Technical Reading & Analysis: Methods for reviewing literature, analyzing prior art, and synthesizing new and existing knowledge.
Bibliographic Databases: Web of Science, Google, Google Scholar, effective search strategies.
Conceptualizing Research: Critical and creative reading, taking notes, reading mathematical models, algorithms, and datasheets.
Citations & Acknowledgments: Attribution, citation styles, impact of keywords, citing datasets, and knowledge dissemination.

UNIT-III — 10Hrs.

Fundamentals of Intellectual Property Rights and Patents

Introduction to Intellectual Property Rights (IPR): Concept, nature, and significance of Intellectual Property.
Types of Intellectual Property: Patents, Copyrights, Trademarks, Industrial Designs, Geographical Indications, Trade Secrets, and Plant Varieties.
Role of IPR in innovation: research, entrepreneurship, and economic development. **International IPR Framework:** Overview of WIPO, WTO, TRIPS Agreement, Paris Convention, and Berne Convention.
Patents: Meaning, objectives, and characteristics of patents. Patentable and non-patentable inventions.
Criteria for patentability: Novelty, Inventive Step, and Industrial Applicability.
Patent search: Importance and databases (InPASS, PATENTSCOPE, Google Patents).
Patent filing procedure in India: Provisional and Complete Specifications. Patent examination, publication, opposition, grant, renewal, and infringement.

UNIT-IV — 10 Hrs.

Copyrights, Trademarks, Industrial Designs and IPR Management

Copyrights: Meaning, subject matter, ownership, duration, and infringement, Copyright issues in the digital environment and academic research.
Trademarks and Industrial Designs: Concept and importance of trademarks. Registration process, infringement, and

remedies. Industrial Designs: Registration, protection, and significance.

Geographical Indications and Trade Secrets: Concept, registration, and protection of Geographical Indications. Trade secrets and confidential information.

IPR Management and Commercialization: Technology Transfer and Licensing. Patent valuation and commercialization. Intellectual Property in Start-ups and Academic Institutions.

Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. **IP Organizations In India. Schemes and Programmes**.

Text Books:

1. Dr. Nejakar Santosh M, Dr. Bendigeri Harish (2023-24) "Research Methodology and Intellectual Property Rights", ISBN 978-93-5987-928-4

Reference Books:

1. Thiel David V. "Research Methods for Engineers" Cambridge University Press,
2. Acharya N.K Intellectual Property Rights . 6th Edition, Asia Law House.
3. P. Naryan, (2007). "Intellectual Property Law", 3rd Ed, Eastern Law House,
4. Dr. Myneni S.R.,(2019) "Law of Intellectual Property", 9th edition, Asia law House,.
5. Dr. Reddy G.B, (2020) "Intellectual Property Rights and Law", Reprint edition, Gogia Law Agency. Hydrabad,.
6. N.R. Subbaram. S. Viswanathan, (2008). "Hand book Indian Patent Law and, Practice" Printers and publishers Pvt,Ltd,
7. Cornish, "Intellectual Property Rights", Universal publications

Web Links and Video Lectures:

1.https://mooc.utm.my/courses/researchmethodologyforen?utm_source=chatgpt.com
2.https://arxiv.org/abs/physics/0601009?utm_source=chatgpt.com
3.https://scholar.google.com/?utm_source=chatgpt.com
4.https://www.webofscience.com/?utm_source=chatgpt.com
5.https://www.wipo.int/en/web/wipo-academy/programs/ip-elearning?utm_source=chatgpt.com
6.https://ipindia.gov.in/?utm_source=chatgpt.com
7.https://patentscope.wipo.int/?utm_source=chatgpt.com
8.https://patents.google.com/?utm_source=chatgpt.com
9.https://nptel.ac.in/courses/109106148?utm_source=chatgpt.com

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	2 WK2&7	2 WK3&8	3 WK4	2 WK5	1 WK7	2 WK8	3 WK9	-	1 WK10	2 WK11
CO2	-	3 WK2&7	2 WK3&8	3WK4	-	2 WK7	2 WK8	2 WK9	-	-	2 WK11
CO3	-	-	-	-	2 WK5	3 WK7	2 WK8	3 WK9	-	1 WK10	3 WK11
CO4	-	-	-	2 WK4	3 WK5	2 WK7	-	1 WK9	-	1 WK10	-

	Course Code	:	BIPA712C	SUPPLY CHAIN MANAGEMENT	Semester	:	VII
	L: T:P	:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Ability to analyze, design, coordinate, and improve supply chain networks and logistics systems for achieving operational efficiency, strategic competitiveness, and sustainable business performance for integrated supply chains

Course Outcomes:

After completion of the course students will be able to

CO1. Apply supply chain concepts, performance metrics, and strategic fit principles to evaluate the effectiveness of supply chain operations in manufacturing and service organizations.

CO2. Analyze the impact of supply chain drivers, distribution networks, and coordination mechanisms on organizational performance and customer responsiveness.

CO3. Apply quantitative and qualitative approaches for designing supply chain networks, transportation systems, and global supply chain structures.

CO4. Analyze the role of information technology, sustainability practices, and risk management in improving supply chain efficiency and competitiveness.

UNIT-I **10 Hrs.**

Chapter 1: UNDERSTANDING THE SUPPLY CHAIN

What Is a Supply Chain? Historical Perspective, The Objective of a Supply Chain, The Importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process Views of a Supply Chain, Examples of Supply Chains

Chapter 2: SUPPLY CHAIN PERFORMANCE: ACHIEVING STRATEGIC FIT AND SCOPE

Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, Challenges to Achieving and Maintaining Strategic Fit, Achieving and Maintaining Strategic Fit in Emerging: Retail Markets: The Indian Scenario, The Experience, Adaptation

▶ CASE STUDY: The Demise of Blockbuster

▶ CASE STUDY: Rise and Fall of Subhiksha

UNIT–II **10 Hrs.**

Chapter 3: SUPPLY CHAIN DRIVERS AND METRICS

Impellers of Supply Chain, Financial Measures of Performance, Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing, Infrastructure, International Logistics,

▶ CASE STUDY: Seven-Eleven Japan Co.

▶ CASE STUDY: Financial Statements for Walmart Stores Inc. and Macy's Inc.

Chapter 4: DESIGNING DISTRIBUTION NETWORKS AND APPLICATIONS TO ONLINE SALES

The Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design, Design Options for a Distribution Network, Online Sales and the Distribution Network, Indian Agricultural Produce Distribution Channels: Ripe for Major Transformation, Indian FMCG Sector-distribution Channels, Indian Commodities Distribution Channels, Distribution Networks in Practice,

▶ CASE STUDY: Blue Nile and Diamond Retailing

UNIT–III **10 Hrs.**

Chapter 5: NETWORK DESIGN IN THE SUPPLY CHAIN

The Role of Network Design in the Supply Chain, Factors Influencing Network Design Decisions, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation, Jaipur Rugs–networking Tradition with Modernity, Making Network Design Decisions in Practice, The Impact of Uncertainty on Network Design,

▶ CASE STUDY: Managing Growth at SportStuff.com

▶ CASE STUDY: Designing the Production Network at Cool Wipes

Chapter 6: DESIGNING GLOBAL SUPPLY CHAIN NETWORKS

The Impact of Globalization on Supply Chain Networks, The Offshoring Decision: Total Cost, Risk Management in Global Supply Chains

Chapter7: COORDINATION IN A SUPPLY CHAIN

Lack of Supply Chain Coordination and the Bullwhip Effect, The Effect on Performance of Lack of Coordination, Obstacles to Coordination in a Supply Chain, Managerial Levers to Achieve Coordination, Continuous Replenishment and Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment, Collaborative Planning,

Forecasting, and Replenishment—Indian Experiences, Achieving Coordination in Practice

UNIT–IV | **12 Hrs.**

Chapter 8: TRANSPORTATION IN A SUPPLY CHAIN

The Role of Transportation in a Supply Chain, Modes of Transportation and Their Performance Characteristics, Transportation Infrastructure and Policies, Design Options for a Transportation Network, Mumbai Dabbawallas: A Highly Responsive Distribution Network, Trade-Offs in Transportation Design, Tailored Transportation, The Role of IT in Transportation, Making Transportation Decisions in Practice,

▶ CASE STUDY: Designing the Distribution Network for Michael's Hardware

▶ CASE STUDY: The Future of Same-Day Delivery: Same as the Past?

▶ CASE STUDY: Selecting Transportation Modes for China Imports

Chapter 9: SUSTAINABILITY AND THE SUPPLY CHAIN

The Role of Sustainability in a Supply Chain, The Tragedy of the Commons, Key Pillars of Sustainability, Sustainability and Supply Chain Drivers, closed-Loop Supply Chains, The Pricing of Sustainability,

▶ CASE STUDY: Sustainable Supply Chains—Indian Efforts 559

▶ CASE STUDY: HUL—A Sustainable Supply Chain 559

▶ CASE STUDY: Future of Supply Chains 560

Chapter10: A INFORMATION TECHNOLOGY IN A SUPPLY CHAIN

The Role of IT in a Supply Chain, The Supply Chain IT Framework, Customer Relationship Management, Internal Supply Chain Management, Supplier Relationship Management, The Transaction Management Foundation, The Future of IT in the Supply Chain, Risk Management in IT, Supply Chain IT in Practice

Text Books:

1. Supply Chain Management–Strategy, Planning & Operation. Sunil Chopra, Peter Meindl, and Dharam Vir Kalra, Pearson Education Asia, ISBN: 978-93-325-4823-7, eISBN: 978-93-325-8267-5, Sixth Edition.

Reference Books:

1. Supply Chain Redesign–Transforming Supply Chains into Integrated Value Systems. Robert B Handfield, Ernest L Nichols, Jr., Pearson Education Inc, 3rd Edition (3rdImpreesion), 2007, ISBN: 81-317-0401-7
2. Modelling the Supply Chain -Jeremy F Shapiro, Duxbury, Thomson Learning, 2002, ISBN 0-534-37363
3. Designing & Managing the Supply Chain. David Simchi Levi, Philip Kaminsky& Edith Simchi Levi; McGraw Hill

Weblinks and Video Lectures (E-Resources):

- **Supply Chain Analytics by Prof. Rajat Agrawal (IIT Roorkee):**

Link: **https://nptel.ac.in/courses/110107114**

- **Supply Chain Management by Prof. Janat Shah (IIM Udaipur):**

Link: https://nptel.ac.in/courses/110108056

- **https://www.linkedin.com/pulse/amuls-supply-chain-management-strategy-amit-srivastava-q41dc/**
- **https://bookboon.com/en/supply-chain-management-ebook**
- **https://www.youtube.com/watch?v=Lpp9bHtPAN0**
- **https://www.youtube.com/watch?v=Tb2zZ8AKftY**
- **https://www.youtube.com/watch?v=j8cAlTW_FC8**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2)	2 (WK3)	-	-	-	-	-	-	-	-	2 (WK4)	2	2	-
CO2	2 (WK1)	3 (WK2, WK3)	-	2 (WK4)	-	-	-	-	-	-	2 (WK5)	3	3	-
CO3	2 (WK1, WK2)	3 (WK3)	3 (WK5)	2 (WK4)	1 (WK6)	-	-	-	-	-	2 (WK5)	2	3	-
CO4	2 (WK1)	2 (WK3)	-	2 (WK4)	3 (WK6)	2 (WK7)	3 (WK7)	-	-	-	2 (WK5)	3	2	-

Course Code		:	BIPA713C	PROJECT MANAGEMENT	Semester	:	VII
L: T:P		:	3: 0 :0		Course Type	:	Theory
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply project management principles, planning and estimation techniques, scheduling tools, resource allocation methods, and performance control strategies to effectively plan, execute, monitor, and manage engineering projects for successful and sustainable outcomes.

Course Outcomes:

After completion of the course students will be able to

CO1. Students will understand the basics of project management, planning, analysis and various facets of PM

CO2. Develop skills of generation and screening of project ideas, organizing, staffing, accountability, controlling and selection of contractors

CO3. Introduced to the use of various tools and techniques of PM, project scheduling, resources allocation methods and PLM

CO4. Knowledge of direction, coordination and control in PM, MIS, performance measures/improvement and project management institute with the help of important case studies

UNIT - I	11 Hrs.

Concepts of project management - Concepts of a project, categories of projects, phases of project life cycle, roles and responsibility of project leader, tools and techniques for project management. **Project planning and estimating -** Capital expenditures: Importance and difficulties, phases of capital budgeting, levels of decision making, facets of project analysis, feasibility study: A schematic diagram, objectives of capital Budgeting. Preparation of cost estimation, evaluation of the project profitability.

UNIT- II	11 Hrs.

Generation and screening of project ideas - Generation of ideas, monitoring the environment, corporate appraisal, scouting for project ideas, preliminary screening, project rating index, sources of positive net present value, on being an entrepreneur, organizing and staffing the project team: skills / abilities required for project manager, authorities and responsibilities of project manager, project organization and types accountability in project, controls, tendering and selection of contractors.

UNIT - III	10 Hrs.

Tools and techniques of project management: Bar (GANTT) chart, bar chart for combined activities, logic diagrams and networks, project evaluation and review techniques (PERT), planning, computerized project management. **Project scheduling:** Project implementation scheduling, effective time management, different scheduling techniques, resources allocation method. PLM concepts.

UNIT- IV	10 Hrs.

Co-ordination and control: Project direction communication in a project, MIS project co-ordination, project control requirement for better control of project or role of MIS in project control, performance, control, schedule control, cost control. **Performance measures in project management**: Performance indicators, performance improvement for the CM and DM companies for better project management, project management and environment and Practitioners. **Project management institute:** Importance of the same for the Industry and **Case studies on project management**: Case studies covering project planning, scheduling, use of tools and techniques, performance measurement.

Text Books:

1. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 4th Edition, 2002.
2. Chaudhry S., Project Execution Plan: Plan for Project Execution Interaction, 2002.
3. Bhavesh M. Patel, Project Management, Vikas Publishing House, 2002.

Reference Books:

1. Beningston Lawrence, Project Management, McGraw Hill, 1970.
2. Weist and Levy, A Management Guide to PERT and CPM, Eastern Economy of PH, 2002
3. L. S. Srinnath, PERT and CPM, Affiliated East West Press Pvt. Ltd., 2002.
4. Moder Joseph and Philips Cerel R., Project Management with PERT and CPM, 2nd Edition, Van Nostrand Reinhold, 1976.
5. Angus, Planning, Performing and Controlling Project, Pearson Education, 3rd Edition, 2001.

6. James P. Lawis, Project Planning, Scheduling and Control, Meo Publishing Company, 2001.

Web links and Video Lectures (E-Resources):

1. Project management lectures: https://www.youtube.com/results?search_query=project+management+lecture
2. PERT and CPM lectures: https://www.youtube.com/results?search_query=PERT+CPM+lecture
3. Project scheduling and Gantt chart: https://www.youtube.com/results?search_query=project+scheduling+Gantt+chart+lecture
4. MIS in project management: https://www.youtube.com/results?search_query=MIS+in+project+management+lecture
5. Project management case studies: https://www.youtube.com/results?search_query=project+management+case+study+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2)	3 (WK1, WK2)	2 (WK2)	2 (WK2)	1 (WK2)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	1
CO2	2 (WK3, WK9)	2 (WK3, WK9)	3 (WK3, WK9)	2 (WK3, WK9)	1 (WK9)	-	-	-	1 (WK9)	1 (WK10)	1 (WK11)	2	2	2
CO3	2 (WK4, WK5)	3 (WK4, WK5)	2 (WK4, WK5)	2 (WK4, WK5)	3 (WK4, WK5)	-	-	-	-	1 (WK10)	1 (WK11)	2	3	2
CO4	2 (WK6, WK7)	2 (WK6, WK7)	1 (WK6)	2 (WK6, WK7)	2 (WK6)	2 (WK7)	1 (WK7)	1 (WK8)	1 (WK9)	2 (WK10)	2 (WK11)	2	1	2

	Course Code	:	BAIP714P	PROJECT	Semester	:	VII
	L: T:P	:	0:0 :9		Course Type	:	Project
Hours/Sem.	Teaching (Contact hours)	:	0 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	294 Hrs.		SEE Marks	:	50
	Exam	:	6 Hrs.		Total Marks	:	100
	Total Hrs.	:	300 Hrs.		Credits	:	09

Professional Competency:

Develop the ability to identify, investigate, design, implement, validate, and communicate innovative solutions to complex Industrial and Production Engineering problems by integrating engineering knowledge, modern tools, research methodologies, sustainability principles, teamwork, and project management practices.

Course Outcomes:

After completion of the course, the student will be able to:

CO1. Apply engineering principles, research methodologies, and modern engineering tools to identify, formulate, and plan the solution of a complex Industrial and Production Engineering problem.

CO2. Analyze, model, design, and implement an engineering solution using appropriate analytical, computational, experimental, and optimization techniques.

CO3. Evaluate and validate the developed solution considering technical performance, economic feasibility, sustainability, societal impact, environmental aspects, and ethical responsibilities.

CO4. Demonstrate professional competence through effective project management, teamwork, technical documentation, presentation, communication, and lifelong learning during project execution.

252 Hrs.

Number of students per batch: Maximum4

Evaluation

Evaluation : 15 Marks
Review : 15 Marks
Guide : 20 Marks

Evaluations will be done by a department committee consisting of

- HOD or his Nominee
- Guide
- Project Coordinator

SEE:

Students have to submit project diary.

The evaluation of the SEE will be based on write-up (10marks) +Demo (15marks) +Presentation (15marks) and Viva- Voce(10marks)

Evaluation Committee

- HOD or his nominee
- External Examiner
- Project Coordinator

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3(WK2, WK3)	3(WK3, WK4)	2(WK4)	2(WK4)	3(WK6)	–	–	–	–	1	2(WK6)	3	3	2
CO2	2(WK3)	3(WK4)	3(WK4, WK5)	3(WK4, WK5)	3(WK6)	1	1	–	1	1	2(WK6)	3	3	3
CO3	2(WK4)	2(WK5)	2(WK5)	3(WK5)	2(WK6)	3(WK7)	3(WK7)	2(WK8)	1	2	3(WK5, WK6)	3	3	3
CO4	1	1	1	1	2(WK6)	1	1	2(WK8)	3(WK8)	3(WK8)	3(WK8)	3	3	2

Scheme of evaluation for Project

RUBRICS FOR PROJECT VII/VIII SEMESTER

SEMESTER VII/VIII

Rubrics for	Phase	Period (Duration)	Rubric #	Marks	Evaluation by
CIE	Evaluation-I	Before first one and half month in VII/VIII semester of BE Program	R1	15	Committee consisting of HOD/Nominee + Project Coordinator/Nominee of Project Coordinator + Guide(s)
	Evaluation-II	Before 15 days from the last working day of VII/VIII semester of BE Program	R2	15	
	Evaluation by guide	In the last week of working days of VII/VIII semester	R3	20	Guide(s)
SEE	Semester End Examination	During SEE of VII/VIII semester of BE Program	R4	50	Committee consisting of HOD/Nominee + External Examiner

The evaluation criteria may vary *marginally* (maximum of 5%) from the perspective of different disciplines but the structure/stages of evaluation and allotted marks for each stage of evaluation in 7th or 8th semesters must be same for all the branches across the institute.

R1. Synopsis presentation (Before the end of the first one and half months in the VII/VIII semester of the BE Program): Total Marks of 15

Evaluation Criteria	Score/Marks			Total Marks	Evaluation By
	Poor (Needs Improvement) (1)	Average (Acceptable) (2)	Very good (Proficient) (3)		
Motivation And Rationale behind the project	• Less motivated and has less desire to achieve a goal, accomplish a task, or work • Need for the process /product that offers viable solutions to accomplish a work towards expectations in a challenging and interesting area is not good	• Moderately motivated and has some interest to achieve a goal, accomplish a task, or work • Need for the process /product that offers viable solutions to accomplish work towards expectations in a challenging and interesting area is okay and acceptable	• Highly motivated and desirous to achieve a goal, accomplish a task, or work • Need for the process /product that offers viable solutions to accomplish work towards expectations in a challenging and interesting area is good	15	Committee consisting of HOD/Nominee +Project Coordinator + Guide(s) Each will be evaluated for 15 marks and the average of all three is the marks awarded
Literature review	• Less than 3 technical papers are reviewed and less relevant	• Three to five technical papers are reviewed and moderately relevant	• More than 5 technical papers from reputed journals are made and reviews are quite relevant to the project work		

Objectives, Project plan	• Only some objectives of the proposed work are well defined and ill-defined project plan	• Incomplete justification to the objectives proposed and moderately defined project plan	• Good justification to the objectives and well-defined project plan		
Proposed methodology	• Division of project work into modules but improper selection of design approaches and design methodology and not properly justified	• Division of project work into modules with proper selection of design approaches and design methodology but not properly justified	• Division of project work into modules and good selection of design approaches, appropriate design methodology with proper justification		
Presentation	• Contents of presentations are not appropriate and not well arranged • Very less eye contact and unclear voice	• Contents of presentations are appropriate but not well arranged • Eye contact with few people and unclear voice	• Contents of presentations are appropriate and well arranged • Satisfactory demonstration, clear voice with good spoken language and good non-verbal communication		

R2. Project Complete presentation (Before 15 days of the end of the Last month in the VII/VIII semester of the BE Program): Total Marks of 15

Evaluation Criteria	Score/Marks			Total Marks	Evaluation By
	Poor (Needs Improvement) (1)	Average (Acceptable) (2)	Very good (Proficient) (3)		
Involvement in the work and ability to work in a team	• Less involved in the work	• Would have involved still more	• Sincerely involved in the work and very hard working and has good interest	15	Committee consisting of HOD/Nominee +Project Coordinator + Guide(s) Each will be evaluated for 15 marks and the average of all three is the marks awarded
Incorporation of Suggestions made in the previous review	• Some changes are made as per modifications suggested during previous evaluation	• All major changes are made as per modifications suggested during previous evaluation	• Changes are made as per modifications suggested during previous evaluation and good justification		
Results and Discussion	• Results are not presented properly, Project work is not summarized and concluded • Future extensions in the project are not	• Results presented are not much satisfactory, Project work summary and conclusion not very appropriate • Future extensions in the project are not	• Results are presented in good manner, Project work summary and conclusion not very appropriate		

	specified	specified	• Future extensions in the project are specified		
Demonstration/ Conclusion	• Modules are not in proper working form that further leads to failure of integrated system, Contents of presentations are not appropriate and not well delivered	• Modules are working well in isolation and properly demonstrated, Modules of project are not properly integrated, Contents of presentations are appropriate but not well delivered	• Each module working well and properly demonstrated, Integration of all modules done and system working is very satisfactory		
Presentation	• Contents of presentations are not appropriate and not well arranged • Very less eye contact and unclear voice	• Contents of presentations are appropriate but not well arranged • Eye contact with few people and unclear voice	• Contents of presentations are appropriate and well arranged • Satisfactory demonstration, clear voice with good spoken language and good eye contact		

R3: Evaluation by the guide (In the last week of working days of VII semester): Total Marks of 20

Evaluation Criteria	Score/Marks				Total Marks	Evaluated by
	Needs improvement (Poor) (2)	Acceptable (Average) (3)	Satisfactory (Good) (4)	Proficient (Excellent) (5)		
Technical Knowledge gained through project work	• Poor knowledge and no awareness related to project	• Lacks sufficient knowledge and Awareness	• Fair knowledge and awareness related to the project	• Extensive knowledge and awareness related to the project	**20**	**Guide(s)**
Regularity and Attendance	• Irregular and inconsistent in work	• Reports to the guide but lacks Consistency	• Reports to the guide very often but not very consistent	• Reports to the guide regularly and consistent in work		
Incorporation of Suggestions made periodically	• Major changes are not made as per modifications suggested	• Few changes are made as per modifications suggested	• Changes are made as per modifications suggested	• Changes are made as per modifications suggested and innovations are added		
Organization and structure of Project Report	• Project report not prepared according to the specified format, References and citations	• Project report is according to the specified format but some mistakes, Insufficient	• Project report is according to the specified format, References and citations are	• Project report is according to the specified format, References and citations are appropriate and well mentioned		

	are not appropriate	references and citations	appropriate but not mentioned well			

R4: SEE Evaluation for Project Phase (During SEE of VII/VIII semester of BE Program): Total Marks of 50

Evaluation Criteria	Score				Total Marks	Evaluation By
	Needs improvement (Poor) (4)	Acceptable (Average) (6)	Satisfactory (Good) (8)	Proficient (Excellent) (10)		
Presentation	• Contents of presentations are not appropriate and not well delivered, Poor eye contact with audience and unclear voice	• Contents of presentations are appropriate but not well delivered, Eye contact with only few people and unclear voice	• Contents of presentations are appropriate and well delivered, Clear voice with good spoken language but less eye contact with audience	• Contents of presentations are appropriate and well delivered, Proper eye contact with audience and clear voice with good spoken language	50	Internal Examiner + External Examiner Each will evaluate for 50 marks and average of two will be taken
Designs and implementation	• Proper design methodology is not followed resulting into poor design , No modern tools are used to implement, Work contributes very less to the world	• Proper design methodology is followed, Design lacks, very less modern tools are used to implement, the work contributes to the world in little way	• Proper design methodology is followed, Design is done but not perfect, few modern tools are used to implement, the work contributes to the world in some way	• Proper design methodology is followed, Design is perfect, Modern tools are used to implement, the work contributes to the world in greater way		
Results and Demonstration	• Some of the defined objectives are achieved • Modules are not in proper working form that further leads to failure of integrated system	• All defined objectives are achieved • Modules are working well in isolation and properly demonstrated • Modules of project are not properly integrated	• All defined objectives are achieved and working well and demonstrated • Integration of all modules done and system working is not very satisfactory	• All defined objectives are achieved and evident from the results • Each module working well and properly demonstrated • All modules of project are well integrated and system		

				working is accurate		
Project report	• Project report not prepared according to the specified format • References and citations are not appropriate	• Project report is according to the specified format with mistakes • In-sufficient references and citations	• Project report is according to the specified format • References and citations not mentioned well	• Project report is according to the specified format • References and citations are appropriate and well mentioned		
Viva - Voce	• Answered 25% of questions related to design, implementation and applications of project work	• Answered 50% of questions related to design, implementation and applications of project work	• Answered 75% of the questions related to design, implementation and applications of project work	• Answered more than 90% of the questions related to design, implementation and applications of project work		

Basaveshwar Engineering College, Bagalkote
Department of Industrial and Production Engineering

Scheme of Teaching and Evaluation
(THE STUDENTS ADMITTED TO FIRST YEAR IN THE ACADEMIC YEARS 2024-25)

VIII Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs./Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs./Week (Hrs./Sem.)	T Hrs./Week (Hrs./Sem.)	P Hrs./Week (Hrs./Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs./Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1		BIPAXXXO	MOOCS	3 (42)	0	0	90	03	03	90	50	50	100	3
2		BIPAXXXO	MOOCS	3 (42)	0	0	90	03	03	90	50	50	100	3
3		BIPA801I	Internship	20 Contact hours per week			0	03	03	300	50	50	100	10
			Total										Total	16

CH=Contact Hrs

Course Code		**:**	**BIPA801I**	**.**	**Semester**	**:**	**VIII**
L: T:12		**:**	**0:0 :0**		**Course Type**	**:**	**Internship**
Hours/Sem.	**Teaching**	**:**	**0 Hrs.**	**INTERNSHIP**	**CIE Marks**	**:**	**50**
	Learning (TW+SL)	**:**	**294 Hrs.**		**SEE Marks**	**:**	**50**
	Exam	**:**	**06 Hrs.**		**Total Marks**	**:**	**100**
	Total Hrs.	**:**	**300 Hrs.**		**Credits**	**:**	**10**

Professional Competency:

Develop professional competency to apply Industrial and Production Engineering knowledge, modern engineering tools, and research methodologies for solving real-world industrial and research problems through experiential learning in industries, research institutes, IITs, IIITs, IIMs, and National Laboratories, while demonstrating professionalism, teamwork, communication, ethics, sustainability, project management, and lifelong learning.

Evaluation Scheme

1. Continuous Internal Evaluation	:	50 Marks
2. Semester End Evaluation	:	50 Marks
Total	:	**100 Marks**

Note: Both CIE and SEE are conducted for 100 marks then reduced to 50 marks.

Assessment of Continuous Internal Evaluation (CIE)

Assessment of CIE for 100 marks shall be awarded by a committee consisting of the Head of the concerned department and two faculty members of the department, one of whom shall be the guide in case of single discipline and guides in case of interdisciplinary. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the interns shall be based on the rubrics.

1. Continuous Internal Evaluation (CIE) -50 marks	
Evaluation Criteria	**Maximum Score**
Regularity in maintenance of the diary	**10**
Quality of Work	10
Adequacy & quality of information recorded	10
Ability to Learn	10
Initiative and Creativity	10
Thought process and recording techniques used	10
Drawings, sketches and data recorded.	10
Dependability	10
Organizational Fit	10
Response to Mentor	10
Total	**100**

Assessment of Semester End Evaluation (SEE)

Assessment of SEE for 100 marks shall be awarded as per the rubrics by a committee consisting of the Head of the concerned department and two faculty members of the department, one of whom shall be the guide in case of single discipline and guides in case of interdisciplinary.

1. Semester End Evaluation (SEE) -50 marks	
Evaluation Criteria	**Maximum Score**
Diary	25
Report	50
Presentation skill & Viva Voce	25
Total	**100**

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3(WK2, WK3)	2(WK3)	1	2(WK4)	3(WK6)	–	–	–	–	1	2(WK6)	3	3	2
CO2	2(WK3)	3(WK4)	2(WK4)	3(WK4, WK5)	3(WK6)	1	1	–	1	1	2(WK6)	3	3	3
CO3	2(WK4)	2(WK5)	2(WK5)	3(WK5)	2(WK6)	3(WK7)	3(WK7)	2(WK8)	1	2	3(WK5, WK6)	3	3	3
CO4	1	1	1	1	2(WK6)	1	1	2(WK8)	3(WK8)	3(WK8)	3(WK8)	3	3	2

DEPARTMENT ELECTIVES

Sl. No.	Subject Code	Department Electives
1.	BIPA001E	Materials Management
2.	BIPA002E	Industrial Robotics
3.	BIPA003E	Management Information System
4.	BIPA004E	Marketing Management
5.	BIPA005E	Automation In Manufacturing
6.	BIPA006E	Project Management
7.	BIPA007E	Non-Conventional Machining Processes
8.	BIPA008E	Supply Chain Management
9.	BIPA009E	Total Quality Management
10.	BIPA010E	Just In Time Manufacturing
11.	BIPA011E	Design of Experiments
12.	BIPA012E	Engineering Economy
13.	BIPA013E	Value Engineering
14.	BIPA014E	Enterprise Resource Planning
15.	BIPA015E	Business Process Reengineering and Bench Marking

	Course Code	:	BIPA001E	MATERIALS MANAGEMENT	Semester	:	--
	L:T:P	:	3: 0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Students will develop the professional competency to plan, analyze, and manage organizational materials systems by integrating corporate policy with materials management functions, and by applying classification, codification, purchasing, warehousing, and inventory management principles to ensure cost-effective availability, efficient flow, and optimal utilization of materials across the supply chain.

Course Outcomes:

After completion of the course students will be able to

- **CO1.** Demonstrate an understanding of the role of materials management as it integrates with corporate policy, and analyze materials through ABC classification.
- **CO2.** Acquire foundational knowledge of codification and standardization practices.
- **CO3.** Analyze and apply various purchasing policies and procedures within the purchasing function.
- **CO4.** Apply and integrate warehousing and stores management skills to enhance overall supply chain performance.
- **CO5.** Demonstrate proficiency in inventory management principles and apply them effectively within an organizational context.

UNIT-I — **11 Hrs.**

Integrated Materials Management: Importance, Need for integrated concept, Definition and scope, Advantages. Advantages of Integrated Materials Management Concept

Corporate Policy and Materials Management: General corporate policy, Scope, make or buy, Quality requirements, Quantity requirements.

Materials Research-Need and Importance, Definition and Scope, Organization for Materials Research, Techniques and Reporting

ABC Analysis: What is ABC Analysis- Advantages of ABC Analysis, Mechanics of ABC Analysis, Purpose of ABC Analysis, Objective of ABC Analysis, Limitations of ABC Analysis.

UNIT–II — **11 Hrs.**

Codification and Standardization: Nature of Codification, Process of codification, Kodak System, Brisch System, Advantages of Codification, Need for Standardization, Standardization in India, Importance of Standardization, Definition of Simplification, Benefits of Standardization.

Purchasing Management: Creative Purchasing, Purchase Systems, Price Forecasting, Buying Seasonal Commodities, Purchasing Under Uncertainty, Purchasing of Capital Equipment, International Purchasing, Import Substitution: Prospects and Retrospect, Public Buying Insurance Buying

UNIT–III — **10 Hrs.**

Warehousing and Stores Management: Stores Management, Stores Systems and Procedures, Incoming Materials Control, Stores Accounting and Stock Verification, Obsolete, Surplus and Scrap Management, Value Analysis, Material Handling, Transportation and Traffic Management.

UNIT–IV — **10 Hrs.**

Inventory Management: Definition, Inventory planning for independent demand items, Types of inventories, Inventory costs, Inventory control for deterministic demand items, Inventory control systems, Selective control of inventory, other issues in inventory planning and control .

Text Books:

1. Gopal Krishna. P. and M. Sundaresan. Materials Management: An Integrated Approach, Prentice-Hall of India Private limited, New Delhi, 2007, ISBN –978-81-203-0027-9.
2. Operations Management Theory and Practice- B. Mahadevan, 3rd Edition, Pearson ISBN 978-96-325-4109-2

Reference Books:

1. Datta. A K. Materials Management, Procedures, Text and Cases. Prentice-Hall of India Private limited, New Delhi, 2000.
2. Materials Management Chitale
3. Materials Management by Arnold
4. Handbook of Materials Management by Gopalkrishnan

Weblinks and Video Lectures (E-Resources):
• https://www.youtube.com/watch?v=E7JlYl8RcBM&list=PLJdQgRDfPMeBLIHYf8oNuXJ7daeMj8JGx • https://www.youtube.com/watch?v=XP_zi6GbU_Q • https://www.youtube.com/watch?v=ZIwnhjHl3vA&t=7s • https://www.youtube.com/watch?v=oSoU4msV2ss • https://www.youtube.com/watch?v=iaD-pyE03lc

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	1 (WK5)	-	-	2 (WK1, WK5. WK7)	2 (WK9)	2	2	2	-	2	2	2
CO2	-	-	-	-	-		2 (WK9)	-	-	3	-	2	1	1
CO3	-	-	-	-	-	2 (WK5. WK7)	2 (WK9)	2	2	2	-	1	2	1
CO4	-	-	-	-	-	2 (WK5. WK7)	-	-	2	2	-	2	1	2
CO5	2 (WK1, WK2, and WK4)	-	3 (WK5)	-	3 (WK2, WK6)	2 (WK1, WK5. WK7)	-	-	3	-	-	2	2	2

	Course Code	:	BIPA002E	INDUSTRIAL ROBOTICS	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to analyze, model, program, and control robotic systems by applying principles of robot kinematics, dynamics, trajectory planning, drive systems, and sensor integration for industrial automation applications.

Course Outcomes:

After completion of the course student will be able to

CO1. Understand the fundamentals of industrial robotics, including classifications, drive systems, and end-effectors.
CO2. Analyze robot motion using direct and inverse kinematics, rotation matrices, and homogeneous
CO3. transformations.
CO4. Apply dynamic modeling and trajectory planning to robotic systems using Lagrangian formulation.
CO5. Demonstrate programming techniques and sensor integration in industrial robotic systems.

UNIT-I — **11 Hrs.**

Introduction: Automation and robotics, brief history of robotics, social and economic aspects of robots, advantages and disadvantages of using robots in industries. Overview of robots - present and future applications.

Classification and Structure of Robotic System: Classifications, geometrical configuration, wrist and its motions end effectors and its types, links and joints.

Robot drive system**:** Hydraulic, electric and pneumatic drive system, resolution, accuracy and repeatability, advantages and disadvantages of drive systems.

UNIT - II — **11 Hrs.**

Robot Motion Analysis: Kinematics – Introduction, direct and inverse kinematics, rotation matrix, composite rotation matrix, rotation matrix about an arbitrary axis, Euler angles representation, homogeneous transformations, links, joints and their parameters, D-H representation. Geometrical approach to direct and inverse kinematics.

UNIT - III — **10 Hrs.**

Robot Arm Dynamics: LaGrange Euler formulations-joint velocities, kinetic energy potential energy and motion equations of a robot manipulator.

Trajectory Planning: Introduction, general considerations on trajectory planning, joint interpolated trajectories, 4-3-4-trajectory example.

UNIT - IV — **10 Hrs.**

Robot Programming: Introduction, manual teaching, lead through teaching, programming languages, programming with graphics, storing and operating. Task programs.

Sensors: State and external state sensors, tactile sensors, non-tactile sensors, proximity sensing, range sensing, and force-torque sensors.

Text books:

1. M. P. Groover "*Industrial Robotics*", PHI, New Delhi:
2. Yoram Koren, "*Robotics for Engineers*" TATA McGraw Hill Intl. Book Co., New Delhi

Reference Books:

1. Richard Paul., "*Robot manipulators, mathematics, programming and control*" MIT Press
2. Fu. Gonzales and Lee "*Robotics*", TATA McGraw Hill. Int Edition, New Delhi
3. Robert J. Schiling, "*Fundamentals of Robotics*" Prentice-Hall International
4. Richard D Klafter "*Robotic Engineering*". PHI New Delhi.

Weblinks and Video Lectures (E-Resources):

https://www.youtube.com/watch?v=L3APegLlE8A&list=PLXDsvE7qtfNf_N99hJZbdTEM001mOii6_&index=1
https://www.youtube.com/watch?v=4Jss1ByWw2Q&list=PLXDsvE7qtfNf_N99hJZbdTEM001mOii6_&index=3
https://www.youtube.com/watch?v=gnfodUuaES4&list=PLXDsvE7qtfNf_N99hJZbdTEM001mOii6_&index=5
https://www.youtube.com/watch?v=_seMKVkIJlY&list=PLCEGN3cLEboBpr14mUy2LnQeMY4lKQNjA
https://www.youtube.com/watch?v=QiFbrmJTib4

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1)	2 (WK1)	2 (WK2)	1 (WK2)	2 (WK5)	2 (WK1,WK5, WK7)	1 (WK9)	1	1	1	1	3	2	2
CO2	3 (WK2)	3 (WK2)	3 (WK2)	2 (WK2)	3 (WK5)	1 (WK9)	1	1	1	1	2	3	3	2
CO3	3 (WK2, WK3)	3 (WK2)	3 (WK2)	3 (WK2)	3 (WK5)	2 (WK5, WK7)	1 (WK9)	2	2	2	2	3	3	3
CO4	2 (WK5)	2 (WK5)	3 (WK5)	2 (WK5)	3 (WK6)	2 (WK5, WK7)	2 (WK9)	2	2	2	3	3	3	3

	Course Code	:	BIPA003E	MANAGEMENT INFORMATION SYSTEMS	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to apply information systems and information technology concepts to support business operations, strategic decision-making, enterprise integration, and e-commerce solutions for improving organizational performance and competitiveness.

Course Outcomes:

After completion of the course student will be able to

- **CO1.** Explain the role and components of Information Systems and evaluate their significance in business environments.
- **CO2.** Apply knowledge of information technologies such as hardware, software, networks, and the internet to business systems.
- **CO3.** Analyze enterprise and functional business systems, including ERP, CRM, and SCM, for organizational efficiency
- **CO4.** Apply system development approaches and e-commerce concepts in solving business-related problems

UNIT-I — **11 Hrs.**

Foundation Concepts:

Information Systems (IS) in Business*:* What is Information System? Fundamental role of IS in business, trends in Information systems, role of e-business in business, types of information systems. Managerial challenges of Information technology. **System concepts*:*** Foundation, Components of Information systems, Information system resources, Information system activities

Competing with Information Technology - Fundamentals of Strategic Advantage*:* competitive strategy concepts, strategic uses of Information technology. Building a customer –focused business, The value chain and strategic IS.

Using Information Technology for Strategic Advantage: Strategic uses of IT, re-engineering business processes, becoming an agile company, creating a virtual company, building a knowledge creating company.

UNIT – II — **11 Hrs.**

Review of Information Technologies:

Computer Systems- End user and Enterprise Computing: Types of computer systems,

Computer Peripherals, Input, Output and Storage Technologies: Peripherals, Input technologies, Output technologies, Storage devices

Computer Software: Application Software: End user applications: Application software, System Software, other system management programs.

Telecommunications and Networks: Networking the enterprise, Trends in telecommunications, business value of Telecommunication networks, the Internet revolution business use of Internet, business value of Internet, role of intranets and extranets. Telecommunications and Networks

UNIT - III — **10 Hrs.**

Technical Telecommunications alternatives: Telecommunication alternatives, A telecommunications network model, types of telecommunication networks, telecommunications media, Wireless technologies, telecommunications processors, telecommunications software, network topologies.

Business Applications: Electronic Business Systems: Cross-functional enterprise applications, Enterprise application integration, transaction processing systems, Functional Business Systems- Marketing systems, manufacturing systems, Human recourse systems, Accounting systems, Financial management systems.

Enterprise Business Systems: Customer Relationship management, Enterprise resource planning, Supply chain management.

UNIT - IV — **10 Hrs.**

Electronic Commerce systems: electronic commerce fundamentals, scope of e-commerce, essential e-commerce processes, electronic payment processes. **Developing Business Systems:** IS development, the systems approach, the system development cycle. Prototyping.

Case Discussions: Covering the chapters listed above (Minimum Six cases to be discussed covering entiresyllabus)

Text Books:

1. James. A O'Brien, George M Marakas *"Management information systems"* The McGraw Hill publishing companies. Special Indian Edition, **Seventh edition** ISBN-13:978-0-07-0620032 ISBN-10:0-07-062003-2

Reference Books:

1. Laudon & Laudon, "Management Information Systems" PHI ISBN 8 J -203- J 282-]. 1998 edn.
2. W.S. Jawadekar "Management Information System" TMH 2002 Edn, ISBN- 0 - 07 -044575-3
3. Gordon B Davis, Margrethe H. Olson "Management information systems" Tata McGraw Hill
4. S. Sadogopan "Management Information Systems" .PHI 1998Edn. ISBN 81-203- 180-9

Weblinks and Video Lectures (E-Resources):

- https://nptel.ac.in/courses/110105148?utm_source=chatgpt.com
- https://ocw.mit.edu/courses/15-561-information-technology-essentials-spring-2005/resources/lecture13/?utm_source=chatgpt.com
- https://ocw.mit.edu/courses/15-561-information-technology-essentials-spring-2005/resources/lecture13/?utm_source=chatgpt.com

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2 (WK1)	2 (WK1)	-	-	1 (WK5)	1 (WK1, WK5,WK7)	-	-	-	-	1 (WK9)	1	2	-
CO2	3 (WK2)	2 (WK2)	-	-	2 (WK5)	-	-	-	-	-	1 (WK9)	-	-	-
CO3	2 (WK2)	3 (WK2)	-	-	2 (WK5)	2 (WK5,WK7)	-	-	-	2	2 (WK9)	2	2	-
CO4	2 (WK2)	2 (WK2)	2 (WK5)	3 (WK5)	2 (WK6)	1 (WK5,WK7)	-	-	2	2	2 (WK9)	1	1	-

	Course Code	:	BIPA004E	MARKETING MANAGEMENT	Semester	:	--
	L: T:P	:	3: 0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	6 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Students will develop the professional competency to systematically analyze markets and customers, and to design, evaluate, and implement integrated marketing strategies that create and deliver customer value in dynamic business environments.

Course Outcomes:

After completion of the course student will be able to

- **CO1.** Apply core marketing concepts and frameworks to real-world business scenarios to define customer value and market orientation.
- **CO2.** Analyze consumer and organizational buying behavior using psychological and behavioral models to identify influencing factors and decision processes.
- **CO3.** Analyze segmentation, targeting, and positioning (STP) strategies to develop effective marketing plans for various consumer and business markets.
- **CO4.** Evaluate integrated marketing mix strategies (product, price, place, and promotion) for effectiveness in different market environments, including services, retail, and digital contexts.

UNIT-I — **11 Hrs.**

Defining marketing for the new realities: The value of marketing, the Scope of Marketing, Core marketing concepts, the new marketing realities, and Company Orientation towards the marketplace.

Collecting Information: Components of modern marketing information system, Internal records, marketing intelligence, Analyzing the macro environment

Conducting Marketing Research: The scope of Marketing research, The Marketing research process, the Seven Characteristics of good marketing research

UNIT–II — **11 Hrs.**

Analyzing Consumer Markets: What influences consumer behavior? Key psychological processes, the buying decision process: Five stage model, Behavioral Decision Theory and Behavioral Economics

Identifying Market Segments and Targets: Basis for segmenting consumer markets, how should business markets be segmented? Market targeting, Effective segmentation criteria.

Analyzing Business Markets: What is organizational buying? Participants in the business buying process, the purchasing/procurement process, Stages in the buying process, Developing Effective-business-to- business marketing programs, Managing business-to-business customer relationships, and Institutional and Government markets.

UNIT–III — **10 Hrs.**

Setting Product Strategy: Product characteristics and classifications, Differentiation, Environmental issues Product and brand relationships, Packaging, Labelling, warranties, and guarantees

Designing and Managing services: The nature of services, the realities of the new service, Achieving excellence in services marketing

Managing retailing, Wholesaling, and Logistics: Retailing, private labels, wholesaling, market logistics

UNIT–IV — **10 Hrs.**

Developing Pricing strategies and programs: Understanding pricing, setting the price, Adapting the price, Initiating and responding to price changes

Designing and Managing Integrated marketing communications: The role of marketing communications, Marketing communications mix, How do marketing communications work, developing effective communications, Selecting the marketing communications mix, Developing and managing an advertising programme

Text Books:

1. Philip Kotler, Kevin Lane Keller "Marketing Management" 15th edition, Pearson India Education Services Pvt. Ltd. ISBN 978-93-325-5718-5.
2. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithileshwar Jha "Marketing Management: A South Asian Perspective". 13th Edition, 2012, Pearson Prentice – Hall of India private limited, ISBN-978-81-317-1683-0

Reference Books:

1. Philip Kotler "Principles of Marketing", Prentice - Hall.
2. Michael R Czinkota, Marketing Management, 2nd Edition. Vikas Publishing House, ISBN 981-240-366-3
3. Wiliam J Stannon, "Fundamentals of Marketing", McGraw Hill

4. R.S.S. Pillia and Mrs. Bagavathi "Marketing" S. Chand & Co. Ltd
5. S.A Sherlaker, "Marketing Management", 13th Edition.
6. Rajagopal, Marketing Management Text & Cases, Vikas Publishing House.

Weblinks and Video Lectures (E-Resources):

MOOC Course:https://www.edx.org/course/marketing-management-iimbx-mk102x#!
NPTEL Course: http://nptel.ac.in/courses/110104068/3
https://www.youtube.com/watch?v=65MQnEMf-uI&t=175s
https://www.youtube.com/watch?v=OUxmwxA66Ss
https://www.youtube.com/watch?v=rG2Ui_BKpBY&list=PLgMDNELGJ1CZF8bYMr8YZ7JFD7WD8M46k

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2 (WK1, WK2, and WK4)	3 (WK1, WK2, WK3, and WK4)		-	1 (WK2, WK6)	-	-	-	-	2	-	2	1	1
CO2	-	3 (WK2, WK3, and WK4)	-	2 (WK8)	-	-	-	-	-		-	1	3	2
CO3	-	3 (WK1, WK2, WK3, and WK4)	2 (WK5)	-	-	-	2 (WK9)	-	-	-	-	1	1	1
CO4	-	-	3 (WK5)	-	-	-	2 (WK9)	-	-	3	-	2		2

	Course Code	:	BIPA005E	AUTOMATION IN MANUFACTURING	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply automation principles, flow line analysis, material handling systems, and PLC-based control to design and improve efficient, reliable, and integrated manufacturing systems.

Course Outcomes:

After completion of the course student will be able to

CO1. Understand the fundamentals, need, and challenge of automation in manufacturing systems.

CO2. Analyze production concepts, mathematical models, and automation strategies related to machining and production flow.

CO3. Evaluate and design automated flow lines and assembly systems using balancing and parts feeding analysis.

CO4. Apply concepts of material handling, automated storage systems, and PLC programming in integrated manufacturing environments.

UNIT - I **10 Hrs.**

Introduction: Definition of automation, reasons for automating arguments for and against automation

Reasons for Automation: strategies of automation, Detroit type of automation flow lines, transfer mechanisms, work part transfer- different methods, problems. Automation for machining operations, design & fabrication considerations, machining center.

UNIT - II **10Hrs.**

Production Concepts and Mathematical Models: Manufacturing lead time, components of operating time, capacity utilization and availability, work in process, comments on the production concepts, automation strategies

UNIT - III **10 Hrs.**

Analysis of automated flow lines: Analysis of transfer lines without storage with storage buffers-single stage, double stage, multistage with problems, automated assembly systems-design for automated assembly, parts feeding devices, analysis of multi-station assembly machine, analysis of single-stage assembly machines, assembly systems and line balancing of automated assembly systems.

UNIT - IV **12 Hrs.**

Automated material handling and storage: material handling function, types of material handling equipment, analysis of material handling systems, design of systems, conveyor systems, Automated Guided Vehicle Systems, Automated Storage/Retrieval Systems. Caroused storage systems, work in process storage, interfacing, handling & storage with manufacturing**.**

Programming logic control: Introduction, basic structure, input-output processing, programming- logic functions. Latching, sequencing, mnemonics timers, internal relay & counters shift resister, master & jump controls, data handling, selection of a PLC

Text Books:

1. Mikell P. Groover, *Automation, Production Systems, and Computer-Integrated Manufacturing*, 3rd ed., PHI, New Delhi, 2008.
2. W. Bolton, *Mechatronics*, 3rd ed., Pearson Education.
3. Mikell P. Groover and Emory W. Zimmers, *CAD/CAM*, PHI, New Delhi, 2001.

Reference Books:

1. Pressman and Williams, *Numerical Control and Computer-Aided Manufacturing*.
2. Tiesschieuchang and Richard A. Wysk, *An Introduction to Automated Process Planning System*.
3. Supplementary course notes on automated manufacturing systems, flow line analysis, and PLC-based automation.

Weblinks and Video Lectures (E-Resources):

1. Automation in manufacturing overview: https://archive.nptel.ac.in/content/syllabus_pdf/112103293.pdf
2. Automation in production systems: https://archive.nptel.ac.in/content/syllabus_pdf/110105155.pdf
3. PLC and industrial automation lecture notes: https://intranet.cb.amrita.edu/sites/default/files/OL803_Industrial_Automation_and_Control.pdf

4. Automated flow lines and material handling: https://www.gvpce.ac.in/MECHANICAL/R-2020/syllabus/20ME1169.pdf
5. Automation in manufacturing course material: https://files.mlrit.ac.in/curriculum/MECH/Mech-MLR18/3-2/AUTOMATION-IN-MANUFACTURING-(OE2).pdf

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2)	2 (WK1, WK2)	1 (WK2)	-	-	-	-	-	-	1 (WK10)	1 (WK11)	2	1	1
CO2	2 (WK3, WK5)	3 (WK3, WK5)	2 (WK3, WK5)	1 (WK5)	1 (WK5)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	1
CO3	2 (WK4, WK6)	2 (WK4, WK6)	2 (WK4, WK6)	3 (WK4, WK6)	2 (WK6)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	2
CO4	2 (WK7)	2 (WK7)	1 (WK7)	-	1 (WK7)	-	-	-	1 (WK9)	2 (WK10)	1 (WK11)	2	1	3

	Course Code	:	BIPA006E	PROJECT MANAGEMENT	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Plan, execute, and control engineering and industrial projects by applying project management principles, tools, and leadership practices to deliver results within scope, time, budget, and quality constraints.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain the principles, phases, and functions of project management across its lifecycle.
CO2. Apply techniques for project scheduling, budgeting, and resource optimization.
CO3. Identify and manage risks, stakeholders, and quality for project success.
CO4. Demonstrate leadership, teamwork, and effective communication using project management tools.

UNIT - I — **10 Hrs.**

Concepts of project management - Concepts of a project, categories of projects, phases of project life cycle, roles and responsibility of project leader, tools and techniques for project management. **Project planning and estimating -** Capital expenditures: Importance and difficulties, phases of capital budgeting, levels of decision making, facets of project analysis, feasibility study: A schematic diagram, objectives of capital Budgeting. Preparation of cost estimation, evaluation of the project profitability.

UNIT- II — **10 Hrs.**

Generation and screening of project ideas - Generation of ideas, monitoring the environment, corporate appraisal, scouting for project ideas, preliminary screening, project rating index, sources of positive net present value, on being an entrepreneur, organizing and staffing the project team: skills / abilities required for project manager, authorities and responsibilities of project manager, project organization and types accountability in project, controls, tendering and selection of contractors.

UNIT - III — **12 Hrs.**

Tools and techniques of project management: Bar (GANTT) chart, bar chart for combined activities, logic diagrams and networks, project evaluation and review techniques (PERT), planning, computerized project management. **Project scheduling:** Project implementation scheduling, effective time management, different scheduling techniques, resources allocation method. PLM concepts.

UNIT- IV — **12 Hrs.**

Co-ordination and control: Project direction communication in a project, MIS project co-ordination, project control requirement for better control of project or role of MIS in project control, performance, control, schedule control, cost control. **Performance measures in project management**: Performance indicators, performance improvement for the CM and DM companies for better project management, project management and environment and Practitioners. **Project management institute:** Importance of the same for the Industry and **Case studies on project management**: Case studies covering project planning, scheduling, use of tools and techniques, performance measurement.

Text Books:

1. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, 4th Edition, 2002.
2. Chaudhry S., *Project Execution Plan: Plan for Project Execution Interaction*, 2002.
3. Bhavesh M. Patel, *Project Management*, Vikas Publishing House, 2002.

Reference Books:

1. Beningston Lawrence, *Project Management*, McGraw Hill, 1970.
2. Weist and Levy, *A Management Guide to PERT and CPM*, Eastern Economy of PH, 2002
3. L. S. Srinnath, *PERT and CPM*, Affiliated East West Press Pvt. Ltd., 2002.
4. Moder Joseph and Philips Cerel R., *Project Management with PERT and CPM*, 2nd Edition, Van Nostrand Reinhold, 1976.
5. Angus, *Planning, Performing and Controlling Project*, Pearson Education, 3rd Edition, 2001.
6. James P. Lawis, *Project Planning, Scheduling and Control*, Meo Publishing Company, 2001.

Weblinks and Video Lectures (E-Resources):

1. Project management lectures: https://www.youtube.com/results?search_query=project+management+lecture
2. PERT and CPM lectures: https://www.youtube.com/results?search_query=PERT+CPM+lecture

3. Project scheduling and Gantt chart: https://www.youtube.com/results?search_query=project+scheduling+Gantt+chart+lecture
4. MIS in project management: https://www.youtube.com/results?search_query=MIS+in+project+management+lecture
5. Project management case studies: https://www.youtube.com/results?search_query=project+management+case+study+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2)	3 (WK1, WK2)	2 (WK2)	2 (WK2)	1 (WK2)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	1
CO2	2 (WK3, WK9)	2 (WK3, WK9)	3 (WK3, WK9)	2 (WK3, WK9)	1 (WK9)	-	-	-	1 (WK9)	1 (WK10)	1 (WK11)	2	2	2
CO3	2 (WK4, WK5)	3 (WK4, WK5)	2 (WK4, WK5)	2 (WK4, WK5)	3 (WK4, WK5)	-	-	-	-	1 (WK10)	1 (WK11)	2	3	2
CO4	2 (WK6, WK7)	2 (WK6, WK7)	1 (WK6)	2 (WK6, WK7)	2 (WK6)	2 (WK7)	1 (WK7)	1 (WK8)	1 (WK9)	2 (WK10)	2 (WK11)	2	1	2

	Course Code	:	BIPA007E	NON-CONVENTIONAL MACHINING PROCESSES	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to analyze, select, and apply non-traditional machining processes to manufacture complex engineering components by evaluating process principles, machining parameters, material removal mechanisms, and performance characteristics.

Course Outcomes:

After completion of the course student will be able to

CO1. Introduce and classify non-traditional machining processes, understand mechanical energy machining processes in context to mechanics of metal removal process, principles, advantages, disadvantages and application.

CO2. Explain electrochemical and chemical advance machining processes like electro chemical machining and design the tool for ECM process.

CO3. Explain thermoelectric advanced machining processes in context to working principal, process parameters, advantages, disadvantages and applications of electric discharge machining.

CO4. Identify the principles, processes and applications of electron, laser and plasma arc machining processes.

UNIT - I	12 Hrs.

Introduction to NCMP- Need for non-traditional machining methods, classification of modern machining processes, considerations in process selection, materials and applications. **Ultrasonic machining -** Elements of the process, mechanics of metal removal process parameters, economic considerations, working principles, equipment used, process parameters, metal removal rate, applications and limitations, recent developments. **Abrasive jet machining, Water jet machining and Abrasive water jet machining -** Basic principles, equipment, process variables, mechanics of metal removal, metal removal rate, application and limitations.

UNIT - II	09 Hrs.

Electro chemical machining and chemical machining processes - Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate, tool design, surface finish and accuracy, economic aspects, simple problems for estimation of metal removal rate, fundamentals of chemical machining, advantages, disadvantages and applications.

UNIT - III	09 Hrs.

Electric discharge machining- General Principle and applications of electric discharge machining, electric discharge, grinding and electric discharge wire cutting processes - Power circuits for electric discharge machining, mechanics of metal removal, process parameters, selection of tool electrode and dielectric fluids, methods of surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection, wire electric discharge machining, principle and applications.

UNIT - IV	12 Hrs.

Electron beam, laser beam and plasma arc machining processes- Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - general principle and application of laser beam machining - thermal features, cutting speed and accuracy of cut, application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

Text Books:

1. Pandey P.C. and Shan H.S, 1980, Modern Machining Processes, Tata McGraw-Hill, New Delhi.
2. Vijay K. Jain, 2002, Advanced Machining Processes, Allied Publishers Pvt. Ltd., New Delhi, ISBN 81-7764-294-4.

Reference Books:

1. Benedict. G.F. 1987, Nontraditional Manufacturing Processes, Marcel Dekker Inc., New York.
2. McGeough, 1988, Advanced Methods of Machining, Chapman and Hall, London.

Weblinks and Video Lectures (E-Resources):

https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me202
https://www.youtube.com/watch?v=PaYInS9axxw
https://www.youtube.com/watch?v=PaYInS9axxw&list=PLzCSUZGIUJkaSyCzPiQMWynGyxmC8hrpl
https://www.youtube.com/watch?v=tTnXn498F90&list=PLWv6RLxuaVQwMg6kFEoeeMEGTWNnr7Jmr
https://www.youtube.com/watch?v=cxU1zUOpGLk&list=PLtpJfjyaifnmCI-JcNxs6uQgv3b2WYKzS

https://www.youtube.com/watch?v=jhU5JHxQ5iU&list=PLQRJVeoYJzdSYIqWwsEYGwPuwLSSa404U
https://www.youtube.com/watch?v=9tD5f4XYY9M

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3)	2 (WK2, WK3, WK4)	-	-	1 (WK5)	-	-	-	-	-	-	1		1
CO2	3 (WK1, WK2, WK3)	3 (WK2, WK3, WK4)	2 (WK5)	2 (WK4)	2 (WK5, WK6)	-	-	-	-	-	-	-	1	1
CO3	3 (WK1, WK2, WK3)	3 (WK2, WK3, WK4)	2 (WK5)	2 (WK4)	2 (WK5, WK6)	-	-	-	-	-	-	-	-	1
CO4	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	2 (WK4)	2 (WK5, WK6)	-	1 (WK7)	-	-	-	-	-	-	1

	Course Code	:	BIPA008E	SUPPLY CHAIN MANAGEMENT	Semester	:	--
	L: T:P	:	3: 0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Ability to analyze, design, coordinate, and improve supply chain networks and logistics systems for achieving operational efficiency, strategic competitiveness, and sustainable business performance for integrated supply chains

Course Outcomes:

After completion of the course students will be able to

CO1. Apply supply chain concepts, performance metrics, and strategic fit principles to evaluate the effectiveness of supply chain operations in manufacturing and service organizations.

CO2. Analyze the impact of supply chain drivers, distribution networks, and coordination mechanisms on organizational performance and customer responsiveness.

CO3. Apply quantitative and qualitative approaches for designing supply chain networks, transportation systems, and global supply chain structures.

CO4. Analyze the role of information technology, sustainability practices, and risk management in improving supply chain efficiency and competitiveness.

UNIT-I **10 Hrs.**

Chapter 1: UNDERSTANDING THE SUPPLY CHAIN

What Is a Supply Chain? Historical Perspective, The Objective of a Supply Chain, The Importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process Views of a Supply Chain, Examples of Supply Chains

Chapter 2: SUPPLY CHAIN PERFORMANCE: ACHIEVING STRATEGIC FIT AND SCOPE

Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, Challenges to Achieving and Maintaining Strategic Fit, Achieving and Maintaining Strategic Fit in Emerging: Retail Markets: The Indian Scenario, The Experience, Adaptation

▶ CASE STUDY: The Demise of Blockbuster

▶ CASE STUDY: Rise and Fall of Subhiksha

UNIT–II **10 Hrs.**

Chapter 3: SUPPLY CHAIN DRIVERS AND METRICS

Impellers of Supply Chain, Financial Measures of Performance, Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing, Infrastructure, International Logistics,

▶ CASE STUDY: Seven-Eleven Japan Co.

▶ CASE STUDY: Financial Statements for Walmart Stores Inc. and Macy's Inc.

Chapter 4: DESIGNING DISTRIBUTION NETWORKS AND APPLICATIONS TO ONLINE SALES

The Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design, Design Options for a Distribution Network, Online Sales and the Distribution Network, Indian Agricultural Produce Distribution Channels: Ripe for Major Transformation, Indian FMCG Sector-distribution Channels, Indian Commodities Distribution Channels, Distribution Networks in Practice,

▶ CASE STUDY: Blue Nile and Diamond Retailing

UNIT–III 10 Hrs.

Chapter 5: NETWORK DESIGN IN THE SUPPLY CHAIN

The Role of Network Design in the Supply Chain, Factors Influencing Network Design Decisions, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation, Jaipur Rugs–networking Tradition with Modernity, Making Network Design Decisions in Practice, The Impact of Uncertainty on Network Design,

▶ CASE STUDY: Managing Growth at SportStuff.com

▶ CASE STUDY: Designing the Production Network at Cool Wipes

Chapter 6: DESIGNING GLOBAL SUPPLY CHAIN NETWORKS

The Impact of Globalization on Supply Chain Networks, The Offshoring Decision: Total Cost, Risk Management in Global Supply Chains

Chapter7: COORDINATION IN A SUPPLY CHAIN

Lack of Supply Chain Coordination and the Bullwhip Effect, The Effect on Performance of Lack of Coordination, Obstacles to Coordination in a Supply Chain, Managerial Levers to Achieve Coordination, Continuous Replenishment and Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment, Collaborative Planning, Forecasting, and Replenishment—Indian Experiences, Achieving Coordination in Practice

UNIT–IV	12 Hrs.

Chapter 8: TRANSPORTATION IN A SUPPLY CHAIN

The Role of Transportation in a Supply Chain, Modes of Transportation and Their Performance Characteristics, Transportation Infrastructure and Policies, Design Options for a Transportation Network, Mumbai Dabbawallas: A Highly Responsive Distribution Network, Trade-Offs in Transportation Design, Tailored Transportation, The Role of IT in Transportation, Making Transportation Decisions in Practice,

▶ CASE STUDY: Designing the Distribution Network for Michael's Hardware

▶ CASE STUDY: The Future of Same-Day Delivery: Same as the Past?

▶ CASE STUDY: Selecting Transportation Modes for China Imports

Chapter 9: SUSTAINABILITY AND THE SUPPLY CHAIN

The Role of Sustainability in a Supply Chain, The Tragedy of the Commons, Key Pillars of Sustainability, Sustainability and Supply Chain Drivers, closed-Loop Supply Chains, The Pricing of Sustainability,

▶ CASE STUDY: Sustainable Supply Chains—Indian Efforts 559

▶ CASE STUDY: HUL—A Sustainable Supply Chain 559

▶ CASE STUDY: Future of Supply Chains 560

Chapter10: A INFORMATION TECHNOLOGY IN A SUPPLY CHAIN

The Role of IT in a Supply Chain, The Supply Chain IT Framework, Customer Relationship Management, Internal Supply Chain Management, Supplier Relationship Management, The Transaction Management Foundation, The Future of IT in the Supply Chain, Risk Management in IT, Supply Chain IT in Practice

Text Books:

1. Supply Chain Management–Strategy, Planning & Operation. Sunil Chopra, Peter Meindl, and Dharam Vir Kalra, Pearson Education Asia, ISBN: 978-93-325-4823-7, eISBN: 978-93-325-8267-5, Sixth Edition.

Reference Books:

1. Supply Chain Redesign–Transforming Supply Chains into Integrated Value Systems. Robert B Handfield, Ernest L Nichols, Jr., Pearson Education Inc, 3rd Edition (3rdImpreesion), 2007, ISBN: 81-317-0401-7
2. Modelling the Supply Chain -Jeremy F Shapiro, Duxbury, Thomson Learning, 2002, ISBN 0-534-37363
3. Designing & Managing the Supply Chain. David Simchi Levi, Philip Kaminsky& Edith Simchi Levi; McGraw Hill

Weblinks and Video Lectures (E-Resources):

https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg52
https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_mg112
https://www.youtube.com/watch?v=Lpp9bHtPAN0
https://www.youtube.com/watch?v=NEWYaget310
https://www.youtube.com/watch?v=j8cAlTW_FC8&t=3324s

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2)	2 (WK3)	-	-	-	-	-	-	-	-	2 (WK4)	2	2	-
CO2	2 (WK1)	3 (WK2, WK3)	-	2 (WK4)	-	-	-	-	-	-	2 (WK5)	3	3	-
CO3	2 (WK1, WK2)	3 (WK3)	3 (WK5)	2 (WK4)	1 (WK6)	-	-	-	-	-	2 (WK5)	2	3	-
CO4	2 (WK1)	2 (WK3)	-	2 (WK4)	3 (WK6)	2 (WK7)	3 (WK7)	-	-	-	2 (WK5)	3	2	-

	Course Code	:	BIPA009E	TOTAL QUALITY MANAGEMENT	Semester	:	--
	L:T:P	:	3: 0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

The professional competency that students will gain is the ability to design, analyze, and guide organization-wide quality improvement and strategic alignment efforts by incorporating the Total Quality Management principles, continuous improvement approaches (reactive and proactive), teamworking practices and total participation, and Hoshin Kanri-based policy implementation to logically improve the process performance, customer satisfaction, and long-term organizational excellence.

Course Outcomes:

After completion of the course student will be able to:

CO1. Apply the principles of TQM and contributions of quality pioneers like Deming, Juran, and Ishikawa to quality improvement initiatives

CO2. Analyze quality improvement techniques such as reactive and proactive improvement methods, and the seven QC tools for process diagnosis and control.

CO3. Apply teamwork principles and total participation concepts in implementing continuous improvement programs within an organization.

CO4. Analyze the phases and strategic impact of Hoshin Kanri (Hoshin Management) for aligning organizational vision, planning, and control systems.

UNIT-I — **11 Hrs.**

Review of Total Quality Management: History of TQM quality, Walter Shewhart's concept of variation and control system, Contribution of Quality Gurus - Deming's approach, Juran's quality trilogy, Crosby and quality treatment, Imai's Kaizen. Ishikawa's companywide quality control, and Feigenbaum's theory of TQC

Evolution of Quality Concepts and Methods: Quality concepts. Development of four fitnesses, evolution of methodology, evolution of company integration, quality of conformance versus quality of design, from deviations to weaknesses to opportunities. Future fitnesses

Four revolutions in Management thinking: Customer focus, Continuous Improvement, Total Participation, and Societal Networking. Focus On Customers: Change in work concept, market-in, and Customers.

UNIT–II — **10 Hrs.**

Continuous Improvement:

Improvement as problem problem-solving process: Management by process, WV model of continuous improvement, process control, process control and process improvement, process versus creativity.

Reactive Improvement: Identifying the problem, standard steps and tools, seven steps - case study, and seven QC tools. Management diagnosis of seven steps reactive improvement. General guidelines for managers diagnosing a QI story. Case study for diagnosis of the seven steps

UNIT–III — **11 Hrs.**

Proactive Improvement: Introduction to proactive improvement, standard steps for proactive improvement, semantics, example customer visitation. Applying proactive improvement to develop new products - three stages and nine steps

Total Participation: Teamwork skills, dual function of work, teams and team work, principles for activating teamwork, creativity in team processes. Initiation strategies; CEO involvement. Example: strategies for TQM introduction. Infrastructure for mobilization. Goal setting (Vision/Mission), organization setting, training and Education, promotional activities, diffusion of success stones, awards and incentives monitoring and diagnosis. Phase-in, orientation phase, alignment phase, evolution of parallel organization.

UNIT–IV — **10 Hrs.**

Hoshin Management: Definition, phases in hoshin management - strategic planning(proactive), hoshin deployment, controlling with metrics(control), check and act (reactive). Hoshin management versus management by objective, hoshin management and conventional business planning, an alternative hoshin deployment system, hoshin management as "Systems Engineering" for alignment

Text Books:

1. N. Logothetis, "Managing for Total Quality", Prentice Hall of India, New Delhi. (Chapter I - partly)
2. Shoji Shiba, David Walden "Four Practical Revolutions in Management: Systems for creating unique organizational Capability",2001, Productivity Press, ISBN 1-56327-217-2
3.

Reference Books:
1. Roger C. Swanson, "The Quality Improvement Hand Book", Publisher Vanity Books International, New Delhi. 2. William. C. Johnson and Richard J. Chavla, "Encyclopedia of Total Quality Management", New Delhi.
Weblinks and Video Lectures (E-Resources):
https://www.youtube.com/watch?v=vtcYE63GzRo https://www.youtube.com/watch?v=VrvYQCkhz_8 https://www.youtube.com/watch?v=VD6tXadibk0 https://www.youtube.com/watch?v=42UgAS-U1-o https://www.youtube.com/watch?v=cTwwMK1AnDU https://www.youtube.com/watch?v=Krpm-df5B9c

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	1 (WK1, WK2, and WK4)	2 (WK1, WK3, and WK4)	2		-		-	1	-		-	2	2	
CO2	2 (WK1, WK2, and WK4)	3 (WK1, WK2, WK3, and WK4)	-	2 (WK8)	-	-	-	1	-		-	2	3	1
CO3	-	2 (WK1, WK2, WK3, and WK4)	-		-	-	-	1	3	2	1 (WK8)	2	2	1
CO4	-	2 (WK1, WK3, and WK4)	2 (WK5)		-	-	-	1	1	3	-	2	2	1

Course Code		:	BIPA010E	JUST IN TIME MANUFACTURING	Semester	:	--
L: T:P		:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply Just-in-Time principles, Toyota Production System concepts, and supply chain coordination tools to reduce waste, improve flow, enhance responsiveness, and optimize manufacturing performance.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain the principles and components of Just in Time (JIT) and Toyota Production Systems.
CO2. Analyze and compare JIT systems with conventional manufacturing systems in terms of layout, workforce, and control.
CO3. Evaluate the implementation frameworks, risks, and challenges in deploying JIT in real-world scenarios.
CO4. Apply JIT concepts to supply chain and purchasing management to improve system responsiveness and efficiency.

UNIT-I — **10 Hrs.**

JIT-An Introduction: Spread of JIT movement, the New Production System Research Association of Japan, some definitions of JIT, core Japanese practices of JIT, creating continuous manufacture, enabling JIT to occur, basic element of JIT, benefits of JIT.

Modern Production System: Key feature of Toyota's Production System, basic framework of Toyota Production System. **KANBAN SYSTEM –** other types of kanban's, kanban rules, adapting to fluctuations in demand through kanban, whirligig, determining the number of kanban's in Toyota Production System, detailed kanban system example, supplier kanban and the sequence schedule for use by suppliers

UNIT - II — **10 Hrs.**

Design, Development and Management of JIT Manufacturing Systems: Plant configurations and flow analysis for JIT manufacturing, comparison of JIT's "demand pull" system with conventional "push type", planning and control systems, quality management system for JIT, product design for JIT, human resource management in JIT, flexible workforce system at Toyota, creation and maintenance of teams for JIT, union organization and conduct of industrial relations in JIT, interface of JIT with advanced manufacturing technology, assessing performance in JIT manufacturing systems, product costing information systems in JIT manufacturing, an example of overhead allocation in JIT, potential for developing countries, potential for small manufacturing.

UNIT - III — **11 Hrs.**

Framework for Implementation of JIT: Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, project work approach to implementation, conclusion.

UNIT - IV — **11 Hrs.**

Supply Management for JIT: JIT purchasing-the Japanese way, some studies in JIT purchasing, experience of implementation organizations, surveys of JIT purchasing, buyer-seller relationship in JIT purchasing, quality certification of suppliers in JIT purchasing, some problems in implementation of JIT purchasing, reduction of freight costs in JIT purchasing, monitoring supplier performance for JIT purchasing, audit in JIT purchasing, implementation of JIT to international sourcing, frequency of shipments, inventory policy, supplier reaction capability, quality, communication sole sourcing, delivery performance and supplier flexibility, conclusion**.**

Text Books:

1. M. G. Korgaonker, *Just in Time Manufacturing*, Macmillan India Ltd., 1992.
2. Richard J. Schonberger, *Japanese Manufacturing Techniques*, The Free Press, Macmillan Pub. Co., Inc., New York, 1988.

Reference Books:

1. Taiichi Ohno, *Toyota Production System: Beyond Large-Scale Production*.
2. James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine That Changed the World*.
3. Yasuhiro Monden, *Toyota Production System: An Integrated Approach to Just-In-Time*.

Weblinks and Video Lectures (E-Resources):

1. JIT manufacturing overview: https://www.ifm.eng.cam.ac.uk/research/dstools/jit-just-in-time-manufacturing/
2. JIT and Toyota Production System:

https://www.youtube.com/results?search_query=just+in+time+manufacturing+lecture
3. Toyota Production System basics: https://www.youtube.com/results?search_query=toyota+production+system+lecture
4. Kanban system explained: https://www.youtube.com/results?search_query=kanban+system+lecture
5. JIT purchasing and supplier management: https://www.youtube.com/results?search_query=jit+purchasing+and+supply+chain+lecture

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2)	2 (WK1, WK2)	1 (WK2)	-	-	-	-	-	-	1 (WK10)	1 (WK11)	2	1	2
CO2	2 (WK3, WK5)	3 (WK3, WK5)	2 (WK3, WK5)	1 (WK5)	1 (WK5)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	1
CO3	2 (WK4, WK6)	2 (WK4, WK6)	2 (WK4, WK6)	3 (WK4, WK6)	2 (WK6)	-	-	-	-	1 (WK10)	1 (WK11)	2	2	2
CO4	2 (WK7)	2 (WK7)	1 (WK7)	-	1 (WK7)	-	-	-	1 (WK9)	2 (WK10)	1 (WK11)	2	1	3

	Course Code	:	BIPA011E	DESIGN OF EXPERIMENTS	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to design, conduct, analyze, and optimize engineering experiments using statistical Design of Experiments (DoE), factorial designs, Taguchi methods, and signal-to-noise ratio analysis to improve product quality and process performance.

Course Outcomes:

After completion of the course student will be able to

CO1. Apply the fundamental principles of Design of Experiments (DoE), statistical concepts, randomization, replication, blocking, and experimental design techniques for engineering applications.

CO2. Analyze full and fractional factorial experiments to determine the effects of process variables and their interactions for engineering problem-solving.

CO3. Apply Taguchi orthogonal arrays and robust design methodology to design, conduct, and optimize engineering experiments.

CO4. Analyze experimental results using Signal-to-Noise (S/N) ratios and interpret the performance of engineering systems for quality improvement.

UNIT-I — **10 Hrs.**

Strategy of Experimentation, Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments. Definition and scope of DoE. Importance in engineering and quality improvement, Basic statistical concepts review:

- Population and sample
- Mean, variance, standard deviation
- Normal distribution

Concept of variation and control Randomization, replication, and blocking. Types of experimental designs

UNIT–II — **10 Hrs.**

Factorial Experimentation-Two Levels: Full Factorial Designs: Experimentation as a learning process. Traditional scientific experiments. Two-factor design, Three-factor design. Replicating experiments. Factor interactions. Normal plots of estimated effects. Mechanical plating experiment. Four-factor design.

Fractional Factorial Experimentation-Two Levels: Fractional Factorial Designs: Blocking two-level designs. Other useful two-level designs

UNIT–III — **12 Hrs.**

Experiment Design Using Taguchi's Orthogonal Arrays: Types of Orthogonal Arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs. Illustration through Numerical examples.

Steps In Robust Design-Case study discussion. Noise factors and testing conditions. Quality characteristics and objective functions. Control factors and their levels. Matrix experiment and data analysis plan. Conducting the matrix experiment, data analysis, verification experiment and future plan.

UNIT–IV — **10 Hrs.**

Signal-To-Noise Ratio: Evaluation of sensitivity to noise. Signal to Noise ratios for static problems: Smaller-the-better type, Nominal-the –better-type, Larger-the-better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples. designs for factors at three and four levels

Text Books:

1. Robert H. Lochner and Joseph E. Matar, 'Designing for Quality - an Introduction Best of Taghuchi and Western Methods or Statistical Experimental Design", Chapman and Hall, Madras.
2. Madhav S. Phadke, "Quality Engineering Using Robust Design", Prentice Hall PTR, Englewood Cliffs, New Jersey 07632.

Reference Books:

1. D.C. Montgomery, 'Design and Analysis of Experiments", 5th Edition.
2. Philip J. Ross, "Taguchi Techniques for Quality Engineering".
3. Mannuals of SYSTAT and DOE PC IV

Weblinks and Video Lectures (E-Resources):

Coursera course on Design of Experiments
https://www.youtube.com/watch?v=pTAUa6qXV6E&list=PLIfM0lEfH5PVUhY_etTBhmm31m7r8c6Ea
https://www.youtube.com/watch?v=ZoaUu6iRE64
https://www.youtube.com/watch?v=IEUTRhyoHNc&list=PLPjSqITyvDeWS9Lxp4jreGJ7eNsxHxJA8
https://www.youtube.com/watch?v=zu4ZVso0HTo&list=PL5ND7pZq8F23NO_RejjQ0NwJe8V4wB-PZ
https://www.youtube.com/watch?v=HPsSK-8Uz3o&list=PLHm5EVKgoDDQmH4q19yWJWSxrPYS0B56V
https://www.youtube.com/watch?v=dcNKu8oWpLM&list=PL3HnRmbJODOgk92M25QFOLfr7o5aXeklk

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3)	2 (WK2, WK3, WK4)		1 (WK4)	2 (WK5)							3	2	1
CO2	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	2 (WK5)							3	3	1
CO3	2 (WK1, WK2)	3 (WK2, WK3, WK4)	3 (WK5)	2 (WK4)	3 (WK5, WK6)							3	3	
CO4	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	3 (WK5, WK6)		1 (WK7)				1 (WK7)	3	3	

	Course Code	:	BIPA012E	ENGINEERING ECONOMY	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to apply engineering economic principles and cost analysis techniques to evaluate alternatives, perform depreciation and replacement analyses, and estimate costs for effective engineering decision-making.

Course Outcomes:

After completion of the course student will be able to

CO1. Apply the concepts of interest and interest factors to analyze the time value of money in engineering problems.

CO2. Analyze and compare economic alternatives using Present Worth and Equivalent Annual Worth methods.

CO3. Apply depreciation and replacement analysis techniques for engineering asset management.

CO4. Analyze and estimate the cost of engineering products using standard costing and mensuration methods.

UNIT-I **12 Hrs.**

Introduction: engineering decision – makers, engineering and economics, problem solving, intuition and analysis, tactics and strategy with an example.

Interest and Interest Factors: Interest rate, simple interest compound interest, interest formulae, time value equivalence exercises, problems and discussion

Present Worth Comparison: Conditions for present worth comparisons, rule 72, and basic present worth comparisons, present worth equivalence, net present worth, assets with equal and unequal lives, comparison of assets assume to have infinite lives, exercises and problems.

UNIT–II **10 Hrs.**

Equivalent Annual Worth Comparisons: Situations for equivalent annual worth comparison, net annual worth of a single project, comparison of net annual worth's, definitions of asset life, comparison of assets with equal and unequal lives, exercises and problems.

Depreciation: Introduction, Reasons for Depreciation, Various methods of depreciation, Numerical Problems on all the methods of Depreciation.

UNIT–III **10 Hrs.**

Replacement Analysis: Introduction, Reasons for Replacements - Deterioration, obsolescence, inadequacy, replacement criteria problems, Replacements of assets considering and ignoring time value of money. Group Replacements. Numerical Problems on the above types of Replacement Problems.

UNIT–IV **10 Hrs.**

Estimating and Costing: components of costs such as direct material cost, direct labour cost, Fixed, over –heads, factory costs, administrative – over heads, first cost, selling price, calculation of the total cost of various components, mensuration, estimation of simple components.

Text Books:

1. Riggs J.L. (2002) Engineering economy McGraw Hill
2. Paul Degarmo (2001), Engineering economy Macmillan Pub, Co.

Reference Books:

1. NVR. Naidu, KM Babu (2006). Engineering Economy, New Age International Pvt. Ltd.
2. O.P Khanna (2000), Industrial Engineering and Management Dhanpat Rai and Sons
3. Theusen G. (2000) Engineering Economy. PHI.

Weblinks and Video Lectures (E-Resources):

- https://www.youtube.com/watch?v=9yj6CtMUsYU
- https://www.investopedia.com/terms/c/compoundinterest.asp
- https://www.youtube.com/watch?v=ZSoLPCHsknA
- https://www.youtube.com/watch?v=r0aDjTLxy5c
- https://www.youtube.com/watch?v=r0aDjTLxy5c

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3)	2 (WK2, WK3, WK4)	–	1 (WK4)	2 (WK5)	–	–	–	–	–	–	2	2	–
CO2	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	2 (WK5)	–	–	–	–	–	–	3	3	–
CO3	2 (WK1, WK2)	3 (WK2, WK3, WK4)	3 (WK5)	2 (WK4)	3 (WK5, WK6)	–	–	–	–	–	–	3	3	2
CO4	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	3 (WK5, WK6)	–	1 (WK7)	–	–	–	1 (WK7)	3	3	2

	Course Code	:	BIPA013E	VALUE ENGINEERING	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to apply value analysis and value engineering techniques to identify unnecessary costs, improve product and process functions, and enhance value, quality, and organizational performance across engineering and management applications

Course Outcomes:

After completion of the course student will be able to

CO1. Apply value engineering principles and techniques such as function analysis and cost evaluation to identify unnecessary costs in simple engineering products.

CO2. Use the value engineering job plan systematically to solve industrial problems through creative and structured phases.

CO3. Analyze different types of values (use, esteem, cost, exchange) and their impact on product design and cost reduction through detailed case studies.

CO4. Compare and contrast traditional cost reduction techniques with value analysis in terms of methodology, applications, and outcomes across functional areas like design, purchasing, quality, and management.

UNIT-I — **12 Hrs.**

INTRODUCTION TO VALUE ANALYSIS: Definition of Value, Value Analysis, Value Engineering, Value management, Value Analysis versus Value Engineering, Value Analysis versus Traditional cost reduction techniques, uses, Applications, advantages and limitations of Value analysis. Symptoms to apply value analysis, Coaching of Champion concept.

TYPE OF VALUES: Reasons for unnecessary cost of product, Peeling cost Onion concept, unsuspected areas responsible for higher cost, Value Analysis Zone, attractive features of value analysis. Meaning of Value, types of value & their effect in cost reduction. Value analysis procedure by simulation. Detailed case studies of simple products

FUNCTIONAL COST AND ITS EVALUATION: Meaning of Function and Functional cost, Rules for functional definition, Types of functions, primary and secondary functions using verb and Noun, Function evaluation process, Methods of function evaluation. Evaluation of function by comparison, Evaluation of Interacting functions, Evaluation of function from available data, matrix technique, MISS technique, Numerical evaluation of functional **relationships and case studies.**

UNIT–II — **10 Hrs.**

PROBLEM SETTING & SOLVING SYSTEM: A problem solvable stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

PROBLEM SETTING & SOLVING SYSTEM: Goods system contains everything the task requires. Various steps in problem solving, case studies.

VALUE ENGINEERING JOB PLAN: Meaning and Importance of Value Engineering Job plan. Phases of job plan proposed by different value engineering experts, Information phase, Analysis phase, Creative phase, Judgment phase, Development planning phase, and case studies. Cost reduction programs, criteria for cost reduction program, Value analysis change proposal.

UNIT–III — **10 Hrs.**

VALUE ENGINEERING TECHNIQUES: Result Accelerators or New Value Engineering Techniques, Listing, Role of techniques in Value Engineering, Details with Case examples for each of the Techniques.

ADVANCED VALUE ANALYSIS TECHNIQUES: Functional analysis system technique and case studies, Value analysis of Management practice (VAMP), steps involved in VAMP, application of VAMP to Government, University, College, Hospitals, School Problems etc., (service type problems).

TOTAL VALUE ENGINEERING: Concepts, need, Methodology and benefits.

UNIT–IV — **10 Hrs.**

APPLICATION OF VALUE ANALYSIS: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques.

Text Books:

1. Lawrence D. Miles, Techniques of Value Analysis and Engineering, 2nd Edn.

2. M.S. Vittal, Systems Consultancy Services, Value engineering for Cost Reduction and Product, Edn, 1991.

Reference Books:

1. Edward D Heller Value Management, Value Engineering and Cost Reduction, , Addison Wesley Publishing Company, 1991
2. Warren J Ridge, Value Analysis for Better Management, , American Management Association Edn, 1969.
3. G. Jagannathan, Getting More at Less Cost (The Value Engineering Way), Tata Mcgraw Hill Pub.Comp. Edn,1995.
4. Arther E Mudge "Value Engineering, , McGraw Hill Book Comp. Edn, 1981

Weblinks and Video Lectures (E-Resources):

- https://www.youtube.com/watch?v=L-TfAfip1ME
- https://www.youtube.com/watch?v=mJoaZ4GewyI
- http://www.simplynotes.in/e-notes/mbabba/productivity-management/value-analysis/
- https://www.youtube.com/watch?v=mJoaZ4GewyI
- https://www.value-eng.org/page/AboutVM

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3(WK1, WK2, WK3)	2(WK2, WK3, WK4)	1(WK5)	–	2(WK5)	–	–	–	–	–	–	2	2	–
CO2	2(WK1, WK2)	3(WK2, WK3, WK4)	2(WK5)	2(WK4)	2(WK5, WK6)	–	–	–	–	–	1(WK6)	3	3	–
CO3	2(WK1, WK2)	3(WK2, WK3, WK4)	2(WK5)	3(WK4)	2(WK5, WK6)	–	–	–	–	–	1(WK6)	3	3	2
CO4	2(WK1, WK2)	3(WK2, WK3, WK4)	2(WK5)	2(WK4)	2(WK5, WK6)	–	1 (WK7)	1 (WK7)	–	–	2(WK6, WK7)	3	3	2

	Course Code	:	BIPA014E	ENTERPRISE RESOURCE PLANNING	Semester	:	--
	L: T:P	:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to understand, implement, and manage Enterprise Resource Planning (ERP) systems by integrating business processes, manufacturing operations, and organizational resources to improve efficiency, decision-making, and enterprise performance.

Course Outcomes:

After completion of the course student will be able to

CO1. Explain the evolution, scope, and need for ERP in modern enterprises and evaluate the reasons for ERP success or failure.

CO2. Analyze ERP modules and manufacturing-related ERP functions including MRP, BOM, and PDM systems.

CO3. Analyze the benefits of ERP implementation in terms of organizational performance and decision-making.

CO4. Describe and apply the ERP implementation life cycle phases, stakeholders' roles, and critical success factors.

UNIT-I — **12 Hrs.**

INTRODUCTION TO ERP: Introduction, Evolution of ERP, what is ERP, Reasons for the growth of the ERP market, The advantages of ERP, why do Man ERP Implementations Fail? Why are ERP packages being used now?

ENTERPRISE – AN OVERVIEW: Introduction, Integrated Management Information, Business modelling, Integrated Data Model

ERP AND RELATED TECHNOLOGIES: Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management

UNIT–II — **10 Hrs.**

ERP- MANUFACTURING PERSPECTIVE: Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP. Manufacturing Resource Planning, Distribution Requirements Planning

KANBAN: JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, assemble to order, Engineer to order, Configure-to order.

ERP MODULES: Introduction, Finance, Plant Maintenance, Quality Management, Materials Management.

UNIT–III — **10 Hrs.**

BENEFITS OF ERP: Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Suppler Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

ERP PACKAGES: Overview of ERP Software Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions Company, System Software Associates, Inc. QAD.

UNIT–IV — **12 Hrs.**

ERP Implementation Life Cycle: Pre-Evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, end user Training, Post Implementation

VENDOR, CONSULTANTS AND USERS: Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users. **ERP-** Case studies

Text Books:

1. Alexis Leon (1999), "Enterprise Resource Planning," Tata McGraw Hill Publishing Company Ltd.

Reference Books:

1. Vinod Kumar Garg and Venkitakrishnan "Enterprise Resource Planning Concept and Practice", Prentice Hall, India 2nd Edition.
2. Thomas Volloman, et,al. "Manufacturing Planning & Controls"

Weblinks and Video Lectures (E-Resources):

- https://www.projectmanager.com/guides/resource-management
- ttps://www.youtube.com/watch?v=igssKXYS23A
- https://www.youtube.com/watch?v=1N9WbIP9S_g
- https://www.youtube.com/watch?v=1N9WbIP9S_g&list=RDCMUCObs0kLIrDjX2LLSybqNaEA&index=1
- https://www.youtube.com/watch?v=ssg6DTVfTSY

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3 (WK1, WK2, WK3)	2 (WK2, WK3, WK4)	–	–	2 (WK5)	–	–	–	–	–	1 (WK6)	2	2	–
CO2	2 (WK1, WK2, WK3)	3 (WK2, WK3, WK4)	2 (WK5)	2 (WK4)	3 (WK5, WK6)	–	–	–	–	–	1 (WK6)	3	3	–
CO3	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	3 (WK5, WK6)	–	–	–	–	–	2 (WK6)	3	3	2
CO4	2 (WK1, WK2)	3 (WK2, WK3, WK4)	3 (WK5)	2 (WK4)	3 (WK5, WK6)	–	1 (WK7)	1 (WK7)	1	1	2 (WK6, WK7)	3	3	2

Course Code		:	BIPA015E	BUSINESS PROCESS REENGINEERING AND BENCHMARKING	Semester	:	--
L: T:P		:	3:0 :0		Course Type	:	Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Develop the ability to apply business process reengineering and benchmarking techniques to analyze, redesign, and improve organizational processes for enhanced efficiency, competitiveness, and continuous performance improvement.

Course Outcomes:

After completion of the course student will be able to

CO1. Apply the fundamental principles of Business Process Reengineering (BPR) and understand the role of 3Cs (Customer, Competition, and Change) in process transformation.

CO2. Analyze the roles and responsibilities of BPR teams, and evaluate real-world case studies to identify effective process redesign practices.

CO3. Apply benchmarking methods to identify performance gaps and set process improvement targets in alignment with organizational goals.

CO4. Analyze collected benchmarking data to derive actionable insights and recommend best practices for business process improvement.

UNIT-I	10 Hrs.

Definition of reengineering, importance of 3Cs – customers take charge, competition intensifies, and change becomes constant.

Detailed definition of reengineering – fundamental rethinking, radical redesign, and dramatic improvement

Rethinking business process, new world of work, and enabling role of information technology

UNIT–II	10 Hrs.

Reengineering leader, process owner, reengineering team, steering committee, and reengineering czar.

Reengineering opportunities: Choosing the processes to reengineer and understanding processes.

Experience of process redesign – redesign session. Discussion on Reengineering Case Studies

UNIT–III	10 Hrs.

Benchmarking: Definition, mission and objectives, managing benchmarking process, training and code of conduct, future scope and benchmarking process

What to benchmark: Concept of step zero, priorities, business processes – linking to goals etc., investigation, documentation, performance measures, improving business processes.

Whom to benchmark: Developing candidate list, systematic search, refining the initial list

UNIT–IV	10 Hrs.

Data Collection and Analyzing the Performance Gap: Data collection plan, research - internal, public domain sources, outside experts etc. original research, site visits, and code of conduct

Analyzing the gap: Tools, displaying data, deciding and combining best work practices, validation, recommendations etc.

Discussion on Benchmarking Case studies

Text Books:

1. Michael Hammer and James Champy, "Reengineering the Corporation – A Manifesto for Business Revolution", Nicholas Brealey Publishing London. ISBN 1 85 7880 560
2. Robert C. Camp, "Business Process Benchmarking- Finding and implementing Best Practices", Vision Books New Delhi. ISBN 81-7094-275-6

Reference Books *

1. Robert C. Camp "Benchmarking: The Search for Industry Best Practices that lead to Superior Performance" ASQC Quality Press, ISBN 978-1-56327-352-0
2. Raymond L Manganelli, Mark M. Klein "The Reengineering Handbook: A step-by-step guide to business transformation" American Management Association, ISBN 0-8144-0236-4
3. Chang Meng Khoong "Reengineering in Action: The Quest for World-Class Excellence, Imperial College Press, ISBN 978-81-7596-787-8
4. Bjorn Anderson and Per-GautePettersen, "The Benchmarking Handbook: Step-by-step instructions" , Chapman and Hall, ISBN: 04120735202

Weblinks and Video Lectures (E-Resources):
https://www.youtube.com/watch?v=M28W5EKiwCs&list=PLNQKQTBvVeQyZ56LdwEDvXKJnTSwT6gEp https://www.youtube.com/watch?v=v-jAf7L2Uak https://www.youtube.com/watch?v=LtSiTpb7mS0 https://www.youtube.com/watch?v=WEIHeGOEDPE https://www.youtube.com/watch?v=R15QBniQuZA https://www.youtube.com/watch?v=AkGwJSlkpfY https://www.youtube.com/watch?v=sfWi2EmM1QA https://www.youtube.com/watch?v=sgy0ka4vh-M

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3)	2 (WK2, WK3, WK4)	1 (WK5)	–	2 (WK5)	–	–	–	–	–	1 (WK6)	2	2	–
CO2	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	2 (WK5, WK6)	–	–	–	1	1	1 (WK6)	3	3	–
CO3	2 (WK1, WK2)	3 (WK2, WK3, WK4)	3 (WK5)	2 (WK4)	3 (WK5, WK6)	–	–	–	–	1	2 (WK6)	3	3	2
CO4	2 (WK1, WK2)	3 (WK2, WK3, WK4)	2 (WK5)	3 (WK4)	3 (WK5, WK6)	–	1 (WK7)	1 (WK7)	1	1	2 (WK6, WK7)	3	3	2

DEPARTMENT OPENELECTIVES

Sl. No.	Subject Code	Department Electives
1.	BIPAXXXN	Marketing Management
2.	BIPAXXXN	Materials Management
3.	BIPAXXXN	Total Quality Management

	Course Code	:	BIPAXXXN	MATERIALS MANAGEMENT	Semester	:	--
	L:T:P	:	3: 0 :0		Course Type	:	Open Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Students will develop the professional competency to plan, analyze, and manage organizational materials systems by integrating corporate policy with materials management functions, and by applying classification, codification, purchasing, warehousing, and inventory management principles to ensure cost-effective availability, efficient flow, and optimal utilization of materials across the supply chain.

Course Outcomes:

After completion of the course students will be able to

CO1. Demonstrate an understanding of the role of materials management as it integrates with corporate policy, and analyze materials through ABC classification.
CO2. Acquire foundational knowledge of codification and standardization practices.
CO3. Analyze and apply various purchasing policies and procedures within the purchasing function.
CO4. Apply and integrate warehousing and stores management skills to enhance overall supply chain performance.
CO5. Demonstrate proficiency in inventory management principles and apply them effectively within an organizational context.

UNIT-I — **11 Hrs.**

Integrated Materials Management: Importance, Need for integrated concept, Definition and scope, Advantages. Advantages of Integrated Materials Management Concept

Corporate Policy and Materials Management: General corporate policy, Scope, make or buy, Quality requirements, Quantity requirements.

Materials Research-Need and Importance, Definition and Scope, Organization for Materials Research, Techniques and Reporting

ABC Analysis: What is ABC Analysis- Advantages of ABC Analysis, Mechanics of ABC Analysis, Purpose of ABC Analysis, Objective of ABC Analysis, Limitations of ABC Analysis.

UNIT–II — **11 Hrs.**

Codification and Standardization: Nature of Codification, Process of codification, Kodak System, Brisch System, Advantages of Codification, Need for Standardization, Standardization in India, Importance of Standardization, Definition of Simplification, Benefits of Standardization.

Purchasing Management: Creative Purchasing, Purchase Systems, Price Forecasting, Buying Seasonal Commodities, Purchasing Under Uncertainty, Purchasing of Capital Equipment, International Purchasing, Import Substitution: Prospects and Retrospect, Public Buying Insurance Buying

UNIT–III — **10 Hrs.**

Warehousing and Stores Management: Stores Management, Stores Systems and Procedures, Incoming Materials Control, Stores Accounting and Stock Verification, Obsolete, Surplus and Scrap Management, Value Analysis, Material Handling, Transportation and Traffic Management.

UNIT–IV — **10 Hrs.**

Inventory Management: Definition, Inventory planning for independent demand items, Types of inventories, Inventory costs, Inventory control for deterministic demand items, Inventory control systems, Selective control of inventory, other issues in inventory planning and control .

Text Books:

1. Gopal Krishna. P. and M. Sundaresan. Materials Management: An Integrated Approach, Prentice-Hall of India Private limited, New Delhi, 2007, ISBN –978-81-203-0027-9.
2. Operations Management Theory and Practice- B. Mahadevan, 3rd Edition, Pearson ISBN 978-96-325-4109-2

Reference Books:

1. Datta. A K. Materials Management, Procedures, Text and Cases. Prentice-Hall of India Private limited, New Delhi, 2000.
2. Materials Management Chitale
3. Materials Management by Arnold
4. Handbook of Materials Management by Gopalkrishnan

Weblinks and Video Lectures (E-Resources)
• https://www.youtube.com/watch?v=E7JlYl8RcBM&list=PLJdQgRDfPMeBLIHYf8oNuXJ7daeMj8JGx • https://www.youtube.com/watch?v=XP_zi6GbU_Q • https://www.youtube.com/watch?v=ZIwnhjHl3vA&t=7s • https://www.youtube.com/watch?v=oSoU4msV2ss • https://www.youtube.com/watch?v=iaD-pyE03Ic

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	-	-	1 (WK5)	-	-	2 (WK1, WK5. WK7)	2 (WK9)	2	2	2	
CO2	-	-	-	-	-		2 (WK9)	-	-	3	
CO3	-	-	-	-	-	2 (WK5. WK7)	2 (WK9)	2	2	2	
CO4	-	-	-	-	-	2 (WK5. WK7)	-	-	2	2	
CO5	2 (WK1, WK2, WK4)	-	3 (WK5)	-	3 (WK2, WK6)	2 (WK1, WK5. WK7)	-	-	3	-	

	Course Code	:	BIPAXXXN	MARKETING MANAGEMENT	Semester	:	--
	L: T:P	:	3: 0 :0		Course Type	:	Open Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	6 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Students will develop the professional competency to systematically analyze markets and customers, and to design, evaluate, and implement integrated marketing strategies that create and deliver customer value in dynamic business environments.

Course Outcomes:

After completion of the course student will be able to

- **CO1.** Apply core marketing concepts and frameworks to real-world business scenarios to define customer value and market orientation.
- **CO2.** Analyze consumer and organizational buying behavior using psychological and behavioral models to identify influencing factors and decision processes.
- **CO3.** Analyze segmentation, targeting, and positioning (STP) strategies to develop effective marketing plans for various consumer and business markets.
- **CO4.** Evaluate integrated marketing mix strategies (product, price, place, and promotion) for effectiveness in different market environments, including services, retail, and digital contexts.

UNIT-I — **11 Hrs.**

Defining marketing for the new realities: The value of marketing, the Scope of Marketing, Core marketing concepts, the new marketing realities, and Company Orientation towards the marketplace.

Collecting Information: Components of modern marketing information system, Internal records, marketing intelligence, Analyzing the macro environment

Conducting Marketing Research: The scope of Marketing research, The Marketing research process, the Seven Characteristics of good marketing research

UNIT–II — **11 Hrs.**

Analyzing Consumer Markets: What influences consumer behavior? Key psychological processes, the buying decision process: Five stage model, Behavioral Decision Theory and Behavioral Economics

Identifying Market Segments and Targets: Basis for segmenting consumer markets, how should business markets be segmented? Market targeting, Effective segmentation criteria.

Analyzing Business Markets: What is organizational buying? Participants in the business buying process, the purchasing/procurement process, Stages in the buying process, Developing Effective-business-to- business marketing programs, Managing business-to-business customer relationships, and Institutional and Government markets.

UNIT–III — **10 Hrs.**

Setting Product Strategy: Product characteristics and classifications, Differentiation, Environmental issues Product and brand relationships, Packaging, Labelling, warranties, and guarantees

Designing and Managing services: The nature of services, the realities of the new service, Achieving excellence in services marketing

Managing retailing, Wholesaling, and Logistics: Retailing, private labels, wholesaling, market logistics

UNIT–IV — **10 Hrs.**

Developing Pricing strategies and programs: Understanding pricing, setting the price, Adapting the price, Initiating and responding to price changes

Designing and Managing Integrated marketing communications: The role of marketing communications, Marketing communications mix, How do marketing communications work, developing effective communications, Selecting the marketing communications mix, Developing and managing an advertising programme

Text Books:

1. Philip Kotler, Kevin Lane Keller "Marketing Management" 15th edition, Pearson India Education Services Pvt. Ltd. ISBN 978-93-325-5718-5.
2. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithileshwar Jha "Marketing Management: A South Asian Perspective". 13th Edition, 2012, Pearson Prentice – Hall of India private limited, ISBN-978-81-317-1683-0

Reference Books:

1. Philip Kotler "Principles of Marketing", Prentice - Hall.

2. Michael R Czinkota, Marketing Management, 2nd Edition. Vikas Publishing House, ISBN 981-240-366-3
3. Wiliam J Stannon, "Fundamentals of Marketing", McGraw Hill
4. R.S.S. Pillia and Mrs. Bagavathi "Marketing" S. Chand & Co. Ltd
5. S.A Sherlaker, "Marketing Management", 13th Edition.
6. Rajagopal, Marketing Management Text & Cases, Vikas Publishing House.

Weblinks and Video Lectures (E-Resources):

MOOC Course:https://www.edx.org/course/marketing-management-iimbx-mk102x#!
NPTEL Course: http://nptel.ac.in/courses/110104068/3
https://www.youtube.com/watch?v=65MQnEMf-uI&t=175s
https://www.youtube.com/watch?v=OUxmwxA66Ss
https://www.youtube.com/watch?v=rG2Ui_BKpBY&list=PLgMDNELGJ1CZF8bYMr8YZ7JFD7WD8M46k

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	2 (WK1, WK2, and WK4)	3 (WK1, WK2, WK3, and WK4)	-	-	1 (WK2, WK6)	-	-	-	-	2	-
CO2	-	3 (WK2, WK3, and WK4)	-	2 (WK8)	-	-	-	-	-		-
CO3	-	3 (WK1, WK2, WK3, and WK4)	2 (WK5)	-	-	-	2 (WK9)	-	-	-	-
CO4	-	-	3 (WK5)	-	-	-	2 (WK9)	-	-	3	-

Course Code		:	BIPAXXXN	TOTAL QUALITY MANAGEMENT	Semester	:	--
L:T:P		:	3: 0 :0		Course Type	:	Open Elective
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

The professional competency that students will gain is the ability to design, analyze, and guide organization-wide quality improvement and strategic alignment efforts by incorporating the Total Quality Management principles, continuous improvement approaches (reactive and proactive), team working practices and total participation, and Hoshin Kanri-based policy implementation to logically improve the process performance, customer satisfaction, and long-term organizational excellence.

Course Outcomes:

After completion of the course student will be able to:

CO1. Apply the principles of TQM and contributions of quality pioneers like Deming, Juran, and Ishikawa to quality improvement initiatives

CO2. Analyze quality improvement techniques such as reactive and proactive improvement methods, and the seven QC tools for process diagnosis and control.

CO3. Apply teamwork principles and total participation concepts in implementing continuous improvement programs within an organization.

CO4. Analyze the phases and strategic impact of Hoshin Kanri (Hoshin Management) for aligning organizational vision, planning, and control systems.

UNIT-I — **11 Hrs.**

Review of Total Quality Management: History of TQM quality, Walter Shewhart's concept of variation and control system, Contribution of Quality Gurus - Deming's approach, Juran's quality trilogy, Crosby and quality treatment, Imai's Kaizen. Ishikawa's companywide quality control, and Feigenbaum's theory of TQC

Evolution of Quality Concepts and Methods: Quality concepts. Development of four fitnesses, evolution of methodology, evolution of company integration, quality of conformance versus quality of design, from deviations to weaknesses to opportunities. Future fitnesses

Four revolutions in Management thinking: Customer focus, Continuous Improvement, Total Participation, and Societal Networking. Focus On Customers: Change in work concept, market-in, and Customers.

UNIT–II — **10 Hrs.**

Continuous Improvement:

Improvement as problem problem-solving process: Management by process, WV model of continuous improvement, process control, process control and process improvement, process versus creativity.

Reactive Improvement: Identifying the problem, standard steps and tools, seven steps - case study, and seven QC tools. Management diagnosis of seven steps reactive improvement. General guidelines for managers diagnosing a QI story. Case study for diagnosis of the seven steps

UNIT–III — **11 Hrs.**

Proactive Improvement: Introduction to proactive improvement, standard steps for proactive improvement, semantics, example customer visitation. Applying proactive improvement to develop new products - three stages and nine steps

Total Participation: Teamwork skills, dual function of work, teams and team work, principles for activating teamwork, creativity in team processes. Initiation strategies; CEO involvement. Example: strategies for TQM introduction. Infrastructure for mobilization. Goal setting (Vision/Mission), organization setting, training and Education, promotional activities, diffusion of success stones, awards and incentives monitoring and diagnosis. Phase-in, orientation phase, alignment phase, evolution of parallel organization.

UNIT–IV — **10 Hrs.**

Hoshin Management: Definition, phases in hoshin management - strategic planning(proactive), hoshin deployment, controlling with metrics(control), check and act (reactive). Hoshin management versus management by objective, hoshin management and conventional business planning, an alternative hoshin deployment system, hoshin management as "Systems Engineering" for alignment

Text Books:

1. N. Logothetis, "Managing for Total Quality", Prentice Hall of India, New Delhi. (Chapter I - partly)
2. Shoji Shiba, David Walden "Four Practical Revolutions in Management: Systems for creating unique organizational Capability",2001, Productivity Press, ISBN 1-56327-217-2

Reference Books:
1. Roger C. Swanson, "The Quality Improvement Hand Book", Publisher Vanity Books International, New Delhi. 2. William. C. Johnson and Richard J. Chavla, "Encyclopedia of Total Quality Management", New Delhi.
Weblinks and Video Lectures (E-Resources):
https://www.youtube.com/watch?v=vtcYE63GzRo https://www.youtube.com/watch?v=VrvYQCkhz_8 https://www.youtube.com/watch?v=VD6tXadibk0 https://www.youtube.com/watch?v=42UgAS-U1-o https://www.youtube.com/watch?v=cTwwMK1AnDU https://www.youtube.com/watch?v=Krpm-df5B9c

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes	Programme Outcomes (POs)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	1 (WK1,WK2, And WK4)	2 (WK1,WK3, And WK4)	2		-		-	1	-		-
CO2	2 (WK1, WK2,and WK4)	3 (WK1,WK2, WK3,and WK4)	-	2 (WK8)	-	-	-	1	-		-
CO3	-	2 (WK1,WK2, WK3,and WK4)	-		-	-	-	1	3	2	1 (WK8)
CO4	-	2 (WK1,WK3, and WK4)	2 (WK5)		-	-	-	1	1	3	-