



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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

Yelahanka, Bengaluru 560119



**Bachelor of Engineering
Department of Computer Science and
Business Systems**

VI Semester Scheme and Syllabus

2022 Scheme Effective from the AY: 2025-26

Approved in the BoS Meeting held on 31st January 2026

Scheme of VI Semester



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2025 - 26
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

UG PROGRAM: B.E. in Computer Science and Business Systems										Semester: VI				
Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Credit Distribution				Examination				No of contact hours per week	
					Theory/ Lecture	Tutorial	Practical	Total credits	SEE Duration in hours	CIE Marks	SEE Marks	Total Marks		
					L	T	P	C						
1	IPCC	BCB601	Cloud Computing	TD : CB PSB : CS	3	0	1	4	03	50	50	100	05	
2	PCC	BCB602	Machine Learning and Business Applications	TD : CB PSB : CS	4	0	0	4	03	50	50	100	04	
3	PCC	BCB603	Entrepreneurship and Startup Management	TD:CB PSB:CS	3	0	0	3	03	50	50	100	03	
4	PEC	BCB604x	Professional Elective Course	TD :CB PSB : CS	3	0	0	3	03	50	50	100	03	
5	OEC	BCB605x	Open Elective Course	TD : CB PSB : CS	3	0	0	3	03	50	50	100	03	
6	PROJ	BCBP606	Major Project Phase I	TD : CB PSB : CS	0	0	3	3		100	--	100	06	
7	PCCL	BCBL607	Machine Learning Lab	TD : CB PSB : CS	0	0	1	1	03	50	50	100	02	
8	AEC/ SDC	BCB608x	Ability Enhancement Course/Skill Development Course V	TD and PSB: Concerned department	If the course is offered as a Theory				01	50	50	100	01	
					1	0	0	-						
					If course is offered as a practical				02					
					0	0	1	1						

9	NMC	BNSK609	National Service Scheme (NSS)	NSS coordinator	0	0	0	--	--	100	---	100	02	
		BPEK609	Physical Education (PE) (Sports and Athletics)	Physical Education Director				--						
		BYOK609	Yoga	Yoga Teacher				--						
		BMUK609	Music	Music Teacher				--						
10	NMC	BIKS610	Indian Knowledge System	Any Department	0	0	0	--	--	100	---	100	01	
Total									22		650	350	1000	-

PCC: Professional Core Course, **PCCL:** Professional Core Course laboratory, **UHV:** Universal Human Value Course, **MC:** Mandatory Course (Non-credit), **AEC:** Ability Enhancement Course, **SEC:** Skill Enhancement Course, **L:** Lecture, **T:** Tutorial, **P:** Practical **S= SDA:** Skill Development Activity, **CIE:** Continuous Internal Evaluation, **SXX:** Semester End Evaluation. **K:** The letter in the course code indicates common to all the stream of engineering **PROJ:** Project /Mini Project. **PEC:** Professional Elective Course. **OEC:** Open Elective Course

Professional Elective Course

BCB604A	Compiler Design	BCB604C	Supply Chain Management
BCS604B	Blockchain Essentials	BCB604D	Investment Management

Open Elective Course

BCS605A	UNIX System Programming	BCB605B	Organizational Behavior
Ability Enhancement Course / Skill Enhancement Course-V			
BCS608A	Generative AI	BCS608C	DevOps
BCS608B	Mobile Application Development		

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching- Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of degree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a

professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Phase-I : Students have to discuss with the mentor /guide and with their helphe/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS) applicable for 2022 Scheme			
SEMESTER -VI			
Cloud Computing (3:0:1) 4			
(Effective from the academic year 2025-26)			
Course Code	BCB601	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	50
Total Number of Contact Hours	40 + 12	Exam Hours	3
Course Objectives:			
This course will enable students to:			
<ul style="list-style-type: none"> ● Understand the basic concepts, characteristics, delivery models, and deployment models of cloud computing.. ● Apply cloud-enabling technologies such as virtualization, multitenancy, containerization, and service APIs in cloud environments. ● Identify security threats, vulnerabilities, and risks in cloud systems. ● Analyze key cloud infrastructure and specialized mechanisms that improve performance, reliability, and automation in cloud environments. ● Understand how cloud architecture patterns like workload distribution and multicloud improve performance and reliability. ● and reliability. 			
Preamble: Cloud Computing has emerged as a transformative paradigm in modern computing by enabling on-demand access to shared computing resources such as servers, storage, applications, and services over the internet. This course provides a comprehensive understanding of cloud computing fundamentals, enabling technologies, service and deployment models, cloud security mechanisms, and architectural design principles. The subject equips students with the knowledge required to analyze, design, and manage cloud-based solutions while addressing scalability, cost efficiency, performance, and security challenges in real-world environments.			
Module - 1			
Understanding Cloud Computing: Origins and Influences, Basic Concepts and Terminology, Goals and Benefits,Risks and Challenges.			
Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.			
TextBook: Chapter 3 (3.1-3.4) Chapter 4 (4.1-4.4)			
Module - 2			
Cloud-Enabling Technology: Cloud Data Center Technology, Modern Virtualization, Multitenant Technology, Service Technology and Service APIs.			
Understanding Containerization: Fundamental Virtualization and Containerization, Understanding Containers, Understanding Container Images.			
TextBook: Chapter 5 (5.2-5.5) Chapter 6 (6.2- 6.4)			

Module - 3

Understanding Cloud Security and Cybersecurity: Basic Security Terminology, Basic Threat Terminology, Threat Agents, Common Threats.

Cloud Infrastructure Mechanisms: Virtual Server, Hypervisor, Cloud Storage Device

TextBook: Chapter 7 (7.1-7.4) Chapter 8 (8.2-8.4)

Module - 4

Cloud Infrastructure mechanism: Cloud Usage Monitor, Resource Replication

Specialized Cloud Mechanisms: Automated Scaling Listener, SLA Monitor, Pay-Per-Use Monitor, Audit Monitor, Failover System, Resource Cluster, Multi-Device Broker

Text Book: Chapter 8 (8.5, 8.6) Chapter 9 (9.1, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8)

Module - 5

Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, 8 Redundant Storage Architecture, Multicloud Architecture

Text Book: Chapter 13 (13.1- 13.9)

Course Outcomes:

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

:

CO1: Explain fundamental concepts, models, benefits, and challenges of cloud computing.

CO2: Describe cloud-enabling technologies including virtualization, containerization, and service APIs.

CO3: Identify cloud security concepts, threats, and core cloud infrastructure components.

CO4: Analyze cloud infrastructure and specialized mechanisms for monitoring, scaling, and fault tolerance.

CO5: Design and evaluate fundamental cloud architectures and multicloud solutions.

Textbook

Thomas Erl, Eric Barcelo Monroy **Cloud Computing: Concepts, Technology, Security, and Architecture**, 2nd edition, 2023.

Reference Books:

1. **Cloud Computing Theory and Practice**, Dan C. Marinescu, Morgan Kaufmann, Morgan Kaufmann Publishers In Elsevier 2013
2. **Mastering Cloud Computing** Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi McGraw Hill Education
3. **Computing Principles and Paradigms**, RajkumarBuyya , James Broberg, Andrzej Goscinsk,i Willey, 2014

Web links and Video Lectures (e-Resources):

- 1) <https://nptel.ac.in/courses/106105167>
- 2) <https://archive.nptel.ac.in/courses/106/104/106104182/>

Continuous Comprehensive Assessments (CCA):

Cloud Engineering Certificate from Google Cloud Foundation-20Marks.

Cloud Computing Laboratory (0:0:2)

1	Create an AWS skill builder account and explore the AWS Management Console.
2	Demonstrate how to manage access and permissions to AWS services using AWS Identity and Access Management (IAM). Practice the steps to add users to groups, manage passwords, log in with IAM-created users, and see the effects of IAM policies on access to specific services.
3	Demonstrate how to create an Amazon S3 bucket, add an object, view an object, move an object, and delete an object and bucket in the AWS Management Console.
4	Create a VPC, attach an Internet Gateway, add a subnet and then define routing for the VPC so that traffic can flow between the subnet and the Internet gateway.
5	Demonstrate steps to launch an EC2 instance in a public subnet to host a web server and another EC2 instance in a private subnet for the database.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS) applicable for 2022 Scheme
SEMESTER -VI

Machine Learning and Business Applications (4:0:0) 4
(Effective from the academic year 2025-26)

Course Code	BCB602	CIE Marks	50
Teaching Hours/Week (L:T:P)	4:0:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

1. To provide a comprehensive introduction to the concepts and methodologies of machine learning in Business applications.
2. To understand and apply different machine learning algorithms to real-world problems.
3. To develop skills to preprocess and analyze data for machine learning applications.
4. To gain experience in evaluating and improving the performance of machine learning models.
5. To foster the ability to implement and deploy machine learning systems in Business applications.

Preamble: This course introduces the fundamental concepts, techniques, and tools of machine learning with a focus on business applications. It emphasizes data-driven problem solving, model development, performance evaluation, and practical implementation of machine learning solutions for real-world business scenarios.

Module - 1

Introduction: What Is Business Analytics?, What Is Machine Learning?, Machine Learning, AI, and Related Terms, Big Data, Data Science, Why Are There So Many Different Methods?, Terminology and Notation.

Overview of the Machine Learning Process: Core Ideas In ML, The Steps in a Machine Learning Project, Preliminary Steps, Predictive Power and Overfitting, Building a Predictive Model with ASDM
Textbook 1: Chapters 1 & 2 (10 Hours)

Module - 2

Supervised Learning: Classification – Decision Tree, K-Nearest Neighbor, Random Forest, Support Vector Machine, Navie Baise Classifier. **Regression-** Linear Regression, Logistic/Lasso Regression, Support Vector Regression, Decision Tree Regression

Model Evaluation and Improvement: Cross Validation, Grid Search, Evaluation Metrics and Scoring.
Textbook 1: Chapter 5, Textbook 2: Chapter 2 , 5 (10 Hours)

Module - 3

Unsupervised Learning: Clustering - K-Means Clustering, Hierarchical Clustering, DBSCAN (Density-Based Spatial Clustering), Gaussian Mixture **Dimensionality Reduction** - Principal Component Analysis (PCA), t-SNE (t-Distributed Stochastic Neighbor Embedding), **Association Rule Learning** - Apriori Algorithm.

Textbook 2: Chapter 3 (10 Hours)

Module - 4

Data Visualization: Uses of Data Visualization, Data Examples, Basic Charts, Multidimensional Visualization, Specialized Visualizations

Dimension Reduction: Curse of Dimensionality, Data Summaries, Correlation Analysis, Reducing the Number of Categories in Categorical Variables, Converting a Categorical Variable to a Numerical Variable, Principal Component Analysis, Dimension Reduction Using Regression Models, Dimension Reduction Using Classification and Regression Trees

Textbook 1: Chapter 3 & 4

(10 Hours)

Module - 5

ML for Business: Case Study - Charles Book Club, German Credit, Tayko Software Cataloger, Political Persuasion, Taxi Cancellations, Segmenting Consumers of Bath Soap, Direct-Mail Fundraising, Catalog Cross-Selling, Time Series Case: Forecasting Public Transportation Demand, Loan Approval
Textbook 1: Chapter 23 (10 Hours)

Course Outcomes:

The students will be able to:

CO1: Describe machine learning process to develop and validate predictive models for business decision-making.

CO2: Apply supervised learning algorithms and model evaluation techniques to build, tune, and assess predictive models.

CO3: Apply unsupervised learning techniques to discover patterns, reduce dimensionality, and extract associations from data.

CO4: Analyze multidimensional data using visualization and dimensionality reduction techniques to extract meaningful patterns.

CO5: Apply data analytics and machine learning techniques to solve real-world business problems using case studies.

Textbooks

1. Machine Learning for Business Analytics: Concepts, Techniques, and Applications with Analytic Solver Data Mining, 4th Edition - Galit Shmueli, Peter C. Bruce, Kuber R. Deokar, Nitin R. Patel - ISBN: 978-1-119-82983-6
2. "Introduction to Machine Learning with Python", Andreas C. Müller and Sarah Guido, Published by O'Reilly Media, Sixth Indian Reprint: January 2022, ISBN: 978-93-5213-457

Reference Books

1. Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, Aurélien Géron, 3rd Edition, O'REILLY Publications
2. Python Machine Learning - Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, Packt Publishers

Alternate Assessment Tools (AATs) suggested:

1. Experiential Learning/ MOOC/Certification Courses (Infosys Springboard, Geek for Geeks, IBM, Hacker earth, Math works)
2. Case study/Mini-project presentation

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS) applicable for 2022 Scheme
SEMESTER -VI

Machine Learning Lab (0:0:2:0) 1
(Effective from the academic year 2025-26)

Course Code	BCBL504	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.
3. To Outline predictions using machine learning algorithms

Preamble: Machine Learning is concerned with computer programs that automatically improve their performance through experience. This course covers the theory and practical algorithms for machine learning from a variety of perspectives. We cover topics such as, Decision tree (ID3 Algorithm), Backpropagation Algorithm, Naïve Bayesian classifier, Bayesian Network, k-Means Algorithm, k-Nearest Neighbour Algorithm, Linear and Logistic Weighted Regression Algorithm, SVM, K-Means and PCA

SL No.	Laboratory Programs
1	Data Exploration and Visualization <ul style="list-style-type: none"> Load a dataset (e.g., Iris dataset or Titanic dataset). Perform basic data exploration: check for missing values, data types, and summary statistics. Create visualizations such as histograms, scatter plots, and box plots to understand the data distribution and relationships between features
2	Linear Regression <ul style="list-style-type: none"> Load a dataset with a continuous target variable (e.g., Boston Housing dataset). Implement a simple linear regression model to predict the target variable. Visualize the regression line and the residuals.
3	Logistic Regression <ul style="list-style-type: none"> Load a binary classification dataset (e.g., Titanic dataset or Breast Cancer dataset). Implement a logistic regression model to predict the target variable. Evaluate the model using accuracy, precision, recall, and the confusion matrix.
4	k-Nearest Neighbours (k-NN) <ul style="list-style-type: none"> Load a dataset suitable for classification (e.g., Iris dataset). Implement the k-NN algorithm and classify the data points. Experiment with different values of k and visualize the decision boundaries.
5	Decision Trees <ul style="list-style-type: none"> Load a dataset (e.g., Titanic dataset or Iris dataset). Implement a decision tree classifier to predict the target variable. Visualize the decision tree and understand the decision rules.
6	Clustering with K-means <ul style="list-style-type: none"> Load a dataset suitable for clustering (e.g., Iris dataset without labels).

	<ul style="list-style-type: none"> ■ Implement the K-means clustering algorithm to group the data points. ■ Visualize the clusters and the cluster centres.
7	<p>Support Vector Machines (SVM)</p> <ul style="list-style-type: none"> ■ Implement an SVM classifier to classify handwritten digits using the MNIST dataset.
8	<p>Principal Component Analysis (PCA)</p> <ul style="list-style-type: none"> ■ Load a high-dimensional dataset (e.g., MNIST dataset). ■ Implement PCA to reduce the dimensionality of the data. ■ Visualize the explained variance and the data in the reduced dimensional space.
<p>Course Outcomes:</p> <p>At the end of the course the student will be able to:</p> <p>CO1: Understand complexity of Machine Learning algorithms and their limitations</p> <p>CO2: Describe the implementation procedures for the Machine Learning algorithms</p> <p>CO3: Be Capable of confidently applying common Machine Learning algorithms to solve real-world data</p>	
<p>Textbooks</p> <ol style="list-style-type: none"> 1. Machine Learning for Business Analytics: Concepts, Techniques, and Applications with Analytic Solver Data Mining, 4th Edition - Galit Shmueli, Peter C. Bruce, Kuber R. Deokar, Nitin R. Patel - ISBN: 978-1-119-82983-6 2. "Introduction to Machine Learning with Python", Andreas C. Müller and Sarah Guido, Published by O'Reilly Media, Sixth Indian Reprint: January 2022, ISBN: 978-93-5213-457 	
<p>Web links / e – resources:</p> <ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc24_cs101 2. https://github.com/ageron/handson-ml2 	

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS) applicable for 2022 Scheme			
SEMESTER -VI			
ENTREPRENEURSHIP AND STARTUP MANAGEMENT (3:0:0:0) 3			
(Effective from the academic year 2025-26)			
Course Code	BCB603	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives:			
This course will enable students:			
1. To impart the skills needed to manage databases of large-scale organizations, techniques for data mining.			
2. To become familiar with the processes needed to develop, report, and analyze business data.			
3. To provide a comprehensive introduction to various visualization techniques.			
4. To focus on solving problems around Data Processing and Analysis			
5. To provide a comprehensive introduction to various visualization techniques.			
6. To focus on solving problems around Data Processing and Analysis			
Module - 1			
Entrepreneur: Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Characteristics and Skills of Entrepreneurship, Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Role of Entrepreneurship in Economic Development, Factors affecting Entrepreneurship, Problems of Entrepreneurship (08 Hours)			
Module - 2			
Meaning and concept of Entrepreneurial Competency, Developing Entrepreneurial Competencies, Entrepreneurial Culture, Entrepreneurial Mobility, Entrepreneurship Development Program: Needs and Objectives of EDPs, Phases of EDPs, Evaluation of EDPs. Factors affecting Entrepreneurial mobility, Types of Entrepreneurial mobility (08 Hours)			
Module - 3			
Role of Government in promoting Entrepreneurship, MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centres (DIC), Small Industries , Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB), Financial Support System: Forms of Financial support, Long t e r m and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions (08 Hours)			
Analysis of Projects: Introduction, the cost of money, Economic Equivalence, Present worth Analysis, Annual Equivalence Analysis, Future worth Analysis, Pay-back period analysis, Rate of Return Analysis, Benefit-Cost Analysis, Decision making under risk-EMV Methodology, Capitalized Cost Analysis. (08 Hours)			
Module - 5			
Start up: Start up definition, Difference between Start up Founder and Entrepreneur, Start-up Ideas, Different types of Start-ups, Business Incubator, How does a Business Incubator work, Role of Business Incubator, Accelerator v/s Incubators, Co-working space, Leading business incubators and accelerators in India, (How to build start-up companies), Procedure for registering a Start-up Company in India, Sources of Finance for start-up, Government Schemes for Start-ups, Legal issues concerned to start-ups, Start-up Marketing (08 Hours)			
Course Outcomes:			
The students will be able to:			

CO1: Demonstration the keen interest and orientation towards entrepreneurship, entrepreneurship by learning concepts of Entrepreneurship.
CO2: Identify the necessary competencies of Entrepreneurship.
CO3: Discuss the various sources of funding and institutions supporting entrepreneurs.
CO4: Identify the importance of role of family business in developing Entrepreneurship.
CO5: Explain the factors affecting start-ups and requirements of building a successful start-up.

Textbooks

1. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2010.
2. Entrepreneurship: Creating and Leading an Entrepreneurial Organization by Arya Kumar, Pearson Education, 1/e 2012
3. Steven Fisher, Ja-nae' Duane, The Startup Equation -A Visual Guidebook for Building Your Startup, Indian Edition, Mc Graw Hill Education India Pvt. Ltd, 2016.

Reference Books

1. Donald F Kuratko, Jeffrey S. Hornsby, New Venture Management: The Entrepreneur's Road Map, 2e, Routledge, 2017
2. Management and Entrepreneurship Development, Sudha G. S, Indus Valley Publication, 2009

Alternate Assessment Tools (AATs) suggested:

MOOC Course of duration minimum 4-8 weeks/25 hours.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS) applicable for 2022 Scheme			
SEMESTER -VI			
COMPILER DESIGN (3:0:0) 3			
(Effective from the academic year 2025-26)			
Course Code	BCB604A	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40(Theory)	Exam Hours	3
Course Objectives:			
This course will enable students to:			
1. Describe the phases of compiler.			
2. Familiarize with various parsing techniques and design them for different grammars.			
3. Understand the code generation and optimization techniques.			
Preamble: The world depends on programming languages, because all the software running on all the computers will be written in some programming language. But, before a program can be run, it must be translated into a form in which it can be executed by a computer. The software systems that do this translation are called compilers. In this course, students will learn to how to design and implement compilers.			
Module - 1			
Language processors: The structure of a Compiler; The evolution of programming languages;The science of building a Compiler; Applications of compiler technology; Programming language basics.			
Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.			
Textbook1: 1.1 - 1.6, 3.1 - 3.4		(8 hours)	
Module - 2			
Syntax Analysis - 1: Introduction, the role of the Parser, Error-Recovery Strategies, writing a Grammar, Top-down Parsing: Recursive-Descent Parsing, First and Follow, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.			
Textbook1:4.1, 4.3, 4.4		(8 hours)	
Module - 3			
Syntax Analysis - 2: Bottom-up Parsing: Reductions, Handle Pruning, Shift-Reduce Parsing, Conflicts During Shift-Reduce Parsing. Introduction to LR Parsing: Simple LR; More powerful LR parsers, Parser Generators.			
Textbook1:4.5-4.9		(8 hours)	
Module - 4			
Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD', Applications of SDT, Intermediate Code Generation: Variants of syntax trees, Three-address code, Types and Declarations, Translation of expressions, Type Checking, Control flow; Back patching; Switch statements.			
Textbook1:5.1-5.3,6.1-6.8		(8 hours)	
Module - 5			
Code Generation: Issues in the design of Code Generator, The Target Language, Addresses in the target code, Basic blocks and Flow graphs, Optimization of basic blocks, A Simple Code Generator.			
Textbook1:8.1-8.6		(8 hours)	
Course Outcomes:			
The students will be able to: (List the COs as per the course requirements)			

C01: Acquire fundamental understanding of the structure of a Compiler.

C02: Apply the concept of tokenization, parsing, code generation, code optimization for the given piece of code written in any language.

C03: Analyse the given set of grammars.

C04: Demonstrate the grammars for a given code.

Textbooks:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007.
2. Doug Brown, John Levine, Tony Mason, Lex & YACC, O'Reilly Media, October 2012.

References:

1. Compiler Design, K Muneeswaran, Oxford University Press 2013.
2. System programming and Compiler Design, K C Loudon, Cengage Learning

Alternate Assessment Tools (AATs) suggested:

Lex and YACC –The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers.

Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program.

Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse.

A YACC Parser - The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity.

Text book 2: Chapter 1, 2 and 3.

Web links / e - resources:

1. <https://web.stanford.edu/class/archive/cs/cs143/cs143.1128/>
2. <https://dl.acm.org/doi/pdf/10.5555/578789>
3. <https://courses.grainger.illinois.edu/cs421/sp2011/lectures/lecture7-2up.pdf>
4. <https://www.javatpoint.com/compiler-tutorial>

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS) applicable for 2022 Scheme			
SEMESTER - V I			
Block Chain Essentials (3:0:0) 3			
(Effective from the academic year 2025-26)			
Course Code	BCS604B	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course objectives:			
<ul style="list-style-type: none"> • Understand blockchain fundamentals, including its history, structure, and consensus mechanisms. • Learn about decentralization, smart contracts, and cryptographic principles. • Explore major blockchain platforms like Bitcoin, Ethereum, Hyperledger, and Corda. • Gain hands-on experience with wallets, smart contracts, and blockchain tools. Assess blockchain's benefits, challenges, and industry applications. 			
Preamble:			
<p>Block chain technology is a decentralized, secure, and transparent system built on distributed consensus, cryptographic techniques, and smart contracts. It enables trustless transactions and supports applications like cryptocurrency, decentralized finance, and autonomous organizations. Key concepts include the CAP theorem, Byzantine Generals Problem, Bitcoin, Ethereum, and enterprise solutions like Hyperledger and Corda. Blockchain's impact spans industries, revolutionizing finance, supply chain, governance, and beyond. Understanding its fundamentals, consensus mechanisms, and cryptographic foundations is crucial for leveraging its full potential.</p>			
Module - 1			
<p>Distributed systems, CAP theorem, Byzantine Generals problem, Consensus. The history of blockchain, Introduction to blockchain, Various technical definitions of blockchains, Generic elements of a blockchain, Features of a blockchain, Applications of blockchain technology, Tiers of blockchain technology, Consensus in blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. (8 Hours)</p>			
Module - 2			
<p>Decentralization using blockchain, Methods of decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies Decentralized applications, Platforms for decentralization. Cryptographic primitives: Symmetric cryptography, Asymmetric cryptography, Public and private keys Hash functions: Compression of arbitrary messages into fixed length digest, Easy to compute, Pre-image resistance, Second pre-image resistance, Collision resistance, Message Digest (MD), Secure Hash Algorithms (SHAs), Merkle trees, Patricia trees, Distributed hash tables (DHTs), Digital signatures, Elliptic Curve Digital signature algorithm (ECDSA) (8 Hours)</p>			
Module - 3			
<p>Bitcoin, Bitcoin definition, Transactions, The transaction life cycle, The transaction structure, Types of transaction, The structure of a block, The structure of a block header, The genesis block, The bitcoin network, Wallets, Smart Contracts-History, Definition, Ricardian contracts, Smart contract templates, Oracles, Smart Oracles, Deploying smart contracts on a blockchain, The DAO (8 Hours)</p>			
Module - 4			
<p>Ethereum 101, Introduction, Ethereum clients and releases, The Ethereum stack, Ethereum blockchain, Currency (ETH and ETC), Forks, Gas, The consensus mechanism, The world state, Transactions, Contract creation transaction, Message call transaction, Elements of the Ethereum blockchain, Ethereum virtual machine (EVM), Accounts, Block, Ether, Messages, Mining, The Ethereum network Hands-on: Clients and wallets -Geth (8 Hours)</p>			
Module - 5			
<p>Hyperledger, Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda (8 Hours)</p>			

Course Outcomes:

The students will be able to: (List the COs as per the course requirements)

CO1: Illustrate the Blockchain terminologies with its applications. design.

CO2: Analyze the working principles of Blockchain.

CO3: Comprehend the principles and methodologies used in Bitcoin.

CO4: Create Ethereum Network, Wallets, Nodes, Smart contract & DApps.

CO5: Develop Blockchain Based Application Architecture using Hyperledger.

CO6: Illustrate the Smart Contract Lifecycle.

Textbooks:

1. Imran Bashir. "Mastring BlockChain", Packt

References:

1. Mastering Bitcoin: Programming the Open Blockchain Paperback – 2017 by Andreas M. O’rielly

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

Project-based learning

Tool Demonstration

Web links and Video Lectures (e-Resources):

• <https://nptel.ac.in/courses/106104220>

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS) applicable for 2022 Scheme			
SEMESTER -VI			
SUPPLY CHAIN MANAGEMENT (3:0:0:0) 3			
(Effective from the academic year 2025-26)			
Course Code	BCB604C	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives:			
This course will enable students:			
1. To understand the objectives of Supply Chain Management			
2. To optimize inventory levels through demand forecasting and just-in-time inventory practices to reduce carrying costs.			
3. To understand the fundamentals of program management, including value delivery systems, life cycle concepts, enterprise risk management, performance metrics, enabling effective planning and control of programs.			
4. To understand and apply integrated, IT-enabled supply chain concepts to manage modern, agile, and global supply chains effectively.			
Module - 1			
Introduction: Supply Chain – Fundamentals – Evolution- Delivery chain Vs Value chain- Enablers/ Drivers of Supply Chain Performance. Supply Chain strategy - Supply Chain Performance Measures- Strategic Fit and Scope-SCOR Model (08 Hours)			
Module - 2			
Strategic Sourcing: In/Outsourcing-Make Vs Buy - Identifying Core processes-Sourcing strategy - Supplier Selection and Contract Negotiation- Supplier evaluation, Creating a world class supply base- Supplier Development - World Wide Sourcing- Supply Chain Risks & Resilience (08 Hours)			
Module - 3			
Enterprise Operations and Quality Management: Behavioral Operations – ERP systems – Business Process Re-engineering – Lean Thinking – Process improvement methodologies – Product improvement methodologies – Smart Operations- ISO systems -QMS,EMS,ISMS and Organizational safety – Business excellence and Robotic Process Automation (08 Hours)			
Module - 4			
Program Management: Fundamentals-Value Delivery system – Performance domains , models, methods and artifacts – Enterprise risk management – Focus Groups – Product Vs Project life cycle - Project performance metrics and its applications – Emerging trends in program management (08 Hours)			
Module - 5			
Current Trends: Supply Chain Integration - Building partnership and trust in Supply Chain- Digital Supply Chain –Effective Demand planning & forecasting. IT in Supply Chain - Agile Supply Chains - Reverse Supply chain, Green Supply Chain. Future of IT in supply chain- e commerce – Industry 5.0 and its enabling technologies – Global Supply Chain and its challenges (08 Hours)			
Course Outcomes:			
The students will be able to:			
CO1: Illustrate the framework and scope of Supply Chain Management			
CO2: Develop a competitive supply chain using strategies and models			
CO3: Apply lean principles, ERP systems, business process re-engineering concepts to improve enterprise operational qualityand business excellence.			
CO4: Apply program management principles, models, and performance metrics to support value			

delivery, risk management, and effective program performance across project and product life cycles.

CO5: Design and manage integrated, IT-enabled supply chains by applying effective forecasting, coordination, addressing global challenges and emerging trends such as e-commerce and Industry 5.0.

Textbooks

1. Supply Chain Management– Text and Cases, Janat Shah Pearson Education 2009
2. Supply Chain Management Strategy Planning and Operation, Sunil Chopra and Peter Meindl PHI Learning / Pearson Education 2007

Reference Books

1. Business Logistics and Supply Chain Management, Ballou Ronald H Pearson Education 5th Edition, 2007
2. Designing and Managing the Supply Chain: Concepts, Strategies, and Cases David Simchi Levi, Philip Kaminsky, Edith Simchi-Levi ,Tata McGraw-Hill, 2005
3. Supply Chain Management Concept and Cases Altekar Rahul V, PHI, 2005
4. Supply Chain Management for Engineers- CRC Press, Samuel H. Huang
5. Principles of Supply Chain Management- A Balanced Approach Joel D. Wisner, G. Keong Leong, Keah Choon Tan South-Western, Third Edition, Cengage Learning 2012
6. Supply Chain Management-A Global Perspective, Nada R Sanders, Wiley.
7. Global Supply Chain and operations Management, Second Edition, Dmitry Ivanov, Alexander Tsipoulanidis, Jörn Schönberger, Springer
8. Logistics Management and Strategy-Competing through the Supply Chain, Alan Harrison and Remko van Hoek, 3rd edition,PH.
9. PMBOK Guide, 7th Edition, PMI

Alternate Assessment Tools (AATs) suggested:

- Technical report analysis
- Case Studies in Supply Chain Management

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS) applicable for 2022 Scheme			
SEMESTER -VI			
INVESTMENT MANAGEMENT			
(Effective from the academic year 2025-26)			
Course Code	BCB604D	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives:			
The objective of the course is to provide knowledge on various investment avenues, secondary market operations and valuation of securities along with portfolio construction and evaluation.			
In detail:			
1. To inculcate the knowledge about investment process and financial markets			
2. To understand the concept of risk, return, its calculation, and valuation of securities			
3. To inculcate knowledge about fundamental analysis and technical analysis and usage of charts for investment.			
4. To acquaint knowledge about portfolio construction & evaluation and mutual fund evaluation			
5. To appraise the students on the leading practical application-oriented case studies – relevant and updated and doing case study analysis & arriving at conclusions facilitating business decisions.			
Module – 1			
Investment: Concepts of investment, attributes, forms of investment, Objectives of financial investment, Sources of investment information. Features of a good investment, Investment Process. Economic vs. Financial Investment, Investment and speculation.			
Securities Market: Primary Market - Factors to be considered to enter the primary market, Secondary Market Major Players in the secondary market, Functioning of Stock Exchanges, Trading and Settlement Procedures, Leading Stock Exchanges in India.			
Stock Market Indicators- Types of stock market Indices, Indices of Indian Stock Exchanges. (Calculations) (8 hours)			
Module – 2			
Analysis of Risk and Return: Concept of Risk, Types of Risk- Systematic risk, Unsystematic risk, Calculation of Risk and returns. Portfolio Risk and Return: Expected returns of a portfolio, Calculation of risk and return of individual security and portfolio with 2 assets and more than 2 assets.			
Valuation of Securities: Bond Valuation: meaning, features and types of bonds, Bond pricing theorems, bond valuation, duration of bond and immunization of interest risk, determination of yield curves.			
Equity shares: Concept, Valuation, Dividend Valuation models and CAPM Preference Shares: Concept, Features, Yields. (8 hours)			
Module – 3			
Fundamental Analysis: Concept of intrinsic value, Objectives, and beliefs of fundamental analysts, EIC framework. Economic analysis, Industry Analysis and Company Analysis.			
Technical Analysis: Concept, Theories- Dow Theory, Eliot wave theory. Charts-Types, Trend and Trend Reversal Patterns. Mathematical Indicators –Moving averages, ROC, RSI, Market Indicators. Market Efficiency and Behavioural Finance: Random walk and Efficient Market Hypothesis, Forms of Market Efficiency, Empirical test for different forms of market efficiency. Behavioural Finance – Meaning and biases (8 hours)			
Module – 4			
Modern Portfolio Theory: Markowitz Model -Portfolio Selection, Opportunity set, Efficient Frontier. Beta Measurement and Sharpe Single Index Model Capital Asset pricing model: Basic Assumptions, CAPM Equation, Security Market line, Extension of Capital Asset pricing Model - Capital market line, SML VS CML. Sharpe's Optimum Portfolio Construction. (8 hours)			

Module - 5

Portfolio Management Strategies and Performance Evaluation: Portfolio Management Strategies: Active and Passive Portfolio Management strategy. Portfolio Revision: Portfolio Revision Strategies Objectives, Performance plans.

Mutual Funds: Concept of Mutual Funds, Participants in Mutual Funds, Advantages of Investment in Mutual Fund, Measure of Mutual Fund Performance.

Portfolio performance Evaluation: Measures of portfolio performance.

(8 hours)

Course outcomes:

The students will be able to:

CO1: Understand the capital market and various Instruments avenues in financial market

CO2: Assess the risk and return of various securities.

CO3: Demonstrate the use of fundamental analysis and technical analysis in evaluating. Stock market investments.

CO4: Apply the concept of CAPM and MPT while constructing optimal portfolio.

CO5: Analyse the performance of mutual funds and evaluate portfolio strategies.

MOOC:

Investment Management – www.springboard.com/udemuy/goldman-sachs

Indicative course assignment: Mock investment game

<https://www.digimat.in/nptel/courses/video/110105035/L01.html>

Textbooks

1. Investment Analysis and Portfolio management, Prasanna Chandra, Tata McGraw Hill, 3/e, 2010.
2. Security Analysis & Portfolio Management, S Kevin, Tata McGraw Hill, 2014.
3. Security Analysis & Portfolio Management, Punithavathy Pandian, Vikas Publications, 2/e, 2018.

References

1. Investments –Zvi Bodie, Kane, Marcus & Mohanty, TMH, 8th Edition, 2010.
2. Investment management (Security Analysis and & Portfolio Management), Bhalla V.K., Vikas Publications, 19/e, 2018.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS)
SEMESTER – VI

Unix System Programming (3:0:0:0) 3
(Effective from the academic year 2025 -26)

Course Code	BCB605A	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

- Understand effective use of Unix concepts, commands and terminology. Identify, access, and evaluate UNIX file system
- Explain the fundamental design of the unix operating system
- Familiarize with the systems calls provided in the unix environment
- Design and build an application/service over the unix operating system

Preamble:

Module – I

Unix philosophy and system architecture (kernel, shell, utilities); **Unix File System Concepts:** File types: regular, directory, character, block, FIFO, symbolic and hard links, Directory hierarchy and filesystem layout, Absolute and relative pathnames, **Inodes and File Metadata:** Inode structure and file descriptors, File attributes: size, ownership, timestamps, Hard links vs symbolic links, **File Permissions and Security:** Permission bits (rwx), chmod, chown, umask, **Low-Level File Operations:** open(), creat(), read(), write(), lseek(), close(), File offset and random access, File locking concepts (fcntl)

(08 Hours)

Module – II

Process Fundamentals: Definition and lifecycle of a process, Process states and transitions, Process table and PCB (Process Control Block), Process Identification: PID, PPID, UID, GID, Process hierarchy and parent-child relationships, Process Creation and Execution: fork() system call, exec() family of functions, vfork() and system-level implications, Process Termination and Synchronization: exit(), _exit(), wait(), waitpid(), Zombie and orphan processes, Processor Scheduling: CPU scheduling concepts, Time-sharing and preemptive multitasking, Priority and nice values, Environment Variables and Process Context: Command-line arguments, Process memory layout (text, data, heap, stack)

(08 Hours)

Module – III

Thread Concepts: Process vs thread, Benefits of multithreading, User-level vs kernel-level threads, POSIX thread architecture: thread creation, termination, joining, and detaching; thread attributes and scheduling, Thread Synchronization Basics: race conditions and critical sections; thread safety and reentrancy, Signals in Unix: Signal types and classifications, Default actions, signal() vs sigaction(), Signal Handling: Writing signal handlers, Signal masking and blocking, Handling asynchronous interrupts, interaction of signals with multithreaded programs. **(08 Hours)**

Module – IV

Need for interprocess communication; IPC classification and models; Pipes: anonymous pipes and half-duplex communication; pipe system call and usage patterns; parent-child communication using pipes; limitations of pipes; Named Pipes (FIFOs): FIFO creation using mkfifo(), Bidirectional communication, Synchronization issues; Message Queues: System V IPC overview; message queues and message structure; message queue operations (msgget, msgsnd, msgrcv, msgctl); IPC Resource Management: Creation, control, and deletion, ipcs and ipcrm utilities, Performance and use cases, Advantages and limitations

(08 Hours)

Module – V

Shared memory concepts and advantages; Shared memory vs message passing; System V Shared Memory: shmget(), shmat(), shmdt(), shmctl(), Memory attachment and detachment; POSIX shared memory and memory mapping; mmap-based shared memory; synchronization issues in shared memory; Race conditions in shared memory, Need of synchronization primitives; semaphores and their classification; System V semaphore operations semget(), semop(), semctl(); POSIX semaphore operations sem_init(), sem_wait(), sem_post(); deadlock conditions and prevention techniques; design of concurrent applications using shared memory and semaphores.

(08 Hours)

Course outcomes :

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

- C01:** Explain the UNIX philosophy, system architecture, and file system concepts, including file types, permissions, inodes, and directory structures.
- C02:** Apply low-level UNIX system calls to perform file operations, process creation, execution, and termination.
- C03:** Analyze process and thread behavior, including scheduling, synchronization, signal handling, and multithreaded execution
- C04:** Design and implement inter-process communication mechanisms using pipes, FIFOs, message queues, and shared memory
- C05:** Develop concurrent UNIX-based applications using shared memory and synchronization primitives such as semaphores, ensuring correctness and efficiency.

Textbooks

1. Michael Kerrisk, The Linux Programming Interface, No Starch Press.
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005 .
3. Abraham Silberschatz et al., Operating System Concepts, Wiley

Reference Books

1. Terrence Chan , Unix System Programming Using C++ , PHI, 1999.
2. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
3. Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2ndEdition, Wiley,2014.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS Choice Based Credit System (CBCS) applicable for 2022 Scheme SEMESTER - V I			
ORGANISATIONAL BEHAVIOUR (3:0:0)3 (effective from the academic year-2025-26)			
Course Code	BCB605B	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to:			
<ol style="list-style-type: none"> 1. To understand and analyze Management and Organizational Behavior theories and models. 2. To classify and differentiate between the best methods to solve the problems. 3. Comparing the appropriate framework for solving the problems at the workplace. 4. To apply Management and OB concepts to real-world business scenarios. 			
Preamble: The world depends on programming languages, because all the software running on all the computers will be written in some programming language. But, before a program can be run, it must be translated into a form in which it can be executed by a computer. The software systems that do this translation are called compilers. In this course, students will learn to how to design and implement compilers.			
Module - 1			
Introduction: Meaning, Objectives, Differences between Administration and Management, Levels of Management, Kinds of Managers, Managerial roles, Historical evolution of Management thought, Contemporary issues in Management – sustainability, diversity, equity & inclusion in the workplace. (8 hours)			
Module - 2			
Planning –Importance, Process, Benefits of Planning, Types of Plans, Planning tools and techniques. Organizing–Meaning , Types of Organization structures, Traditional structures, Directions in organization structures. Leading – Meaning, Nature, Traits and Behavior, Contingency approaches to Leadership, Transformational leadership. Controlling – Meaning, Importance, Steps in the Control Process, Types of Control. (8 hours)			
Module - 3			
Organizational Behavior –Introduction, Meaning, History of Organizational Behavior, Organizational effectiveness, Organizational learning process, Stakeholders, OB in a global context. (8 hours)			
Module - 4			
Introduction , MARS Model of individual behavior and performance, Types of Individual behavior, Personality in Organization, Values in the workplace, Types of values, Perception –Meaning, Model of Perceptual process. Emotions in the workplace, Types of emotions, Circumplex Model of Emotion, Attitudes and Behavior, Work-related stress and its management. Motivation – Meaning, Maslow’s Hierarchy of Needs, Four Drive Theory of Motivation. (8 hours)			
Module - 5			
Teams: Meaning of Teams, Advantages of Teams, Model of Team Effectiveness, Stages of Team Development. Power& Politics: Meaning, Sources, Contingencies of Power, Consequences of Power, Politics in organization. Conflict and Negotiation in the workplace: Constructive & Relationship conflict, Conflict Process Model, Structural sources of Conflict Management, Resolving conflict through negotiation and Third-Party Conflict Resolution. (8 hours)			
Course outcomes:			

CO1: Gain practical experience in the field of Management and Organizational Behavior.

CO2: Acquire conceptual knowledge of management, various functions of Management and theories in OB.

CO3: Develop management and behavioral models related to attitude, perception, power, politics and conflict in workplace.

CO4: Analyzing the recent trends in Management and OB models

Textbooks:

1. Management– John R. Schermerhorn, Jr., 8/e, Wiley India, 2010.

2. Organizational Behavior–Steven L. McShane & Mary Ann Von Glinow, 6/e, McGraw Hill Education, 2015.

3. Management & Organization Behaviour – Laurie J. Mullins, 7/e, Prentice Hall, 2005.

4. Essentials of Management – Koontz, McGraw Hill, 8/e, 2014.

5. MGMT –Chuck Williams & Manas Ranjan Tripathy, 5/e, Cengage Learning, 2013

Web links / e – resources:

1. https://onlinecourses.nptel.ac.in/noc22_mg104/preview

2. https://onlinecourses.nptel.ac.in/noc22_mg78/preview

3. https://learninglink.oup.com/access/king-lawley3e-student-resources#tag_all-chapters

4. <https://openstax.org/details/books/organizational-behavior>

5. <https://www.classcentral.com/course/introduction-organi>

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS Choice Based Credit System (CBCS) applicable for 2022 Scheme SEMESTER -VI			
MACHINE LEARNING LABORATORY (0:0:2) 1 (Effective from the academic year 2024-25)			
Course Code	BCBL607	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	3
Course Objectives: This course will enable students to:			
<ol style="list-style-type: none"> 1. Make use of Data sets in implementing the machine learning algorithms 2. Implement the machine learning concepts and algorithms in any suitable language of choice. 3. To Outline predictions using machine learning algorithms for business applications. 			
Programs List			
1	Linear Regression <ul style="list-style-type: none"> • Load a dataset with a continuous target variable • Implement a simple linear regression model to predict the target variable. • Visualize the regression line and the residuals. 		
2	Logistic Regression <ul style="list-style-type: none"> • Load a binary classification dataset • Implement a logistic regression model to predict the target variable. • Evaluate the model using accuracy, precision, recall, and the confusion matrix. 		
3	k-Nearest Neighbours (k-NN) <ul style="list-style-type: none"> • Load a dataset suitable for classification . • Implement the k-NN algorithm and classify the data points. • Experiment with different values of k and visualize the decision boundaries. 		
4	Decision Trees <ul style="list-style-type: none"> • Load a dataset • Implement a decision tree classifier to predict the target variable. • Visualize the decision tree and understand the decision rules. 		
5	Clustering with K-means <ul style="list-style-type: none"> • Load a dataset suitable for clustering • Implement the K-means clustering algorithm to group the data points. • Visualize the clusters and the cluster centres. 		
6	Support Vector Machines (SVM) <ul style="list-style-type: none"> • Implement an SVM classifier to classify handwritten digits using the MNIST dataset. 		
7	Principal Component Analysis (PCA) <ul style="list-style-type: none"> • Load a high-dimensional dataset . • Implement PCA to reduce the dimensionality of the data. • Visualize the explained variance and the data in the reduced dimensional space. 		
8	Data Exploration and Visualization <ul style="list-style-type: none"> • Load a dataset . • Perform basic data exploration: check for missing values, data types, and summary statistics. • Create visualizations such as histograms, scatter plots, and box plots to understand the data distribution and relationships between features 		
Course Outcomes: At the end of the course the student will be able to:			
CO1: Evaluate the complexity of Machine Learning algorithms and their limitations			
CO2: Implement supervised Machine Learning algorithms for the real world datasets and visualize the results.			
CO3: Implement unsupervised Machine Learning algorithms for the real world datasets and visualize the results.			

CO4: Analyze the suitable Machine Learning approaches like SVM, PCA for the given problem statement.

Text books:

1. Tom M Mitchell, "Machine Learning", 1st Edition, Mc Graw Hill Education, 2017.
2. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn & Tensor Flow, O'Reilly, Shroff Publishers and Distributors Pvt. Ltd 2019
3. "Introduction to Machine Learning with Python" by Andreas C. Müller and Sarah Guido, Ethem Alpaydın, —Introduction to Machine Learning, MIT Press

Alternate Assessment Tools (AATs) suggested:

Miniproject: on Some Technical Paper

Web links / e - resources:

1. https://youtube.com/playlist?list=PLlg1dOXc_acbdJoAE5RXpIM_rvwrerwR&si=iHKt4MT TvsTmMm02
2. Web links / e - resources: 1. https://onlinecourses.nptel.ac.in/noc24_cs101
3. <https://github.com/ageron/handson-ml2>

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Choice Based Credit System (CBCS)
SEMESTER – VI

Generative AI Lab (0:0:2:0) 1
(Effective from the academic year 2024 -25)

Course Code	BAI608A	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

- Understand the fundamentals of Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) architectures.
- Learn techniques for document ingestion, preprocessing, and chunking for NLP applications.
- Apply sentence embedding and vector databases (FAISS) for efficient semantic search.
- Design and implement context-aware AI chatbots using transformer-based models.
- Analyze and optimize prompt engineering techniques to reduce hallucination and improve response accuracy.
- Develop practical skills in integrating open-source NLP libraries for real-world AI applications

Preamble:

This course introduces students to the **practical implementation of generative AI techniques** using state-of-the-art open-source and cloud-based models. The course covers a broad range of generative AI capabilities, including **text generation, code synthesis, image generation, music creation, document-based question answering, and resume evaluation**. Students gain experience working with **large language models (LLMs), diffusion models, and retrieval-augmented generation (RAG) architectures**, while learning to control model behavior through prompts, parameters, and user inputs.

SL. No.	PART A
1.	<p>Text Generation using GPT-2 / GPT-Neo / GPT-J</p> <p>To implement a text generation program using a pre-trained GPT-Neo model and explore controlled text generation using several parameters.</p> <p>Lab Objectives:</p> <ul style="list-style-type: none"> • It should generate coherent text based on a user-provided prompt using the EleutherAI/gpt-neo-125M model. • Experiment with temperature, top-k, and top-p parameters to observe changes in creativity. • Explore other GPT Models and compare results.
2.	<p>User-Interactive Multilingual Translator using MarianMT</p> <p>To implement a multilingual translator that supports major world languages and Indian languages using Marian MT Models.</p> <p>Lab Objectives:</p> <ul style="list-style-type: none"> • Interactive input that Supports Indian languages + global languages and select the target language. • Learn how to use Helsinki-NLP MarianMT pre-trained models for reliable translations. • Automated Model Selection.

3.	<p>Image Generation using Stable Diffusion</p> <p>To implement an image generator from user-provided textual prompts using Stable Diffusion. The program should allow users to experiment with different styles, lighting, and negative prompts to control the output.</p> <p>Lab Objectives:</p> <ul style="list-style-type: none"> • Generate high-quality images from textual prompts using Stable Diffusion 2.1 model.(CUDA). • Experiment with parameters like <code>guidance_scale</code> and <code>num_inference_steps</code> • Explore creative control using style, lighting, and negative prompts. <ul style="list-style-type: none"> ✓ Artistic Style:oil painting, watercolor, digital art, anime style ✓ Lighting: sunset lighting, dramatic lighting,soft morning light, cinematic lighting ✓ Negative prompts: blurry, low quality, distorted
4.	<p>Music Generation with Pretty Midi</p> <p>To generate a short AI-composed musical sequence using multiple instruments (e.g., Piano, Violin, Flute etc). Each instrument should play a series of random notes with slight variations.</p> <p>Lab Objectives:</p> <ul style="list-style-type: none"> • Generate simple AI-composed melodies using Python and the <code>pretty_midi</code> library. • Understand how to use multiple instruments, control pitch, timing, and velocity in MIDI compositions. • Learn to customize instrument selection and melody length dynamically.
5.	<p>Code Generation using Open-Source LLMs (StarCoder)</p> <p>Design a program that uses an open-source code-generation LLM (e.g., StarCoder) to generate code for any programming task provided by the user at runtime.</p> <p>Lab Objectives:</p> <ul style="list-style-type: none"> • Generate programming code automatically using open-source LLMs called StarCoder2-3b. • Experiment with code explanation, debugging, and correctness verification. • Explore how AI models can assist in multi-language code generation.
6.	<p>AI-Based Resume Evaluation Using Cloud LLM (Gemini 3)</p> <p>Implement a cloud-based AI system that evaluates resumes automatically that uses a cloud LLM API (Gemini-3) to generate a structured evaluation paragraph with score, strengths, gaps, and improvement suggestions.</p> <p>Lab Objective:</p> <ul style="list-style-type: none"> • An interactive resume evaluation tool running in Google Colab that reads pdf as input. • The system should read a resume, analyze the content, and provide a structured evaluation for a given job role. • Extract text from PDF files, and generate actionable insights using AI.
7.	<p>Retrieval-Augmented Generation (RAG) Based Document Question Answering System</p> <p>Design and implement a Retrieval-Augmented Generation (RAG) chatbot that answers user queries only</p>

from the content of an uploaded document. The system should combine document retrieval with language generation to provide **contextually accurate answers**

Lab Objective:

- Analyse the architecture of Basic RAG Model.
- Extract and process text from TXT, PDF, and DOCX documents.
- Perform semantic search using sentence embedding and FAISS.
- Generate context-aware answers using a transformer-based language model.

Prevent hallucination by restricting answers to retrieved document content

PART B

Design a Domain-Specific Chatbot Using LLMs and RAG

Create a chatbot for a **specific domain of your choice** (e.g., Hydroponics, College FAQs, Travel, Healthcare, Software Documentation, or Historical Knowledge). The chatbot should:

1. Retrieve the **most relevant information** from a dataset (small or medium-sized, CSV/TXT/PDF or hardcoded).
2. Generate **human-like responses** using an **open-source LLM**.
3. Allow experimentation with **retriever embedding, number of retrieved documents, or LLM parameters**.

Expected Outcome:

- Interactive AI Application
- Shareable mini-project

Course outcomes:

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

CO1: **Understand** the foundations and principles behind generative models.

CO2: **Apply** suitable generative AI models and libraries to solve domain-specific problems.

CO3: **Analyze** AI-generated outputs to identify accuracy, relevance, bias, and limitations.

CO4: **Design** AI-based solutions by integrating multiple components such as data ingestion, retrieval, and generation.

CO5: **Create** end-to-end intelligent applications for real-world use cases using open-source or cloud-based AI tools.

Textbooks

1. **Lewis, M., Liu, Y., Goyal, N., et al.**
Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks, Facebook AI Research (FAIR), 2020.
2. **Jay Alamar & Maarten Grootendorst**
Hands-On Large Language Models, O'Reilly Media, 2024.
3. **Hugging Face Team**
Natural Language Processing with Transformers, O'Reilly Media, 2022.

Reference Books

- ❏ **Ian Goodfellow, Yoshua Bengio, Aaron Courville**
Deep Learning, MIT Press, 2016.
- ❏ **Daniel Jurafsky & James H. Martin**
Speech and Language Processing, Pearson, 3rd Edition (Draft).
- ❏ **Sebastian Raschka, Vahid Mirjalili**
Python Machine Learning, Packt Publishing, 2022.
- ❏ **Aurélien Géron**
Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly Media.

Web links / e - resources:

- https://onlinecourses.swayam2.ac.in/imb24_mg116/preview
- <https://www.cloudskillsboost.google/paths/118>

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS Choice Based Credit System (CBCS) applicable for 2022 Scheme SEMESTER -VI			
MOBILE APPLICATION DEVELOPMENT (0:0:2) 1 (Effective from the academic year 2025-26)			
Course Code	BCS608B	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2	SEE Marks	50
Total Number of Contact Hours	28	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Learn and acquire the art of Android Programming. 2. Install and Configure Android studio and its development tools to run the applications. 3. Use User Interface components for android application development. 4. Create Android applications using database like SQLITE. 5. Inspect different methods of sharing data using services. 			
Preamble: This is a practical course on Mobile Application Development. The lab is designed to provide hands-on experience in creating, developing, and testing mobile applications across various platforms. By leveraging state-of-the-art tools and methodologies, students will gain a deep understanding of the entire mobile app lifecycle, from initial concept to the development of applications using SQLite that run on Android Operating System.			
Prerequisite : Basic knowledge on programming and database concepts.			
List of Experiments			
<ul style="list-style-type: none"> • Installation of Android studio and Development of Hello World Application. <ol style="list-style-type: none"> 1. Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number. 2. Develop an Android application using controls like Button, TextView, EditText for designing a Calculator having basic functionality like Addition, Subtraction, Multiplication, and Division. 3. Design a basic alarm clock application that allows users to set a recurring alarm and provides an option to cancel the alarm 4. Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules: <ol style="list-style-type: none"> a. Password should contain uppercase and lowercase letters. b. Password should contain letters and numbers. c. Password should contain special characters. d. Minimum length of the password (the default value is 8). On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another. 5. Create two files of XML and JSON type with values for City_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to 			

parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.

6. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.
7. Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Evening or Night. Application should input the Date and Time of the Day and display the Medicine Name.
8. Create an application to receive an incoming SMS which is notified to the user. On clicking this SMS notification, the message content and the number should be displayed on the screen. Use appropriate emulator control to send the SMS message to your application.

Course Outcomes:

The students will be able to:

CO1: Design and develop user interfaces for mobile apps using basic building blocks.

CO2: Apply methods of storing, sharing and retrieving the data in Android Applications

CO3: Analyze the responsive user interface across a wide range of devices.

CO4: Design a mobile Application by using various components of android app development.

Text Books :

1. Reto Meier, Professional Android 4 Application Development, Wrox Publication,2012,
2. Baijian Yang, Pei Zheng, Lionel M. Ni, Professional Microsoft Smartphone Programming, Wrox Publication,2007.

Reference Books:

1. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014. ISBN-13: 978-8126547197
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015. ISBN-13: 978-9352131341
3. Bill Phillips, Chris Stewart and Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", 3rd Edition, Big Nerd Ranch Guides, 2017. ISBN-13: 978-0134706054

Web links / e – resources:

1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference",Google Developer Training Team, 2017.
2. <https://www.gitbook.com/book/google-developertraining/androiddeveloperfundamentals-course-concepts/details>
(Download pdf file from the above link)

Alternate Assessment Tools (AATs) suggested:

Mini-project : Development of an mobile application

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS Choice Based Credit System (CBCS) applicable for 2022 Scheme SEMESTER -VI			
DevOps (0:0:2) 1 (Effective from the academic year 2025-26)			
Course Code	BCS608C	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2	SEE Marks	50
Total Number of Contact Hours	28	Exam Hours	3
Course Objectives: This course will enable students to: (List as per the requirement of your course)			
<ol style="list-style-type: none"> 1. Understand and apply the DevOps tools used in SDLC. 2. Examine the docker containerization in detail. 			
Preamble: The DevOps Foundation course provides a comprehensive overview of understanding the DevOps competencies needed to accelerate time-to-market by improving the flow of value through the continuous delivery pipeline. Students will map the current value stream through their delivery pipeline from idea to cash, and identify practices that will eliminate bottlenecks to workflow.			
List of Experiments			
<ol style="list-style-type: none"> 1. To perform version control on websites or software using Git by managing repositories through a browser-based interface and synchronizing changes with push and pull commands from the command line and GUI. 2. Install Docker, explore its containerization commands, create Docker containers using various operating system images, and deploy containerized applications using Docker and Docker Hub. 3. Design, Deploy, and Manage a micro services architecture on your local machine using Docker and docker-compose 4. Install and configure SonarQube on your local machine and create a Jenkins CI/CD pipeline that integrates SonarQube to perform static code analysis. 5. Create a Maven Project, Understanding the POM File, Dependency Management and Plugins. 6. Build and Run a Java Application with Maven, Migrate the Same Application to Gradle. 			
Course Outcomes: The students will be able to:			
CO1: Understand the concept of Devops and workflow with different tools.			
CO2: Experiment with GIT, IT, Dockers and Containerization.			
CO3: Jenkins Create CICD Pipeline using tools like SonarQube.			
Textbooks:			
<ol style="list-style-type: none"> 1. Effective DevOps Building a Culture of Collaboration, Affinity, and Tooling at Scale, Jennifer Davis and Ryn Daniels, June 2016: First Edition Published by O'Reilly Media Inc. 			
Reference books:			
<ol style="list-style-type: none"> 1. The Devops Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations, by Gene Kim , Jez Humble, 2016, It Revolution Press. 2. DevOps on the Microsoft Stack, by Wouter de Kort, Apress. 			
Web links / e – resources:			
<ol style="list-style-type: none"> 1. https://www.youtube.com/results?search_query=github+tutorial 2. https://www.youtube.com/results?search_query=setup+and+configure+S ONAR+Q 3. https://www.youtube.com/watch?v=A0g7I4A6GN4&pp=ygUWY29udGFpbmVycyBhbmQgZG9ja2Vycw%3D%3D 			
Alternate Assessment Tools (AATs) suggested: Demonstrate the use of one or two DevOps tools in SDLC lifecycle.			

B.E in COMPUTER SCIENCE AND BUSINESS SYSTEM
Choice Based Credit System (CBCS) applicable for 2022 Scheme
SEMESTER – VI

NSS
(Common to all branches)
(Effective for the 2022 scheme)

Course Code	BNSK609	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: 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.

Preamble: The National Service Scheme (NSS) is a government-sponsored program in India that aims to develop students' personalities and character through voluntary community service. The NSS's motto is "NOT ME, BUT YOU", which reflects the need for selfless service and consideration for others.

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 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

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B.E. Computer Science and Business Systems

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SEMESTER III to VI

Sports

(Common to all Branches)

(Effective for the 2022 scheme)

Course Code	BPEK359/459/559/659	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: 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, Minor 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: Short, 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.

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 in which the student has to give fitness and skill tests and his performance in game will be assessed.

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 Bompá, "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, "Textbook 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, ics 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).

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Choice Based Credit System (CBCS)

SEMESTER III to VI

Yoga

(Common to all Branches)

(Effective for the 2022 scheme)

Course Code	BYOK359/459/559/659	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	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 to Yoga: Introduction, classical and scientific aspects of yoga, Importance, Types, Healthy Lifestyle, Food Habits, Brief Rules, Sitalikarana 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:

C01: Understand the requirement of practicing yoga in their day-to-day life.

C02: Apply the yogic postures in therapy of psychosomatic diseases

C03: Train themselves to have a focussed, joyful and peaceful life.

C04: Demonstrate the fitness of Physical, Mental and Spiritual practices.

C05: 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

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Choice Based Credit System (CBCS)

SEMESTER III to VI

Music

(Common to all Branches)

(Effective for the 2022 scheme)

Course Code	BMUK359/459/559/659	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 the Degree)

Course Objectives:

The course will enable the students to:

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

Module 1

Preamble: Contents of the curriculum intend to promote music as a 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, 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)

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS Choice Based Credit System (CBCS) applicable for 2022 Scheme SEMESTER -VI			
INDIAN KNOWLEDGE SYSTEM (0:0:0) 0 (Common to All UG Programs) Applicable for the Academic Year 2024-25 for 2022 scheme onwards			
Course Code	BIKS610	CIE Marks	100
Teaching Hours/Week (L:T:P)	1:0:0- NCMC	SEE Marks	--
Total Number of Contact Hours	13	Total Marks	100
Course objectives:			
1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.			
2. To make the students understand the traditional knowledge and analyse it and apply it to their day-to-day life.			
Module - 1			
Introduction to Indian Knowledge Systems (IKS): Overview, Vedic Corpus, Philosophy, Character, scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge. (5 Hours)			
Module - 2			
Traditional Knowledge in Humanities and Sciences: Linguistics, Number and measurements- Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology. (4 Hours)			
Module - 3			
Traditional Knowledge in Professional domain: Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals. (4 Hours)			
Course Outcomes: After completing the course, the students 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.			
References:			
1. Introduction to Indian Knowledge System- concepts and applications, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93- 91818-21-0			
2. Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,			
3. Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,			
Suggested Web Links:			
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			
7. https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMIInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_Bw			