BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Avalahalli, Yelahanka, Bengaluru 560119

Bachelor of Engineering

Department of Mechanical Engineering

IV Semester Scheme and Syllabus
2022 Scheme Effective from the AY 2024-25

2023 BATCH

Approved in the BoS meeting held on 01.03.2025

Vision and Mission of the Department

Vision

To develop technically competent Mechanical Engineering professionals for the benefit of the society.

Mission

1. Impart quality education in Mechanical Engineering and allied areas by state-of- the- art- infrastructure and dedicated faculty.

2. Provide conducive environment for both students and faculty to pursue higher education & research and to work ethically for the benefit of society.

Program Educational Objectives (PEOs)

1. Be successful professionals in the field of Mechanical Engineering and allied areas.
2. Exhibit skills to work effectively and ethically in multiple domains of engineering as part of a team.
3. Excel in higher studies, research and adapt in a world of constantly developing technology.

Program Specific Outcomes (PSOs)

1. Design, Analyze and fabricate the mechanisms.
2. Analyze the fluid and thermal aspects of different mechanical systems and components.
3. Develop materials and components through different manufacturing methods.

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BMS Institute of Technology and Management
(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

REVISED

Date: 18-12-2024

CONTINUOUS INTERNAL EVALUATION (CIE) AND SEMESTER END EXAMINATION (SEE) PATTERN

(Applicable to UG students admitted from the 2022 batch, effective from the Academic year 2024-25 onwards)

The UG students admitted from the 2022 batch onwards are hereby informed to note the following regarding Continuous Internal Evaluation and Semester End Examination pattern:

- The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%.
- The Minimum passing mark for the CIE is 40% of the Maximum marks (i.e. 20 marks out of 50) and for the SEE minimum passing mark is 35% of the Maximum marks (i.e. 18 out of 50 marks).
- A student will be declared to have passed the course if they secure a minimum of 40% (i.e. 40 marks out of 100) in the combined total of the CIE and SEE.

The following tables summarize the CIE and SEE Patterns for the courses of various credits:

IPCC COURSES: 4 CREDITS OR 3 CREDITS						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	20	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **20 Marks**.
		CIE – Test 2 (1.5 hr)	40			

	CIE – CCA (Comprehensive Continuous Assessment)	CCA	10	05	-	Any one assessment method can be used from the list appended below.
	Total CIE Theory			**25**	**10**	
Practical Component	CIE - Practical		30	15	-	Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics.
	CIE Practical Test		20	10	-	One test after all experiments to be conducted for **20 Marks**
	Total CIE Practical			**25**	**10**	
Total CIE Theory + Practical				**50**	**20**	
SEE			100	50	18	SEE exam is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE				**100**	**40**	
The laboratory component of the IPCC shall be for CIE only.						

Professional Core Courses (PCC) / Engineering Science Courses (ESC): 03 and 02 Credit						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	30	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks**.
		CIE – Test 2 (1.5 hr)	40			
	CIE - CCAs	CCA	20	20	-	Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given.
	Total CIE Theory			**50**	**20**	
SEE			100	50	18	SEE is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE				**100**	**40**	

NON-IPCC COURSES: 01 Credit Course - MCQ						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Continuous Internal Evaluation Component	CIE – IA Tests (MCQs)	CIE – Test 1 (1 hr)	40	40	-	The question paper pattern for this course shall be an **MCQ** of **1 or 2 Marks (s).** The questions with 2 Marks can be framed based on a higher Bloom's level. The sum of the two internal assessment tests will be **80 Marks**, and the same will be scaled down to **40 Marks**.
		CIE – Test 2 (1 hr)	40			
	CIE - CCAs	CCA	10	10	-	Any One Assessment method can be used from the list provided below.
	Total CIE			**50**	**20**	
SEE (MCQ Type)				50	18	The question paper pattern for this course shall be an **MCQ** of **1 or 2 Marks (s).** The questions with 2 Marks can be framed based on higher Bloom's level. MCQ-type question papers of 50 questions with each question of a **01 Mark**, examination duration is 01 hour.
CIE + SEE				**100**	**40**	

Professional Core Course Laboratory (PCCL) /Ability Enhancement Course Laboratory (AEC) - 01 Credit					
Evaluation Type	**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Continuous Internal Evaluation	CIE - Practical	30	30		Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics.
	CIE - Practical Test	50	20		One test after all experiments is to be conducted for **50 Marks** and to be scaled down to **20 Marks**.
	Total CIE	-	**50**	**20**	
Semester End Examination		100	50	18	SEE to be conducted for **100 Marks**.
CIE+SEE		**100**		**40**	

Learning Activities for CCAs:

A faculty member may choose the following CCAs based on the needs of the course:

1. Course project
2. Literature review
3. MOOC
4. Case studies
5. Tool exploration
6. GATE-based aptitude test
7. Open book tests
8. Industry integrated learning
9. Analysis of Industry / Technical / Business reports
10. Programming assignments with higher Bloom level
11. Group discussions
12. Industrial / Social / Rural projects

CoE 18/12/2024

Dean AA 18.12.24

Principal 18/12/24

Copy To:

1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2022, 2023, and 2024 batch.
3. Examination Section

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

B. E. in Mechanical Engineering

Scheme of Teaching and Examinations – 2022 Scheme

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2024-25 onwards)

IV Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Credits Distribution				Examination				Contact Hours/week
					L	T	P	Total	CIE Marks	SEE Marks	Total Marks	SEE Duration (H)	
1	PCC	BME401	Applied Thermodynamics	TD: ME PSB: ME	3	1	0	4	50	50	100	3	5
2	IPCC	BME402	Machining Science & Metrology		3	0	1	4	50	50	100	3	5
3	IPCC	BME403	Fluid Mechanics		3	0	1	4	50	50	100	3	5
4	PCCL	BME404	Mechanical Measurements and Metrology laboratory		0	0	1	1	50	50	100	3	2
5	ESC	BME405X	Engineering Science Course		3	0	0	3	50	50	100	3	3
6	AEC	BME456X	Ability Enhancement Course/Skill Enhancement Course		For Theory course				50	50	100	1	1
					1	0	0	1					
					For Practical course							2	2
					0	0	1	1					
7	BSC	BBOK407	Biology For Engineers	TD: Chemistry PSB: Chemistry	2	0	0	2	50	50	100	3	2
8	UHV	BUHV408	Universal Human Values	Any Department	1	0	0	1	50	50	100	1	1
9	NCMC	BNSK459	National Service Scheme (NSS)	NSS Coordinator	0	0	0	0	100	-	100	-	2
		BPEK459	Physical Education (Sports and Athletics)	PED									
		BYOK459	Yoga	Yoga Teacher									
		BNCK459	National Cadet Corps (NCC)	NCC Department									
		BMCK459	Music	Music Department									
TOTAL					**15**	**1**	**4**	**20**	**500**	**400**	**900**	**-**	**28**
Non-Credit Mandatory Course (NCMC) prescribed to lateral entry Diploma Students													
10	NCMC	BENGDIP2	English Communications Skill II	HSS	**0**	**0**	**0**	**0**	**100**	**-**	**100**	**-**	**2**

The Lateral entry diploma students admitted to III semester are required to complete the English Communications Skill I in the III semester and English Communications Skill II in the IV semester. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

Engineering Science Courses (ESC) L: T: P 3:0:0		**Ability Enhancement Courses (AEC)**	
Course Code	**Course Name**	**Course Code**	**Course Name**
BME405A	Non Traditional Machining	BME456A	Introduction to AI & ML [0-0-2]
BME405B	Environmental Studies	BME456B	Digital Marketing [0-2-0]
BME405C	Micro Electro Mechanical Systems	BME456C	Introduction to Data Analytics [0-0-2]
BME405D	Automation and Robotics	BME456D	Programming in C++ [0-0-2]

B.E MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)

Applied Thermodynamics (3:1:0) 4
(Effective from the academic year 2023-24)

Course Code	**BME401**	SEMESTER	**IV**
Teaching Hours/Week (L: T:P)	3:2:0	CIE Marks	50
Total Number of lecture hours	50	SEE Marks	50
Examination Pattern (SEE)	**Theory**	Exam Hours	03

Course Objectives:

This course will enable students to:

1. Know the fundamental concepts of IC engines and various methods to estimate the Indicated power, Brake power, frictional power
2. Study the combustion phenomenon in SI and CI engines and its controlling factor in order to extract maximum power, use of alternative fuels in SI and CI engines.
3. Acquire the knowledge related to working principle and applications of various gas power cycles, gas turbine cycles and vapour power cycles.
4. Understand various refrigeration systems
5. Study the functioning and applications of air-conditioning and psychrometry.

Preamble: Significance of thermodynamic concepts in the present scenario. Outcome of thermodynamic application on societal and renewable solutions.

Module-1

Air standard cycles: Carnot cycle**,** Otto, Diesel, Dual cycle, P-V and T-S diagrams, description, efficiencies, mean effective pressures, Comparison of Otto, Diesel and Dual cycles. Numerical
Gas power cycles: Description and analysis of Brayton cycle, Regenerative, intercooling and reheating in gas turbine cycles**,** numerical.

(10 Hours)

Module-2

Internal Combustion Engines: Combustion phenomenon in SI and CI engines. Detonation and factors affecting detonation, performance analysis of I.C. engines, heat balance sheet, numerical.

(10 Hours)

Module-3

Vapour Power Cycles: Carnot vapour power cycle, drawbacks as a reference cycle, Simple Rankine cycle, description, T-S diagram, and analysis for performance, comparison of Carnot cycle and Rankine cycles, effects of temperature and pressure on Rankine cycle performance. Actual vapour power cycles: Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, reheat Rankine cycle, numerical problems.

(10 Hours)

Module-4

Refrigeration Cycles: Vapour compression refrigeration system; description, analysis, refrigerating effect. Capacity, power required, units of refrigeration, COP, Refrigerants and their desirable properties, alternate Refrigerants. Any one case study on cold storage or industrial refrigerator. Air cycle refrigeration; reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system. **(10 Hours)**

Module-5

Psychrometrics and Air-conditioning Systems: Psychrometric properties of air, psychrometric chart, analyzing air-conditioning processes: heating, cooling, dehumidification and humidification, evaporative cooling, adiabatic mixing of two moist air streams, cooling towers, and numerical problems.

(10 Hours)

Course Outcomes:

The student will be able to:

- **CO1:** Interpret fundamentals of thermodynamics, IC engines, refrigeration systems, psychrometry and air conditioning.
- **CO2:** Apply the concepts of thermodynamics to air standard cycles, gas power cycles, IC engines, vapour power cycles, refrigeration systems, psychrometry and air conditioning.
- **CO3:** Analyze air standard cycles, gas power cycles, and IC engines for optimum performance.
- **CO4:** Examine the optimum performance of vapour power cycles.
- **CO5**: Distinguish the performance of refrigeration and air conditioning systems.

Resource learning materials

TEXTBOOKS:

1. R.K Rajput, "Engineering Thermodynamics", Laxmi Publications(P) Ltd, 6th edition, 2023.
2. P.K. Nag, "Basic and Applied Thermodynamics", Tata McGraw Hill, 6th edition, 2015.

REFERENCES:

1. Yunus A. Cenegal., Michael A. Boles, "Thermodynamics- An Engineering Approach", Tata McGraw Hill publications, 7th edition, 2001.
2. M.L.Mathur & Sharma." IC Engines", Dhanpat Rai & sons-India, 8th edition, 2010
3. Ganesan V, "I.C. Engines", Tata McGraw Hill, 4th edition, 2012.

B.E MECHANICAL ENIGINEERING

Choice Based Credit System (CBCS)

Machining Science and Metrology (3:0:2) 4

(Effective from the academic year 2023-24)

Course Code	**BME402**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	40 hours of theory+ 8-10 Lab slots	Exam Hours	03

Course objectives:

- To enrich the knowledge pertaining to relative motion and mechanics required for various machine tools.
- To introduce students to different machine tools to produce components having different shapes and sizes.
- To develop the knowledge on mechanics of machining process and effect of various parameters on machining.
- To understand the basic principles of measurements
- To enrich the knowledge pertaining to gauge, comparator, and angular measurement.

Preamble: Special purpose machines and processes are used to manufacture complex engineering parts with high quality. Delivering innovative technologies that benefit the society.

Module – 1

Machine tools: Introduction to basic metal cutting machine tools, generating motions of machine tools, nature of relative motion between the tool and work material. Conventional machine tools versus production machine tools, CNC machine tools. Types of CNC machines, energy use in CNC machining centers, constructional features of CNC machines, 3-axis and 4-axis horizontal machines, axis drives, closed-loop machine control system. Tool changing system, types of automatic tool changers, tool holder for turning machines, pallets, fixtures and types of fixtures.

Cutting fluids: Functions, properties of cutting fluids and types of cutting fluids, health and safety concerns. **(08 Hours)**

Module – 2

Mechanics of metal cutting: Orthogonal and oblique cutting. Mechanics of chip formation and its significance. Analysis of orthogonal cutting: Determination of shear angle, shear strain and strain rate, cutting velocity relationship, cutting forces and Merchant circle diagram. Numericals.

Cutting tools: Basic requirements of tool materials, major classes of tool materials, tool coatings, classification of cutting tools, geometry of single point cutting tool. Turning tools, indexable inserts, selection of an insert, insert material and shape. Drilling tools, geometry of twist drill, threading tools. **(08 Hours)**

Module – 3

Grinding and finishing processes: Principle of grinding machines, grinding wheel, material, designation and selection of grinding wheel, grinding process parameters. Principles of cylindrical grinding, surface grinding, centreless grinding. Honing, lapping, super finishing, polishing and buffing.

Tool wear and Machinability: Temperature distribution in metal cutting, measurement of cutting temperatures. Tool wear mechanism, types of tool wear & tool failure, tool-life criteria, affect tool life on cutting parameters, machinability, factors affecting machinability. Numericals

Economics of machining: Machining time, machine utilization, production cost and total production time. **(08 Hours)**

Module – 4

Introduction: Introduction to metrology & measurements, definition, objectives and classification of metrology, standards of length- wave length standard, sub division of standards, numerical problems on length calibration.

Line & End Standards: Line and end standard, slip gauges, wringing phenomena, numerical problems on slip gauges.

Angular Measurements: Bevel protractor, sine bar, angular gauges, numerical on building of angles. **(08 Hours)**

Module – 5

Systems of Limits, Fits & Tolerance: Definition of tolerance, tolerance specification in assembly, limits of size, Indian standards, concepts of limits of size and tolerances, cost v/s tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation

Gauges: Classification of gauges, Taylor's principle, design of GO, NO GO gauges, wear allowance on gauges, types of gauges- plain plug gauges, ring gauges, snap gauge, limit gauge, simple problems.

Comparators: Introduction to comparators, classification, characteristics, systems of displacement amplification in mechanical comparators, Reed type, Sigma comparator, Zeiss ultra-optimeter, Solex air gauge, ultrasonic gauges, LVDT. **(08 Hours)**

PRACTICAL COMPONENT OF IPCC

Sl.NO Experiments

1. Preparation of one model on lathe involving - Plain turning, Facing, Knurling, Drilling, Boring, Internal Thread cuts and Eccentric turning.
2. Preparation of One model on lathe involving - Plain turning, Facing, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.
3. One Job, Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
4. Cutting of Gear Teeth using Milling Machine.
5. Simple operations and One Job on the drilling and grinding machine.
6. Cutting force measurement with dynamometers (Demonstration) for turning, drilling, grinding operations.
7. Analysis of chip formation and chip reduction coefficient in turning of mild steel by HSS tool with different depth of cut, speed, and feed rate.
8. Study & Demonstration of power tools like power drill, power hacksaw, portable hand grinding, cordless screw drivers, production air tools, wood cutter, etc., used in Mechanical Engineering.
9. Demonstration/Experimentation of simple programming of CNC machine operations.
10. Demonstration / Experiment on tool wears and tool life on anyone conventional machining process.
11. To study the tool geometry of a single point turning tool (SPTT) in the American Standards Association (ASA) system.

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Apply the various machining processes to produce variety of engineering products.

CO2: Calculate the machining time for various machining operations.

CO3: Analyze the cutting forces in orthogonal cutting and tool life parameters.

CO4: Apply the scientific principles involved in length and angular measurements.
CO5: Determine tolerance and dimensions involved in the design of limit gauges.
CO6: Make use of different machine tools to get hands on experience to produce required parts/products

Text Books:

1. David A. Stephenson and John S. Agapiou, "Metal Cutting Theory and Practice" Third Edition, CRC Press, Taylor & Francis Group, Boca Raton, London, NY.
2. Engineering Metrology R.K. Jain Khanna Publishers 2009

Reference Books:

1. Geoffrey Boothroyd and Winston A. Knight., "Fundamental of Machining and Machine Tools", 3rd Edition, CRC Taylor & Francis, Fourth Indian reprint 2013.
2. Amitabha Ghosh and Asok Kumar Mallik, "Manufacturing Science", Second Edition, East-West press Pvt Ltd, Reprint 2019.
3. P.N. Rao, "Manufacturing Technology: Volume-2 (4e)", McGraw Hill Education, 2019.
4. Mechanical Measurements Beckwith Marangoni and Lienhard Pearson Education 6th edition

B.E MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)

Fluid Mechanics (3:0:1) 4
(Effective from the academic year 2023-24)

Course Code	**BME403**	SEMESTER	**IV**
Teaching Hours/Week (L:T:P)	3:0:2	CIE Marks	50
Total Number of Lecture Hours	40 hours of theory+ 10 Lab slots	SEE Marks	50
Examination Pattern (SEE)	**Theory**	Exam Hours	03

Course objectives:

1. To have a working knowledge of the basic properties of fluids and understand the continuum approximation.
2. To calculate the forces exerted by a fluid at rest on submerged surfaces and understand the force of buoyancy.
3. To understand the flow characteristics and dynamics of flow field for various Engineering applications.
4. To discuss properties of laminar and turbulent pipe flow and boundary layer theory.
5. To appreciate the effects of heat transfer on compressible flows.

Preamble: Fluid mechanics plays a vital role in all Engineering applications. The properties of fluids and their flow helps in determination of various forces on surfaces. The theoretical concepts of fluid statics, kinematics and dynamics prove useful in various applications.

Module – 1

Properties of fluids –mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapor pressure, compressibility and bulk modulus. Concept of continuum, types of fluids, pressure at a point in the static fluid, variation of pressure, Pascal's law, Absolute, gauge, atmospheric and vacuum pressures measurement by simple, differential manometers and mechanical gauges.

Fluid Statics: Total pressure and center of pressure for horizontal plane, vertical plane surface and inclined plane surface submerged in static fluid.Numericals on total pressure and center of pressure.

Pressure and its Measurements: simple monometer – Piezo meter, U tube mano meter. Differential mano meter – U -tube differential nanometer vacuum pressure monometers. Numericals on manometers.

(08 Hours)

Module – 2

Hydrostatic forces: Derivation of forces on Horizontal, vertical, and Inclined plate**,**

Fluid Kinematics: Types of flow –steady, unsteady, uniform, non-uniform, laminar, turbulent, one, two and three dimensional, compressible, incompressible, rotational, irrotational, stream lines, pathlines, streak lines, velocity components, convective and local acceleration, 3D continuity equation – cartesian coordinate and numerical problems.

Laminar and turbulent flow: Flow through circular pipes, between parallel plates, Poiseuille equation.

(08 Hours)

Module – 3

Fluid Dynamics: Momentum equation, Impact of jets – force on fixed and moving vanes, flat and curved. . Eulers Equation, Integration of Euler's equation to obtain Bernoulli's equation, Bernoullis theorem. Application of Bernoulli's theorem such as venturimeter, orifice meter, triangular notch, pitot tube, orifices. Related Numerical problems.

Friction in pipes: Major and minor losses, pipes in series and parallel. Numerical problems. **(08 Hours)**

Module – 4

Flow over bodies: Development of boundary layer, Lift and drag. Boundary layer theory.

Dimensional analysis: Derived quantities, dimensions of physical quantities, dimensional homogeneity, Buckingham –Pi theorem, dimensionless numbers, and their importance. Numericals on Buckingham Pi theorem.

(08 Hours)

Module - 5

Compressible Fluids: Speed of sound, adiabatic and isentropic study flow, isentropic flow with area change stagnation and sonic properties, Mach number, Mach angle, Mach cone. Normal and oblique shocks, flow through nozzle.

List of experiments

1. Measurement of pressure using different manometers for high and low pressure Measurements.
2. Determination of impact of jets using flat and curved vanes.
3. Determination of coefficient of discharge through Orifice meter
4. Determination of coefficient of discharge through Venturi meter
5. Determination of effect of fluid flow through a nozzle using Bernoulli's equation.
6. Major losses in pipe flow
7. Minor losses in pipe flow
8. Determination of total head using Bernoulli's theorem apparatus.
9. Determination of coefficient of discharge through open channels.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Identify and calculate the key fluid properties used in the analysis of fluid behavior.

CO2: Analyze the principles of pressure ,buoyancy and floatation to real time problems

CO3 : Apply the knowledge of fluid statics ,kinematics and dynamics while addressing problems on mechanical and chemical Engineering

CO4: Enumerate the concept of boundary layer in fluid flow and apply dimensional analysis to form dimensionless numbers in terms of variables.

CO5: Illustrate and explain the basic concept of compressible flow and CFD

Reference learning materials: Text books:

1. Dr. RK Bansal, "A text book of fluid mechanics and hydraulic machines"' 10th Edition, Laxmi Publishers, 2018.
2. Victor L Streeter,: Fluid Mechanics:, MC Graw Hill publisher, 2018

References:

1. John Douglas, Janul and M. Gasiosek, Johan A Swaffield, "Fluid Mechanics:, 5th Edition, Pearson Edition, 2006.
2. FM White, "Fluid Mechanics" 8th Edition, MC Graw Hill publisher, 2016
3. Yunis A Cengel, John M Cimbala, "Fluid Mechanics" , 3rd Edition, 2014.

B.E MECHANICAL ENIGINEERING

Choice Based Credit System (CBCS)

Mechanical Measurements and Metrology laboratory (0:0:2) 1

(Effective from the academic year 2023-24)

Course Code	BME404	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Hours of Pedagogy	15 sessions	Exam Hours	03

Course objectives:

1.To illustrate the theoretical concepts taught in Mechanical Measurements & Metrology through experiments.

2.To illustrate the use of various measuring tools measuring techniques.

3.To understand calibration techniques of various measuring devices.

Sl.No	Experiments
	Part A - MECHANICAL MEASUREMENTS
1	Calibration of Pressure Gauge
2	Calibration of Thermocouple
3	Calibration of LVDT
4	Calibration of Load cell
5	Determination of modulus of elasticity of a mild steel specimen using strain gauges.
	Part B- METROLOGY
6	Calibration of Micrometer/Vernier Caliper using slip gauges
7	Measurements using Optical Projector / Toolmaker Microscope.
8	Measurement of angle using Sine Centre / Sine bar / bevel protractor
9	Measurement of alignment using Autocollimator / Roller set
10	Measurements of Screw thread Parameters using two wire or Three-wire methods.
11	Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
12	Measurement of gear tooth profile using gear tooth Vernier /Gear tooth micrometre
Demonstration Experiments (For CIE)	
13	Measurement of cutting tool forces using a) Lathe tool Dynamometer and b) Drill tool Dynamometer.
14	Measurement using Optical Flats

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

CO1: Demonstrate the calibration procedure for pressure gauge, thermocouple, LVDT and load cell.

CO2: Build slip gauges for calibrating micrometer and vernier caliper.

CO3: Make use of Sine Centre/ Sine Bar/ Bevel Protractor involved in the measurement of an angle.

CO4: Measure screw thread parameters using optical projector/Toolmaker Microscope/ two wire or three wire methods.

CO5: Measure gear tooth thickness and surface roughness parameters.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of

40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

• Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.

• Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.

• Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).

• Weightage to be given for neatness and submission of record/write-up on time.

• Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.

• In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.

• The suitable rubrics can be designed to evaluate each student's performance and learning ability.

• The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

• SEE marks for the practical course are 50 Marks.

• SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.

• The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.

• All laboratory experiments are to be included for practical examination.

• (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

• Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

• Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and

scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

BE Mechanical Engineering
Choice Based Credit System (CBCS)

Non-Traditional Machining (3:0:0) 3
(Effective from the academic year 2023-24)

Course Code	**BME405A**	SEMESTER	**IV**
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50
Total Number of Lecture Hours	40	SEE Marks	50
Examination Pattern (SEE)	**Theory**	Exam Hours	03

Course Objectives:

This course will enable students to:

1. To learn various concepts related to modern machining processes & their applications.
2. To appreciate the differences between conventional and non-conventional machining processes.
3. To acquire a functional understanding of non-traditional manufacturing equipment.
4. To know about various process parameters and their influence on performance and their applications.
5. To impart knowledge on various types of energy involved in non-traditional machining processes.

Preamble:

Non-traditional machining refers to a group of manufacturing processes that do not rely on traditional methods such as cutting, drilling, or milling. These processes often utilize advanced technologies and materials to achieve high precision and accuracy in the production of complex parts and components.

Module – 1

Ultrasonic Machining (USM): Ultrasonic machining system, mechanics of cutting, process parameters, analysis, capability, grain growing model, grain hammering model, advantages, limitations and applications, problems.

Abrasive Jet Machining (AJM): Introduction, Equipment and process of material removal, process variables: carrier gas type of abrasive, work material, stand-off distance (SOD).Process characteristics-Material removal rate, Nozzle wear, accuracy & surface finish. Applications, advantages & limitations of AJM, problems.

Water Jet Machining (WJM): Equipment & process, Operation, applications, advantages and limitations of WJM.

(10 hours)

Module – 2

Electro Chemical Machining:

Working principle, components and functions, effect of process parameters, material removal rate and mechanism, limitations and applications, problems.

Chemical Machining (CHM): Elements of the process: Resists (maskants), Etchants. Types of chemical machining process chemical blanking process, chemical milling process. Process characteristics of CHM: material removal rate, accuracy, surface finish, advantages, limitations and applications of chemical machining process.

(07 hours)

Module – 3

Electrical Discharge Machining (EDM): Working principle, process parameters, process capabilities, components of system and its functions, flushing techniques, effect of various parameters on material removal rate, application and limitations, electrical discharge wire cutting, wire EDM machine, application and limitations.
Plasma Arc Machining (PAM): Working principle, process parameters, process capabilities, components of system and its functions, various plasma arc torches, process capabilities, comparison with oxy fuel cutting, application and limitations.

(08 hours)

Module – 4

Laser Beam Machining (LBM): Types of lasers, process characteristics, working principle, process parameters, process capabilities, components of system and its functions, limitations, application in drilling, cutting, marking and miscellaneous applications.
Electron Beam Machining (EBM): Working principle, process parameters, process capabilities, components of system and its functions, application and limitations.
Summary of NTM processes.

(08 hours)

Module – 5

Micro- and Nano manufacturing by Focused Ion Beam: Focused Ion Beam System (Dual Beam), Ion Column, High-Precision Five-Axes Goniometer Sample Stage, Energy-Dispersive Spectroscopy, Nano manipulator, Residual Gas Analyzer Ion–Matter Interaction, Working Principle of Focused Ion Beam, Ion- Beam-Induced Deposition of Various Materials, Fabrication of 3D Micro/Nanostructure.
Micro- and Nanostructured Surface Development by Nano Plastic Forming and Roller Imprinting: Nano Plastic Forming, NPF-CRI Technique, Micro- and Nanostructured Surface Development, Application Potentials of Micro- and Nanostructured Surfaces.

(07 hours)

Course Outcomes:

The students will be able to:

CO 1: Summarize the need for unconventional machining process.

CO 2: Select the various Non-Traditional Machining process to machine modern materials.

CO 3: Identify the Process parameters affecting of various Non- Traditional Machines processes.

CO 4: Make use of Ion Beam technique for micro and nano manufacturing.

Textbooks

1. Gary F Benedict., “Non Traditional Manufacturing Processes”, Taylor & Francis, 2019.
2. V K Jain, “Micro manufacturing process”, CRC press, 2013.

REFERENCES:

1. Pandey Shan, “Modern machining process”, Tata McGraw Hill, 2013.
2. HMT, “Production Technology”, Tata McGraw Hill, 2017.
3. M Adithan, “Unconventional Machining Processes”, Atlantic publisher, 2014.

BE Mechanical Engineering
Choice Based Credit System (CBCS)

Micro Electromechanical Systems (MEMS) (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	**BME405C**	Semester	**IV**
Teaching Hours/Week (L: T:P: S)	3:0:0:0	CIE Marks	50
Total Hours of Pedagogy	40	SEE Marks	50
Credits	03	Total Marks	100
Examination Pattern (SEE)	**Theory**	Exam Hours	03

Course objectives:

1. Students are exposed to the MEMS technology & Miniaturization.
2. Students will understand the Process of Micro fabrication Techniques.
3. Students are made to understand the principles of system modelling.
4. Students are made to understand the working principles of Mechanical sensors andactuators.
5. Students are made to understand the working principles of Micro-Opto-Electro Mechanical Systems.

Teaching-Learning Process (General Instructions)

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

1. Power Point Presentation,
2. Chalk and Talk are used for Derivations and Correlations (In-general).
3. Video demonstration or Simulations.

Module-1

MEMS: Introduction, Production Engineering, Precision Engineering and Ultra- Precision Engineering, Integrated circuits, Micro Electro Mechanical Systems.

(08 hours)

Module-2

Micromachining: Introduction, Photo Lithography, Structural and Sacrificial Materials, Etching, Surface Micromachining, Bulk versus Surface Micromachining, Wafer Bonding, LIGA.

(08 hours)

Module-3

System Modelling: Introduction, Need for Modelling, System types, Basic Modelling Elements In Mechanical System, Basic Modelling Elements In Electrical Systems, Basic Modelling Elements in Fluid Systems and Thermal Systems. **(08 hours)**

Module-4

Mechanical sensors and actuators: Introduction, Principles of Sensing and Actuation, Beam and Cantilever, Micro Plates, Capacitive Effects, Piezo Electric Material as Sensing and Actuating Elements.

(08 hours)

Module-5

Micro-Opto-Electro Mechanical Systems: Introduction, Fundamental Principles of MOEMS Technology, Review on Properties of Light, Light Modulators, Micro mirrors, Digital Micro mirror Device.

(08 hours)

Course Outcomes:

At the end of the course, the student will be able to :

1. Understand the working of MEMS technology & Miniaturization.

2. Explain the Process of Micro fabrication Techniques and system modelling.
3. Apply the knowledge of working principles of Mechanical sensors and actuators to the real world application.
4. Analyze the output of Micro-Opto-Electro Mechanical Systems based on results.

Text Books

1. MEMS- Nitaigour Premchand Mahalik, TMH 2007.
2. G.K.Ananthasuresh, K.J.Vinoy, S.Gopalakrishnan, K.N.Bhat, V.K.Aatre, Micro and Smart Systems: Wiley India 2010.

Reference Books

1. V. Varadan, K. J. Vinoy, S. Goplakrishnan Design and Development Methodologies, Smart Material Systems and MEMS: K. J. Vinoy, S. Goplakrishnan, Wiley.
Tai-Ran Hsu, Tata Mc-Graw-Hill MEMS & Microsystems: Design and Manufacture,

Web links and Video Lectures (e-Resources):

- VTU e-Shikshana Program
- VTU EDUSAT Program.

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

- Gaining hands on Knowledge to work on ANSYS Tool
- Simulation of Cantilever Beam For Different Loads On ANSYS Tool.

B.E MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)

Automation and Robotics (3:0:0) 3
(Effective from the academic year 2023-24)

Course Code	**BME405D**	Semester	**IV**
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50
Total Hours of Pedagogy	40	SEE Marks	50
Credits	03	Total Marks	100
Examination Pattern (SEE)	**Theory**	Exam Hours	03

Course objectives: Students will be able to

1. Gain knowledge on the principles of Automation and Robotics.
2. Acquire knowledge on kinematics of robotics
3. Illustrate the importance of machine vision sensors in robot for various applications.

Teaching-Learning Process (General Instructions)

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

1. Through Power Point Presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three higher order Thinking questions in the class, which promotes critical thinking.

Preamble:

This course equips students with a comprehensive understanding of the principles, technologies, and applications of automation and robotics in the manufacturing sector. By the end of this course, students will have a solid foundation in the key concepts and technologies driving automation in manufacturing.

Module - 1

Basics of automation: Basic elements of an automated system, Types of automation, Advanced automation functions, Levels of automation, Process industries versus Discrete manufacturing industries. Computer process control, Hardware components for automation and process control,

Sensors: Classification of transducers and sensor based on stimulus category, Analog versus discrete sensors, Active versus passive sensors, Common measuring devices used in automation system, Microsensor and its applications. Difference between transducer and sensor, Robotic Sensors, Desirable features for selecting sensors for automation system. **(09 hours)**

Module - 2

Automated production lines: Automated production lines (APL), Application of automated production lines, Appropriate conditions to adapt APL, Advantages and Disadvantages of APL, Various configurations of APL, Automated part transfer systems: Conveyer belt/chain, Walking beam, Geneva mechanism.

Analysis of Production Line: Ideal cycle time, Downtime frequency, Actual downtime, Common reasons for downtime, Actual production time, Ideal production rate, Actual production rate, Cycle efficiency, Proportionate downtime, Production economics, Cost per part, Numerical problems.

(08 hours)

Module - 3

Material Handling: Material handling equipment: Transport equipment, Positioning equipment, Unit load formation equipment, Storage equipment and Identification and control equipment.

Material Transport Equipment, **Analysis of Material Transport System (Vehicle Based System).**

Storage System Types of Material Stored, Performance and location strategies, Automated Storage system, Engineering Analysis of storage system (AS/RS).

Identification System: Automated Identification and Data Capture (AIDC) system, Principal Components of AIDC and technological categories, Barcode, RFID, Barcode vs RFID, Other Identification Systems.

(07 hours)

Module – 4

Robotics: Origin of robotics, Robot Anatomy, Types of joints, Robot configurations, Various generations of robots, Degrees of freedom and Asimov's laws of robotics.

Robot motion analysis: Introduction to manipulator kinematics, Position representation, Adding orientation: A 3 - degree of freedom arm in two dimension, A 4 - degree of freedom manipulator in three dimensions, Homogeneous transformations and robot kinematics, Knematic equations using homogeneous transformations.

(08 hours)

Module - 5

Machine Vision: Introduction to Machine vision, The sensing and digitizing function in Machine Vision, Lighting techniques, Analog to digital signal conversion, Sampling, Quantization, Encoding, Image storage, Image processing and analysis: Image data reduction, Segmentation, Feature extraction, Object recognition, Training the vision system**.**

(09 hours)

Course Outcomes:

The students will be able to:

CO 1	Apply the concept of principles, strategies and components of automation for the development of Automated manufacturing systems.
CO 2	Analyze the automated production lines to reduce down time.
CO 3	Identify the types of Automated material handling, storage methods and Identification technologies for efficient automated systems.
CO 4	Analyze the robot motion and the machine vision inspection techniques.

Suggested Learning Resources:

Textbooks

1. Mikell P. Groover, Automation, Production System and Computer Integrated Manufacturing, 5th Edition, Pearson Publications, 2022.
1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey, "Industrial Robotics: Technology, Programming and Applications", 2nd Edition, Tata McGraw Hill, 2012.

References

1. John J. Craig, "Introduction to Robotics", 3rd Edition, Pearson publication, 2009.
1. Ashitava Ghosal "Robotics, Fundamental concepts and Analysis", Oxford Publication, 2011.

Web links and Video Lectures (e-Resources):

- NPTEL course on Industrial Robotics.
- Videos on Industrial Automation.

Learning activities / Comprehensive Continuous Assessments (CCAs) suggested:

- Technical report anaysis
- Modern tool usage
- Industrial visits
- Case study
- Literature review

BE Mechanical Engineering
Choice Based Credit System (CBCS)

Introduction to AI&ML (0:0:2:0)
(Effective from the academic year 2023-24)

Course Code	**BME456A**	Semester	**IV**
Teaching Hours/Week (L:T:P: S)	0:0:2:0	CIE Marks	50
Total Hours of Pedagogy	15 sessions	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	**Practical**	Exam Hours	03

Course objectives:

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- Analyse the working of various documents like PDF, Word file

Sl. No.	Experiments
1	Implement A* Search algorithm.
2	Implement AO* Search algorithm.
3	Write a program to implement Water jug program using AI.
4	The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absentgiven that today is Friday? Apply Baye's rule in python to get the result.
5	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
6	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
7	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
8	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API
	Demonstration Experiments (For CIE)
9	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Course Outcomes:

- Understand the implementation procedures for the machine learning algorithms
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems
- Examine working of PDF and word file formats

1. Tom M Mitchell,"Machine Lerning",1 st Edition, McGraw Hill Education, 2017.
2. Elaine Rich, Kevin K and S B Nair, "Artificial Inteligence", 3rd Edition, McGraw Hill Education, 2017.

BE Mechanical Engineering Choice Based Credit System (CBCS)			
Digital Marketing (1:0:0) 1 (Effective from the academic year 2023-24)			
Course Code	**BME456B**	Semester	**IV**
Teaching Hours/Week (L: T:P: S)	1:0:0	CIE Marks	50
Total Hours of Pedagogy	15	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	**Theory**	Exam Hours	01

Course objectives:

- To focuses on the importance of digital marketing and its applications and to introduce current and core practices of Digital and Social Media Marketing that will allow learners to analyse, plan, executeand evaluate a digital marketing strategy.

Module-1

Introduction to Digital Marketing (DM): Meaning, Definition, Need of DM, Scope of DM, History of DM, Concept and approaches to DM, Examples of good practices in DM. Email Marketing-Need for Emails, Types of Emails, options in Email advertising, Mobile Marketing. **(03 Hours)**

Module-2

Social Media Marketing: Introduction to Blogging. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest; their channel advertising and campaigns. **(03 Hours)**

Module-3

Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search engine marketing, mobile marketing, video marketing, and social-mediamarketing. **(03 Hours)**

Module-4

Designing Organization for Digital Success: Digital transformation, digital leadership principles, online P.R. andreputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies. (**03 Hours)**

Module-5

Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; securityand privatization issues with digital marketing, Understanding trends in digital marketing – Indian and global context, online communities and co-creation. **(03 Hours)**

Course Outcomes

The students will be able to:

CO1: Describe concept and approaches of digital marketing.

CO2: Elaborate social media marketing.

CO3: Discuss acquiring and engaging users through Digital Channels.

CO4: Describe digital transformation, digital structure and success.

CO5: Enumerate digital innovation and trends.

Text Books

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson.
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).

Reference Books

3. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts.
4. Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional (October, 2013).
5. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page (3rd Edition, 2014).
6. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)
7. Moutsy Maiti: Internet Marketing, Oxford University Press India.

BE Mechanical Engineering
Choice Based Credit System (CBCS)

Introduction to Data Analytics (0:0:1) 1

(Effective from the academic year 2023-24)

Course Code	**BME456C**	SEMESTER	**IV**
Teaching Hours/Week (L: T:P)	0:0:2	CIE Marks	50
Total Number of Contact Hours	26	SEE Marks	50
Examination type (SEE)	**Practical**	Exam Hours	03

Course Objectives:

This course will enable students to:

1. To understand Numpy, Pandas and Matplot library
2. To understand basics of statistics
3. To learn the basic of decision tree algorithm.
4. To understand random forest algorithm and Anova
5. To use Python data structures.

Preamble: Introduction to python programming, python data structures.

PART A

1. Numpy library in python:
   a) Create single dimensional array and perform various operations using Python.
   b) Create multi-dimensional array and perform various operations using Python.
2. Pandas library in python:
   a) Data set cleaning, merging, and joining using python
   b) Data analysis using python.
3. Matplot library in python:
   a) Plot 2D line graph for data visualization using Python.
   b) Plot 2D contour plots for data visualization using Python.
   c) Plot 3D contour plots for data visualization using Python.
4. Probability distribution using python
   a) Determine simple probabilities using python
   b) Determine frequency distribution using python
   c) Draw the normal curve using python

PART B

5. Basic statistics using python
   a) Determine sampling and sampling distribution using python.
   b) *Calculate* the *average, variance* and *standard deviation using* Python.
6. Discrete statistics using python:
   a) Draw the correlation and correlation coefficient and scatter plots using python.
   b) Draw the scatter plots using python
7. Regression analysis
   a) Implement and analyze Linear regression in Python (Single variable & Multivariable).
   b) Implement and analyze Logistic regression in Python
8. Algorithm in Python
   a) Implement and analyze Decision tree algorithm in Python.
   b) Implement and analyze Random Forest algorithm in Python

Course Outcomes:

the student will be able to:

CO1: Analyze data using different libraries of python.

CO2: Develop Python programs to plot for data visualization.

CO3: Develop Python programs to carry out the probability distribution.

CO4: Develop Python programs to implement various statistical methods.

CO5: Develop Python programs for analysis of data algorithms.

REFERENCES:

1. McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly Media, Inc.".
2. Swaroop, C. H. (2003). A Byte of Python. Python Tutorial.
3. Ken Black, sixth Editing. Business Statistics for Contemporary Decision Making. “John Wiley & Sons, Inc”

BE Mechanical Engineering
Choice Based Credit System (CBCS)

Programming in C++ (0:0:1) 1
(Effective from the academic year 2023-24)

Course Code	**BME456D**	Semester	**IV**
Teaching Hours/Week (L:T:P: S)	0:0:2:0	CIE Marks	50
Total Hours of Pedagogy	15 sessions	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	**Practical**	Exam Hours	03

Course objectives:

CO - 1 To learn object-oriented programming concepts using the C++ language.
CO – 2 To apply the principles of data abstraction, inheritance and polymorphism;
CO - 3 To use the principles of virtual functions and polymorphism
CO – 4 To learn how to handle formatted I/O and unformatted I/O

	Experiments
	1. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects.
	2. Read and display the contents of the array.
	3. Write a C++ program to declare Struct. Initialize and display contents of member variables.
	4. Write a C++ program to declare a class. Declare pointer to class. Initialize and display thecontents ofthe class member.
	5. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
	6. Write a C++ program to read the data of N employee and compute Net salary of each employee(DA=52% of Basic and Income Tax (IT) =30% of the gross salary)**.**
	7. Write a C++ to illustrate the concepts of console I/O operations.
	8. Write a C++ program to use scope resolution operator. Display the various values of the sameWrite a C++ program to create an array of pointers. Invoke functions using array objects.
	Demonstration Experiments (For CIE)
9	Write a C++ program for Vehicle reservation system
10	Write a C++ program to Create a Modern Periodic Table
11	Write a C++ program to Develop a Bookshop inventory
12	Write a C++ program for Credit Card Validation System

Course Outcomes:

At the end of the course the student will be able to:

CO1: Apply Object Oriented Programming concepts in C++

CO2: Write a C++ program by applying knowledge of mathematics, science, and engineering.CO4: Function on multi-disciplinary teams.

CO3: Identify, formulate, and solve engineering problems.

Text Books:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.
2. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press.
3. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd.

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Semester - IV

Choice Based Credit System (CBCS)

BIOLOGY FOR ENGINEERS (2:0:0) 2

(Effective from the academic year 2023-24 for 2022 Scheme)

Common to ECE, ETE, EEE, ME and CV programs

Course Code	BBOK407	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03
Examination type (SEE)	Theory		

Course Objectives:

This course will enable students to:

1. To familiarize the students with the basic biological concepts and their engineering applications.
2. To enable the students with an understanding of bio-sensor principles.

Preamble:

This course provides an insight into understanding of concepts of biology and adaptation of anatomical principles, Biomimetics for engineering applications.

Module – 1 (5 Hours)

Introduction to Biology:

The cell: The basic unit of life, Structure and functions of a cell. Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application. (Text 1 and 2)

Module – 2 (5 Hours)

Biomolecules and Biosensors:

Biomolecules: Properties and functions of carbohydrates, proteins, lipids. Short Biosensor History, Biosensor Classification. (Text 3: 1.1 and 1.2)

Module – 3 (5 Hours)

Biochemical Components used in Biosensor Assemblies:

Enzymes, Antibodies, Protein/Peptide Receptors, Nucleic Acids, Whole Cells as Biosensing Elements, Immobilization of Biochemical Elements of Biosensors. (Text 3: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6)

Module – 4 (5 Hours)

Adaptation of Anatomical Principles:

Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification

system. Kidney as a filtration system. (Text 4)

Module – 5 (5 Hours)

Biomimetics:

Introduction, Echolocation (ultrasonography / ultrasound Imaging), Photosynthesis (photovoltaic cells, bionic leaf). Birds and insects (flight aerodynamics), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train). (Text 5 and 6)

Course Outcomes:

At the end of the course, the student will be able to:

1. Interpret the components of a basic biological cell and their functions
2. Understand the principles of bioengineering sensors.
3. Compare the adaptation of anatomical principles in day-to-day engineering applications.
4. Relate the solution offered by nature to analogous engineering problems.

Suggested Learning Resources:

Textbooks:

[1]	Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
[2]	Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
[3]	Biosensors: essentials. Evtugyn, Gennady. Vol. 84. Springer Berlin Heidelberg, 2014.
[4]	Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011
[5]	Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
[6]	Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008

References:

[1]	Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
[2]	Wilson and Walker- Principles and Techniques of Biochemistry and Molecular Biology, by Andreas Hofmann, Samuel Clokie. 2018 Edition.
[3]	Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.

[4]	3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 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
	ASSESSMENT METHODS: **CIE Components** (50 Marks) **Continuous Internal Evaluation:** 1. For the Internal Assessment Test component, there are 25 marks and for the CCA component of the CIE, there are 25 marks. The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered. 2. Any two assignment methods mentioned in the 22OB2.4 can be considered. If an assignment is project-based then only one assignment for the course shall be planned. 3. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. 4. For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment. **Semester-End Examination:** 1. Theory SEE will be conducted with common question papers for the course (duration 03 hours). The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 2 sub-questions), should have a mix of topics under that module. 3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks. **Assessment Details** (both CIE and SEE): • The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

	• The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). • The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). • A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

BE Mechanical Engineering

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

Autonomous Scheme and Syllabus – 2022

Universal Human Values (UHV)

Course Code	BUHK408	Semester	**IV**
Teaching Hours/Week (L: T:P:S)	1:0:0:1	CIE Marks	50
Total Number of Contact Hours	15	SEE Marks	50
Credits	01	Exam Hours	01

Course Objectives:

This course is intended to:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4. This course is intended to provide a much-needed orientation input in value education to the young enquiring minds

Teaching-Learning Process (General Instructions)

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

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. 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 skills.
3. State the need for UHV activities and its present relevance in the society and provide real-life examples.
5. Support and guide the students for self-study activities.
6. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
7. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
8. Encourage the students for group work to improve their creative and analytical skills.

Module – 1

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 Fulfil the Basic Human Aspirations **(03 Hours)**

Module – 2

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, Programme to ensure self-regulation and Health.

(03 Hours)

Module – 3

Harmony in the Family and Society:

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in 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.

(03 Hours)

Module – 4

Harmony in the Nature/Existence:

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

(03 Hours)

Module – 5

Implications of the Holistic Understanding – a Look at Professional Ethics:

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

(03 Hours)

Course Outcomes

At the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature);

1. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability.
2. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
3. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
4. Expected to positively impact common graduate attributes like: Ethical human conduct, Socially responsible behavior, Holistic vision of life, Environmentally responsible work
5. Having Competence and Capabilities for Maintaining Health and Hygiene
6. Appreciation and aspiration for excellence (merit) and gratitude for all

	Reference Books:
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3.	The Story of Stuff (Book).
4.	SThe Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa.
8	Bharat Mein Angreji Raj – Pandit Sunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad
12	Vivekananda - Romain Rolland (English)
13	Gandhi - Romain Rolland (English)
14	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
16	A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
17	P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers
18	A N Tripathy, 2003, Human Values, New Age International Publishers.
19	Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20	E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
21	M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books
23	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Web links and Video Lectures (e-Resources):

- Value Education websites
- https://www.uhv.org.in/uhv-ii
- http://uhv.ac.in
- http://www.uptu.ac.in
- Story of Stuff
- http://www.storyofstuff.com
- Al Gore, An Inconvenient Truth, Paramount Classics, USA
- Charlie Chaplin, Modern Times, United Artists, USA
- https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
- https://fdp-si.aicte-india.org/8dayUHV_download.php
- https://www.youtube.com/watch?v=8ovkLRYXIjE
- https://www.youtube.com/watch?v=OgdNx0X923I
- https://www.youtube.com/watch?v=nGRcbRpvGoU
- https://www.youtube.com/watch?v=sDxGXOgYEKM

BE Mechanical Engineering
Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
Autonomous Scheme and Syllabus – 2022

National Service Scheme (NSS)
(Common to all branches)

Course Code	**BNSK359/459/559/659**	Semester	III to IV
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks	100
Total Number of Contact Hours	26	SEE Marks	-
Examination pattern (CIE)	Theory + Practical	Exam Hours	-

Mandatory Course (Non-Credit)
(Completion of the course shall be mandatory for the award of degree)

Course Objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Module – 1

Introduction to NSS

History and growth of NSS, Philosophy of NSS, Objectives of NSS, Meaning of NSS Logo, NSS Programs and activities, administrative structure of NSS, Planning of programs / activities, implementation of NSS programs / activities, National & State Awards for NSS College / Program Officer / Volunteers.

(04 Hours)

Module – 2

Overview of NSS Programs

Objectives, special camping – Environment enrichment and conservation, Health, Family, Welfare and Nutrition program. Awareness for improvement of the status of women, Social Service program, production-oriented programs, Relief & Rehabilitation work during natural calamities, education and recreations, Selection of the problem to be addressed. (**04 Hours)**

Module – 3

NSS Activities - Group Contributions to Society / community (Activity based Learning)

Organic Farming, Indian agriculture (Past, Present, Future) Connectivity for marketing, Waste management– Public, Private and Govt. organization, 5 R's. Water conservation techniques – role of different stakeholders – implementation, preparing an actionable business proposal for enhancing the village income and approach for implementation. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.

(06 Hours)

Module – 4

NSS National Level Activities for Society / Community at large (Activity based Learning)

Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc

(06 Hours)

Module – 5

NSS Individual Activities for Local Voice (Activity based learning)

Govt. school Rejuvenation and helping them to achieve good infrastructure, Plantation and adoption of plants. Know your plants. Spreading public awareness under rural outreach programs, National integration and social harmony events. **(06 Hours)**

Course Outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Understand the importance of his / her responsibilities towards society.

CO2: Analyse the environmental and societal problems/issues and will be able to design solutions for the same.

CO3: Evaluate the existing system and to propose practical solutions for the same for sustainable development.

CO4: Implement government or self-driven projects effectively in the field.

CO5: Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Text Books:

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

BE Mechanical Engineering

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

Autonomous Scheme and Syllabus – 2022

Physical Education (Sports and Athletics)

Course Code	BPEK359/459/559/659	Semester	III to IV
Teaching Hours/Week (L: T:P)	0:0:2	CIE Marks	100
Total Number of Contact Hours	26	SEE Marks	--
Examination pattern (CIE)	Theory + Practical	Exam Hours	--

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives: The course will enable students to

1. Develop a healthy life style.
2. Acquire Knowledge about various stages of sports and games.
3. Focus on modern technology in sports.

Module – 1

Introduction of the game: Aim of sports and games, Brief history of the game, Nature of the game, Terminology & Modern trends of the game, Fitness & Skill tests along with Game Performance.

(06 Hours)

Module – 2

Offensive and Defensive Techno Tactical Abilities: Fitness, Fundamentals & Techniques of the game with the implementation of Biomechanics, Tactics- Drills for the Techno Tactical abilities, Individual and Group, Miner games- to implement the Techniques, Tactics and Motor abilities.

(05 Hours)

Module – 3

Team tactics and Rules of the Game: Rules and Regulations of the Game: Game rules as well as sequence of officiating, Team tactics: Offensive and Defensive team strategies and scrimmages, Practice Matches: among the group, Analysis of Techno Tactical abilities: Correction and implementation of skills and Sports Injuries and rehabilitation: First aid, PRICE treatment,

(05 Hours)

Module – 4

Sports Training: Introduction of Sports Training, Principles of Sports performance, how to increase and sustain the sports performance, Training Load & Recovery- How to increase the training load (volume/Intensity) and means and methods for Recovery, Periodization: Shorts, Medium and Long term, Physiological changes: Changes in Lung capacity, heart beats etc…

(05 Hours)

Module – 5

Organization of Sports Event: Tournament system, Planning and preparation for the competition, Ground preparation and Equipment's, Organizing an event among the group.

(05 Hours)

The above 5 modules are common to all the sports events / games, we are offering the following games**: 1. Baseball, 2. Kabaddi, 3. Table Tennis, and 4. Volleyball.**

Course Outcomes:

The students will be able to:

1. Understand the importance of sports and games, inculcate healthy habits of daily exercise & fitness, Self-hygiene, good food habits, Create awareness of Self-assessment of fitness.
2. Develops individual and group techno tactical abilities of the game.
3. Increases the team combination and plan the strategies to play against opponents.
4. Outline the concept of sports training and how to adopt technology to attain high level performance.
5. Summarize the basic principles of organising sports events and concept of technology implemented to organise competitions in an unbiased manner.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation and video analysing.
- Practical classes in outdoor and indoor as per requirement.

Textbooks

1. Barbara Bushman, "ACSM's complete guide to Fitness & Health", 2011, Human Kinetics USA
2. **Pankaj Vinayak Pathak, "*Sports and Games - Rules and Regulation*", 2019, Khel Sahitya Kendra.**
3. Hardayal Singh, *"Sports Training, General Theory & Methods"*, 1984 "Netaji Subhas, National Institute of Sports".
4. Keith A. Brown, "International Handbook of Physical Education and Sports Science", 2018, (5 Volumes) Hardcover.

References

1. Tudor O Bompa,*" Periodization Training for Sports*", 1999, Human Kinetics, USA
2. Michael Boyle, "New Functional Training for Sports" 2016, Human Kinetics USA
3. Michael Kjaer, Michael Rogsgaard, Peter Magnusson, Lars Engebretsen & 3 more, "Text book of Sports Medicine: Basic Science and Clinical Aspects of Sports Injury and Physical Activity", 2002, Wiley Blackwell.
4. Scott L. Delp and Thomas K. Uchida, "Biomechanics of Movement: The Science of Sports, Robotics, and Rehabilitation", 2021, The MIT Press
5. MCARDLE W.D. "Exercise Physiology Nutrition Energy And Human Performance" 2015, LWW IE (50)

BE Mechanical Engineering
Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
Autonomous Scheme and Syllabus – 2022

Yoga
(Common to all Branches)

Course Code	**BYOK359/459/559/659**	Semester	III to IV
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks	100
Total Number of Contact Hours	26	SEE Marks	-
Examination pattern (CIE)	Theory + Practical	Exam Hours	-

Course Objectives:

This course will enable students to:

1. Understand the importance of practicing yoga in day-to-day life.
2. Be aware of therapeutic and preventive value of Yoga.
3. Have a focussed, joyful and peaceful life.
4. Maintain physical, mental and spiritual fitness.
5. Develop self-confidence to take up initiatives in their lives.

Module – 1

Introduction to Yoga: Introduction, classical and scientific aspects of yoga, Importance, Types, Healthy Lifestyle, Food Habits, Brief Rules, Sithalikarana Practical classes. **(04 Hours)**

Module – 2

Physical Health: Introduction, Pre-requisites, Asana-Standing, Sitting, Supine and Prone, Practical classes. **(06 Hours)**

Module – 3

Psychological Health: Introduction Thought Forms, Kriya (Kapalabhati), Preparation to Meditation, Practical classes. **(06 Hours)**

Module – 4

Therapeutic Yoga: Mudra Forms, Acupressure therapy, Relaxation techniques Practical classes. **(06 Hours)**

Module – 5

Spirituality & Universal Mantra: Introduction, Being Human, Universal Mantra, Universal LOVE, Benefits of practice of Spirituality in day-to-day life, practical classes. **(04 Hours)**

Course Outcomes:

Students will be able to:

1. Understand the requirement of practicing yoga in their day-to-day life.
2. Apply the yogic postures in therapy of psychosomatic diseases
3. Train themselves to have a focussed, joyful and peaceful life.
4. Demonstrate the fitness of Physical, Mental and Spiritual practices.
5. Develops self-confidence to take up initiatives in their lives.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Textbooks

1. George Feuerstein: The yoga Tradition (Its history, literature, philosophy and practice.)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind. (Orient paper Backs: vision Books Pvt.Ltd., 1982.
3. B.K.S Iyenkar: Light on the Yoga sutras of patanjali (Haper Collins Publications India Pvt.,Ltd., New Delhi.)
4. Science of Divinity and Realization of Self – Vethathiri Publication, (6-11) WCSC, Erode

References

1. Principles and Practice of Yoga in Health Care, Publisher: Handspring Publishing Limited, ISBN: 9781909141209, 9781909141209
2. Basavaraddi I V: Yoga in School Health, MDNIY New Delhi, 2009
3. Dr. HR. Nagendra: Yoga Research and applications (Vivekanda Kendra Yoga Prakashana Bangalore)
4. Dr. Shirley Telles: Glimpses of Human Body (Vivekanda Kendra Yoga Prakashana Bangalore)

Web resources

Web links and Video Lectures (e-Resources): Refer links

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

BMS Institute of Technology and Management

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

SEMESTER – IV

National Cadet Corps (NCC) (0:0:2)

(Common to all Branches)

(Effective from the academic year 2024-25) (2022 scheme)

Course Code	**BNCK459**	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives:

This course will enable students to:

- Understand the vision of NCC and its functioning.
- Understand the security set up and management of Border/Coastal areas.
- Acquire knowledge about the Armed forces and general awareness.

Module– 1

Introduction to National Cadet Corp: What is NCC, who can join NCC, benefits, Establishment, history, 3 wings, motto, core values, Aims, flag, song, pledge, cardinals, Organization, Director General NCC, Directorates, Uniform and Cadet ranks, Camps, Certificate exams, Basic aspects of drill.

National Integration: Importance of national integration**,** Factors affecting national integration, Unity in diversity**,** Role of NCC in nation building.

Disaster Management: What is a Disaster**,** Natural and Man-made disasters**,** Earthquake, Floods.

(04 Hours)

Module– 2

Indian Army: Introduction to Indian Army, Command and control, Fighting & supporting arms**,** Rank structure, Major Regiments of the Army**,** Major Wars and Battles**,** Entry to the Indian Army, Renowned leaders and Gallantry Awardees.

(02 Hours)

Module– 3

Indian Air Force: Introduction to Indian Air Force, Command and control**,** Rank structure**,** Major Aircrafts, Entry to the Indian Air Force, Renowned leaders.

Indian Navy: Introduction to Indian Navy, Command and control, Rank structure, Major Ships and Submarines**,** Entry to the Indian Navy, Renowned leaders. **(02 Hours)**

Module 4

Health and Hygiene: First Aid Protocols - CPR, Understanding Types of Bandages, Fire Fighting

Field & Battle Crafts: Field Signals using hands, Judging distance -Types of Judging Distance, Section formations-types of Section Formation. **(04 Hours)**

Module– 5

Drill Practical's: Savdhan, Vishram, Salute, Turning, Marching. . **(14 Hours)**

Course Outcomes (Course Skill Set):

At the end of the course the students will be able to:

CO1	Develop qualities like character, comradeship, discipline, leadership, secular outlook, spirit of adventure, ethics and ideals of selfless service.
CO2	Get motivated and trained to exhibit leadership qualities in all walks of life and be always available for the service of the nation.
CO3	Familiarize on the issues related to social & community development and disaster management and equip themselves to provide solutions.
CO4	Get an insight of the defense forces and further motivate them to join the defense forces.

Teaching Practice:

- Blackboard/Multimedia Assisted Teaching.
- Class Room Discussions, Brainstorming Sessions, Debates.
- Activity: Organizing/Participation in Social Service Programs.
- On Ground: Drill training.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.

  CIE 2 for 60 marks – A practical test conducted at the end of the semester.

Text Books:

1. NCC Cadets Handbook –Common Directorate General of NCC, New Delhi.
2. NCC Cadets Handbook –Special(A), Directorate General of NCC, New Delhi.

Reference Books:

1. Chandra B. Khanduri, "Field Marshal KM Cariappa: a biographical sketch", Dev Publications,2000.
2. Gautam Sharma, "Valour and Sacrifice: Famous Regiments of the Indian Army", Allied Publishers,1990

BE Mechanical Engineering

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

Autonomous Scheme and Syllabus – 2022

Course: Music

(Common to all Branches)

Course Code	BMUK359/459/559/659	Semester	III to VI
Teaching Hours/Week (L: T:P)	0:0:2	CIE Marks	100
Total Number of Contact Hours	26	SEE Marks	-
Examination pattern (CIE)	Theory + Practical	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of the Degree)

Course Objectives:

The course will enable the students to:

1. Identify the major traditions of Indian music, both through notations andaurally.
2. Analyze the compositions with respect to musical and lyrical content.
3. Demonstrate an ability to use music technology appropriately in a variety ofsettings.

Module – 1

Preamble: Contents of the curriculum intend to promote music as a language to developan analytical, creative, and intuitive understanding. For this the student must experiencemusic 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, Raga, Tala, Mela. **(03 Hours)**

Module – 2

Compositions: Introduction to the types of compositions in Carnatic Music - Geethe, JathiSwara, Swarajathi, Varna, Krithi, and Thillana, Notation system.

(03 Hours)

Module – 3

Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysore Vasudevacharya. **(03 Hours)**

Module – 4

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

(03 Hours)

Module – 5

Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Notation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethein Malahari, and one Jathi Swara, One Nottu Swara OR One krithi in a Mela raga, a patriotic song.

(14 Hours)

Course Outcomes (COs):

The students will be able to:

CO1: Discuss the Indian system of music and relate it to other genres (Cognitive Domain) CO2: Experience the emotions of the composer and develop empathy (Affective Domain) CO3: Respond to queries on various patterns in a composition (Psycho-Motor Domain)

Teaching Practice:

- Classroom teaching
- ICT – PowerPoint Presentation
- Audio & Video Visualization Tools

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), Shreenivaasa Prakaashana, 2018.

References

1. Lakshminarayana Subramaniam, Viji Subramaniam, "Classical Music of India: A Practical Guide", Tranquebar 2018.
2. R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci
3. Charitable Trust; Third edition, 2019.
4. Ethel Rosenthal, "The Story of Indian Music and Its Instruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
5. Carnatic Music, National Institute of Open Schooling, 2019.

Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
SEMESTER – IV

English Communications Skill II
(Common to all Branches, for Lateral Entry Diploma students)
(Effective from the academic year 2024-2025)

Course Code	BENGDIP2	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2-NCMC	SEE Marks	-
Total Number of Lecture Hours	26	Total marks	100

Course objectives:

This course will enable students to

1. Identify the Common Errors in Writing and Speaking of English.
2. Achieve better technical writing and Presentation skills for employment.
3. Acquire Employment and Workplace communication skills.
4. Enhance their conversation and public speaking skills.

Module – 1: Advanced Vocabulary

Introduction, learning through speeches, Descriptions, Word formation, Synonyms, Antonyms, learning words through situations, Homonyms and Homophones, Words often confused, One word substitution, Phrasal verbs, Idiomatic expressions, Developing technical vocabulary, Eponyms,

Jumbled sentences: Introduction, Steps to approach jumbled sentences, Unscrambling a paragraph

(0**4 Hours)**

Module – 2: Technical Reports and Proposals

Reports and Proposals: Introduction, Definition, Salient Features, Significance, Types, Use of Graphic Aids/Illustrations, Preparation and Planning, Data Collection, Analyzing and Organizing the Data, Writing and Revising, Preparing an Outline, Structure of Formal Reports, Styles of Reports, Preparing a Checklist, Sample Reports, Technical Proposals - Purpose, Importance, Types and Structure.

(0**4 Hours)**

Module – 3: Technical Writing Skills

Email and Other Writings: Introduction, Email Writing- Reasons for Popularity, Some Common Pitfalls, Guiding Principles for Composition, Maintaining Common Etiquette.

Itinerary Writing, Inter-office Memorandum (Memos), Circulars, Notice, Agenda, and Minutes, Writing Instructions, Advertising.

Blogs and Reviews: Introduction, Movie Review, Book Review, Blog Writing (0**6Hours)**

Module – 4: Professional Speaking Practices

Conversations, Dialogues and Debates: Introduction, Purpose of General Conversations, Features of a Good Conversation, Tips for Improving Conversations, Short Conversations, Telephonic Skills, Debate, Situational Dialogues and Role Plays.

The Art of Negotiation: Introduction, Definition, Different Types of Negotiation Styles, Tips for Win-Win Negotiation. **(06 Hours)**

Module – 5: Communication in Workplace.

Public Speaking: Introduction, choosing an appropriate pattern, selecting an appropriate method, Art of Persuasion, making speeches interesting, Delivering different types of speeches.

Group Discussion: Introduction, Definition, Difference between GD and debate, Number and duration, Personality traits to be evaluated, Dynamics of Group Behaviors/Group Etiquette and mannerisms, Type, opening of a GD, summarizing a discussion, Some tips for GD

Job Interviews: Introduction, Definition, Process, Stages of Interview, Types, Desirable Qualities, Preparation, Using Proper Verbal and Non-verbal Clues, Exhibiting Confidence, Tips for Success**.**

(06 Hours)

Course Outcomes: The students will be able to:

1. Understand and identify the Common Errors in Writing and Speaking.
2. Enhance Technical Writing and Presentation skills.
3. Exhibit Employment and Workplace communication skills.
4. Analyze and apply various Techniques of Information Transfer through presentation in different levels

Textbooks

1. "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
2. "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019]

References

1. Gajendra Singh Chauhan, Technical Communication, Cengage Learning India Pvt Limited, Latest Revised Edition, 2019
2. N.P. Sudharshana and C. Savitha, English for Engineers, Cambridge University Press ,2018.

Meenakshi Raman and Sangeetha Sharma, Technical Communication – Principles and Practice, Oxford University Press, Third Edition 2017.