M.C.E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune- 1 (Autonomous)
Affiliated to Savitribai Phule Pune University NAAC
accredited 'A' Grade

F.Y.B.Sc(CA). SEM-I & SEM-II

Syllabus

Applicable for the Autonomous College affiliated to

Savitribai Phule Pune University

B.Sc(CA) under Science Three Year Degree Programme
(NEP 2026 Pattern)
With Effect from June 26-27

Preamble:

- The B.Sc. (Computer Applications) programme is a three-year undergraduate degree structured over six semesters, designed to build strong foundational knowledge and practical skills in computer science and applications. It develops analytical thinking, problem-solving ability, and technical competence through a blend of theory, practical work, and project-based learning. The programme integrates emerging technologies and industry-relevant tools to bridge the gap between academia and industry, preparing students for successful careers in IT and higher studies in computer science and allied disciplines.
- The programme plays a vital role in developing industry-ready professionals equipped with essential digital skills for the modern technology-driven world. It contributes to national and global digital transformation by producing skilled manpower in computing and IT services. It also empowers students to contribute meaningfully to society through innovation and technology-based solutions.
- The B.Sc. (Computer Applications) Degree Course (2026 pattern) will be introduced in the following order:-
    - **a.** First Year B.Sc. (C.A.) 2026-2027
    - **b.** Second Year B.Sc. (C.A.) 2027-2028
    - **c.** Third Year B.Sc. (C.A.) 2028-2029

Programme Educational Objectives:

B.Sc. (Computer Applications) program will prepare its students as:

PEO1: Apply fundamental concepts of computer science and information technology to analyse and solve real-world problems effectively.

PEO2: Demonstrate strong analytical, logical, and problem-solving abilities in computational and technological environments.

PEO3: Design, develop, and implement efficient software solutions using appropriate programming languages, tools, and emerging technologies.

PEO4: Adapt to evolving industry trends and technological advancements through continuous learning, skill enhancement, and professional development.

PEO5: Exhibit professional ethics, social responsibility, teamwork, and leadership skills while pursuing successful careers in IT, allied industries, higher education, and societal development initiatives.

SEMESTER I					
Course Type	**Course Code**	**Course Name**	**Credits**		
			Theory	**Practical**	**Total**
Major/Core Theory	26SBCA11MM	C Programming	2	–	
Major/Core Theory	26SBCA12MM	Database Management System-I	2	–	
Major/Core Practical	26SBCA13MM	Lab I : C Programming	–	2	
GE/OE	26CBBA11OE	Entrepreneurship Skills for Small Enterprises	2	–	
	26CBCO11OED	Digital Marketing	2	–	
Vocational Skill Course	26SBCA11VS	Lab III : Web Designing using HTML and CSS		2	
SEC	26SBCA11SE	Lab II : Database Management System -I	–	2	
AECC	26ABEN11AE	Functional English -I	2	–	
IKS	26ABHS11IKA	History of Knowledge Production in India	2	–	
Value Education	26ABPO11VE	Democracy, Election and Governance	2	–	
Co-Curricular	26SBHENT11CC	Health and Nutrition	2	–	
Total			**16**	**6**	**22**

SEMESTER II					
Course Type	**Course Code**	**Course Name**	**Credits**		
			Theory	**Practical**	**Total**
Major/Core Theory	26SBCA21MM	Programming with C++	2		
Major/Core Theory	26SBCA22MM	Database Management System-II	2		
Major/Core Practical	26SBCA23MM	Lab I : Programming with C++		2	
Minor	26SBCA21MN	Applied Mathematics	2		
GE/OE	26ABPS21OE	Emotional Intelligence and Social Skills	2		
	26CBCO21OED	Search Engine Optimization	2		
Vocational Skill Course	26SBCA21VS	Operating System	2		
SEC	26SBCA21SE	Lab II: Database Management System-II		2	
AECC	26ABEN21AE	Functional English-II	2		
Value Education	26SBEV21VE	Environment Ethics and Values	2		
Co-Curricular Courses	26SBPE21CC	Physical Education ,Sports and Yoga	2		
Total			**18**	**4**	**22**

SEMESTER III					
Course Type	**Course Code**	**Course Name**	**Credits**		
			Theory	**Practical**	**Total**
Major/Core Theory	26SBCA31MM	Python Programming	2		
Major/Core Theory	26SBCA32MM	Introduction to JavaScript	2		
Major/Core Theory	26SBCA33MM	Software Engineering	2		
Major/Core Practical	26SBCA34MM	Lab I : Python Programming		2	
Minor Theory	26SBCA31MNA Or 26SBCA31MNB	Computer Network Or Computer Organization	2		
Minor/Practical	26SBCA32MNA Or 26SBCA32MNB	Lab II: Computer Network Or Lab II : Computer Organization		2	
GE/OE	26SBCA31OE	Professional Etiquette	2		
Vocational Skill Course	26SBCA31VS	Lab III : - Introduction to JavaScript		2	
AECC	26ABHN31AE OR 26ABUR31AE	Hindi /Urdu	2		
Co-Curricular Courses	26SBCS31CC	Basics of Yoga	2		
CEP	26SBCA31CEP	CEP		2	
TOTAL			**14**	**8**	**22**

SEMESTER IV					
Course Type	**Course Code**	**Course Name**	**Credits**		
			Theory	**Practical**	**Total**
Major/Core Theory	26SBCA41MM	Data Structure Using Python	2		
Major/Core Theory	26SBCA42MM	Java Programming	2		
Major/Core Theory	26SBCA43MM	Computing Science in Ancient India	2		
Major/Core Theory	26SBCA44MM	Cloud Computing	2		
Major/Core Practical	26SBCA45MM	Lab I : Data structure Using Python		2	
Minor Theory	26SBCA41MNA OR 26SBCA41MNB	Introduction to Cyber Security Or 8051 Microcontroller Programming	2		
Minor/Practical	26SBCA42MNA OR 26SBCA42MNB	Lab II : Introduction to Cyber Security OR Lab II : 8051 Micro-controller Programming		2	
SEC	26SBCA41SE	LAB III Java Programming		2	
AECC	26ABHN41AE OR 26ABUR41AE	Hindi OR Urdu	2		
Co-Curricular Courses	26SBCA41CC	Digital Art Using AI Tools	2		
FP	26SBCA41FP	FP		2	
TOTAL			14	8	22

SEMESTER V					
Course Type	**Course Code**	**Course Name**	**Credits**		**Total**
			Theory	**Practical**	
Major/Core Theory	26SBCA51MM	Spring Boot	2		
Major/Core Theory	26SBCA52MM	Data Science Using Python	2		
Major/Core Theory	26SBCA53MM	Generative AI	2		
Major/Core Practical	26SBCA54MM	Lab I : Spring Boot		2	
Major/Core Practical	26SBCA55MM	Lab II : Data Science using Python		2	
Major Elective Theory	26SBCA51MEA OR 26SBCA51MEB	React JS OR Software Testing and Quality Assurance	2		
	26SBCA52MEA OR 26SBCA52MEB	MongoDB OR Introduction to Web Services	2		
Minor Theory	26SBCA51MNA OR 26SBCA51MNB	Network Security and Cryptography OR Introduction to Single Board System and Applications.	2		
Minor Practical	26SBCA52MNA OR 26SBCA52MNB	Lab IV: Network Security and Cryptography OR Lab IV: Introduction to Single Board System and Applications.		2	
Vocational Skill Course	26SBCA51VS	Lab III : Web Application Frameworks		2	
Field Project	26SBCA51FP	Project		2	
TOTAL			12	10	22

SEMESTER VI					
Course Type	**Course Code**	**Course Name**	**Credits**		**Total**
			Theory	**Practical**	
Major/Core Theory	26SBCA51MM	Reactive Native	2		
Major/Core Theory	26SBCA52MM	Machine Learning	2		
Major/Core Theory	26SBCA53MM	Fundamental of DevOps	2		
Major/Core Practical	26SBCA54MM	LAB I : Web and Mobile Application Development		2	
Major/Core Practical	26SBCA55MM	Lab II - Machine Learning		2	
Major Elective Theory	26SBCA61MEA OR 26SBCA61MEB	Node JS OR Software Project Management	2		
	26SBCA62MEA OR 26SBCA62MEB	Data Visualisation using Power BI OR Block Chain		2	
Minor Theory	26SBCA61MNA OR 26SBCA61MNB	Ethical Hacking and Penetration Testing OR Fundamentals of IoT and Its Applications	2		
Minor Practical	26SBCA62MNA OR 26SBCA62MNB	Lab III - Ethical Hacking and Penetration Testing OR Lab III - Fundamentals of IoT and Its Applications		2	
OJT	26SBCA6OJT	Internship		4	
TOTAL			10	12	22

SEM-I & SEM-II
SYLLABUS

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F.Y.BSc (CA) SEM I (NEP Pattern-2026)

Course Title	**C Programming**		
Course Code: 26SBCA11MM			**No. Of Credits: 02**
Course Type: Major Mandatory(MM)			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	To introduce fundamental computer concepts and programming languages
2.	To develop problem-solving skills using algorithms and flowcharts
3.	To familiarize students with C programming fundamentals
4.	To apply control structures and modular programming concepts
5.	To enable effective use of arrays, strings, and pointers

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Understand basic computer concepts, programming languages, and problem-solving techniques using algorithms and flowcharts.
2.	Explain the structure, features, and syntax of the C programming language and write simple C programs using tokens, data types, and operators.
3.	Apply decision-making and looping constructs to develop logical and efficient C programs.
4.	Design modular programs using functions, recursion, and appropriate storage classes.
5.	Implement arrays, strings, and pointers in C programs for effective data storage, manipulation, and memory access.

Unit No	Title with Contents	No. of Lectures
Unit I	**C Tokens and Input Output**	**6**
	1. Introduction to C Language i. History of C ii. Features of C iii. Structure of C Program iv. Sample of C Program **2. Operators in C** i. Relational Operator ii. Logical operators iii. Bit wise Operators iv. Assignment Operators v. Comma Operator vi. Size of operator **3. Format specifier** **4. Input Output Inbuilt Function** (Ex. printf, scanf , getch functions..) **5. Escape sequence characters**	**1** 3 2
Unit II	**Control and Iterative Structures**	**6**
	1. If, If- Else Statements, Nested If Statements **2. Conditional Branching** i. Switch statement **3. Loops** i. For ii. While iii. do..while **4. break, continue, goto statements**	**3** **2**
Unit III	**Functions**	**5**
	1. Introduction to Functions and **2. Function Arguments** **3. Library and User defined functions** **4. Methods for parameter passing** **5. Recursion** **6. Storage Classes** i. Auto ii. Static iii. Global iv. Register	**1** **1** **1** **1** **1**
Unit IV	**Arrays , Strings & Pointers**	**13**
	1. Introduction i. Array Declarations ii. Bounds Checking	**2**

	2. Types of Array i. Single dimension Arrays ii. Two dimension arrays **3. Arrays and Function** **4. String Concept** i. Declaration ii. Definition iii. initialization **5. Format specifiers String literals/constants and variables** **6. Array of strings** **7. Introduction to Pointers** i. Declaration,definition,initialization of Pointer ii. Arithmetic,Multiple indirection **8. Parameter passing** i. call by value ii. call by reference **9. Arrays and Pointers** i. Pointer to array ii. Array of pointers **10. Functions and pointers** i. Passing pointer to function ii. Returning pointer from function iii. function pointer **11. Dynamic memory management, Allocation,Resizing, Releasing, Memory leak / danglingpointers**	**1** **1** **1** **1** **2** **1** **1** **1** **2**

Suggested Reading	
1.	**E. Balagurusamy**, *Programming in ANSI C*, McGraw-Hill Education
2.	**Brian W. Kernighan and Dennis M. Ritchie**, *The C Programming Language*, Pearson
3.	**Yashavant Kanetkar**, *Let Us C*, BPB Publications
4.	**Byron Gottfried**, *Programming with C*, Schaum's Outline Series

Website Reference Link	
1.	GeeksforGeeks – C Programming**:** https://www.geeksforgeeks.org/c-programming-language/
2.	TutorialsPoint – CProgramming: https://www.tutorialspoint.com/cprogramming/index.htm
3.	Programiz – Learn C Programming: https://www.programiz.com/c-programming
4.	W3Schools – C Tutorial: https://www.w3schools.com/c/

Best IDE Tools:		
Sr.No	**Name of IDE or Tools**	**Operating System**
1	Code::Blocks, Dev-C++,Turbo C	Windows Operating System

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F.Y.BSc. (CA) SEM I (NEP Pattern-2026)

Course Title	**DATABASE MANAGEMENT SYSTEM-I**		
Course Code: 26SBCA12MM			**No. Of Credits: 02**
Course Type: Major Mandatory(MM)			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	Understand the fundamental concepts of Database Management Systems (DBMS), including architecture, users, and levels of abstraction.
2.	Learn conceptual database design using the Entity-Relationship (ER) model, aggregation, generalization, and specialization.
3.	Gain knowledge of the relational model, including tables, keys, constraints, and conversion from ER model to relational schema
4.	Develop the ability to write and execute SQL queries using DDL, DML, set operations, aggregate functions, subqueries, and joins.
5.	Understand relational database design principles, including functional dependencies, normalization (1NF, 2NF, 3NF), and practical examples.

Sr.No.	Course Outcome
After completing course students will be able to -	
1.	Explain DBMS architecture, users, and levels of abstraction clearly, and differentiate between file-based systems and DBMS
2.	Design a conceptual database using ER diagrams, define entities, attributes, relationships, and weak entities accurately.
3.	Convert ER models into relational schemas**,** and implement tables with appropriate keys and integrity constraints**.**
4.	Write efficient SQL queries for database creation, data manipulation, set operations, aggregate functions, subqueries, and joins.
5.	Apply the concepts of functional dependencies and normalization **to** design optimized, consistent, and redundancy-free relational databases.

Unit No	Title with Contents	No. of Lectures
Unit I	**Introduction of DBMS**	**02**
	1. Overview **2. Level of abstraction** **3. Structure of DBMS** **4. Users of DBMS**	**1** **1**
Unit II	**Conceptual Design (E-R model)**	**06**
	1. Overview of DB design **2. ER Data Model** i. Concept of ER Model ii. Entities and Entity Sets iii. Attributes (Simple, Composite, Multivalued, Derived) iv. Relationships and Relationship Sets v. Degree and Cardinality of Relationships vi. Weak Entities **3. Aggregation and Generalization and Specialization** **4. Case studies**	**1** **2** **2** **1**
Unit III	**Structure of Relational Databases**	**05**
	1. Key Features Of Relational Database i. Table ii. Row iii. Relation iv. Tuple v. Key **2. Conversion of ER to Relational model with example** **3. Integrity constraints** i. Primary key ii. Referential Integrity iii. Null constraint iv. Unique constraint v. Check constraint	**1** **2** **2**
Unit IV	**Structured Query Language**	**12**
	1. Introduction to SQL **2. DDL Commands with Examples(CREATE, DROP, ALTER, TRUNCATE)** **3. DML Commands with Examples((INSERT, UPDATE, DELETE)** **4. Basic Structure of SQL Query** **5. Set Operations** **6. Aggregate Functions** **7. Nested Subqueries** **8. SQL Joins and Their Types** **9. SQL Case Studies / Examples**	**1** **2** **2** **1** **1** **1** **1** **2** **1**

Unit V	Relational Database Design	5
	1. **Functional Dependencies** (Inference Rules, Closure of FD Set, Closure of Attribute Set)	2
	2. **Concept of Normalization** (Definition, 1NF, 2NF, 3NF)	2
	3. **Examples on Normalization**	1

Suggested Reading	
1.	Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan, Tata McGraw-Hill Education, ISBN:9780071289597
2.	Fundamentals of Relational Database Management Systems - S. Sumathiand S. Esakkirajan, Springer Berlin Heidelberg New York, ISBN-13 978-3-540-48397-7
3.	Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, Apress, Second Edition, ISBN: 9781590594780
4.	Database Management Systems ,Raghu Ramakrishna, McGraw-Hill, Second Edition, ISBN:978007125434
5.	Database Systems, Shamkant B. Navathe, RamezElmasri, PEARSON, ISBN:9780132144988
6.	An introduction to Database systems, Bipin C Desai, Galgotia Publications
Website Reference Link:	
1.	Database Management System (DBMS) – Concepts and Theory : https://www.geeksforgeeks.org/dbms/
2.	DBMS Practical Examples : https://www.javatpoint.com/dbms-examples
3.	Functional Dependencies (Inference Rules / Armstrong's Axioms) : https://www.youtube.com/watch?v=79MOa6STZAc
4.	**Introduction and Definition of Database Management System** https://www.techtarget.com/searchdatamanagement/definition/database-management-system

Best IDE Tools:

Sr.No	Name of IDE or Tools	Operating System
1	PostgreSQL 11.0 onwards	Window Operating System
2	PostgreSQL 11.0 onwards	Red Hat /Linux / Ubuntu

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F.Y.BSc. (CA) SEM I (NEP Pattern-2026)

Course Title	**LAB I : C PROGRAMMING**		
Course Code: 26SBCA13MM			**No. Of Credits: 02**
Course Type: MM(Major Mandatory)			**Total Teaching Hours: 60**

Sr.No.	Course Objectives
1.	Understand Fundamental Programming Concepts
2.	Master C Programming Language Fundamentals
3.	Apply Control Structures and Modular Programming
4.	Implement Data Structures Using Arrays and Strings
5.	Utilize Pointers and Dynamic Memory Management

Sr.No.	Course Outcome
After completing course students will be able to -	
1.	Design and Implement Algorithmic Solutions
2.	Develop Console-Based Applications
3.	Build Programs with Functions and Recursion
4.	Create Array and String Manipulation Programs
5.	Implement Dynamic Memory Solutions

Assignment No	Assignment Name	No. Of Sessions
1.	**Assignment on input output statements**	1
2.	**Assignment on Decision Making Statement**	1
3.	**Assignment on Control Structures Iterative Structures**	2
4.	**Assignment on Functions**	2
5.	**Assignment on Recursive Function**	2
6.	**Assignment on Arrays**	2
7.	**Assignment on Strings**	2
8.	**Assignment on pointers**	2
Total Number of Sessions		**14**

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Course Title	**Entrepreneurship Skills For Small Enterprises**		
Course Code: 26CBBA11OE			**No. Of Credits: 02**
Course Type: GE/OE			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	To develop understanding of the basic concepts of **entrepreneur, manager, intrapreneur**, and entrepreneurship, including their roles, responsibilities, and importance in organizations.
2.	To familiarize students with **entrepreneurial qualities, functions, decision-making process**, and factors influencing entrepreneurship such as psychological, social, economic, and environmental factors.
3.	To enable students to identify and analyze **business opportunities** using opportunity search methods, thinking modes, environmental scanning, SWOT analysis, and market surveys.
4.	To provide knowledge about **MSMEs, industrial sickness, financial assistance, government schemes**, and the role of financial institutions in supporting small enterprises.
5.	To inspire students by studying **women entrepreneurs in India**, their start-ups, challenges, achievements, and the growing role of women in entrepreneurship.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Explain the concepts of **entrepreneur, intrapreneur, and manager**, and differentiate between entrepreneur and intrapreneur with suitable examples
2.	Analyze the **qualities, functions, and decision-making process** of entrepreneurs and evaluate factors influencing entrepreneurship in real-life business situations.
3.	Identify viable **business opportunities** using divergent, convergent, creative, and critical thinking tools such as **SCAMPER, SWOT, and environmental scanning**.
4.	Assess the role of **MSMEs, financial institutions, venture funding, angel funding**, and government self-employment schemes in promoting entrepreneurship and preventing industrial sickness.
5.	Evaluate the contribution of entrepreneurs, especially **women entrepreneurs**, to **economic and social development**, and recognize ethical, social, and leadership responsibilities in entrepreneurship.

Unit No	Title with Contents	No. of Lectures
Unit I	**Entrepreneurial Perspective**	**8**
	1. Concept of Entrepreneur, Manager, Intrapreneur. i. Meaning and definitions Entrepreneur, Manager, Intrapreneur ii. Roles and responsibilities of an Entrepreneur. iii. Types of Entrepreneurs with examples. iv. Difference between Entrepreneur and Intrapreneur. v. Importance of Intrapreneurship in modern organizations vi. Contribution of Entrepreneur to economic and social development **2. Qualities and Functions of an Entrepreneur.** **3. Entrepreneurship Definition, Evolution and aspects.** **4. Factors influencing Entrepreneurship: Psychological, Social, Economical and Environmental factors.** **5. The Entrepreneurial decision process.**	3 1 1 2 1
Unit II	**Business Opportunity Identification**	**8**
	1. Business, Industry and Commerce: Concepts, Modern Perspective and Interrelationship **2. How Business Impacts Owners and Customers** **3. Advantages and disadvantages of Business: For the owner, For customers.** **4. How Business Impacts Owners and Customers** **5. Advantages and disadvantages of Business: For the owner, For customers.** **6. How Business Impacts Owners and Customers** **7. Advantages and disadvantages of Business: For the owner, For customers.** **8. How Business Impacts Owners and Customers** **9. Advantages and disadvantages of Business: For the owner,For customers.** **10. How Business Impacts Owners and Customers** **11. Advantages and disadvantages of Business: For the owner, For customers.** **12. How Business Impacts Owners and Customers** i. Definition, Advantages and disadvantages of Business For the owner and customers. **13. Divergent thinking Mode: Meaning and objectives.** i. Analytical Thinking – meaning and objectives. ii. Creative Thinking – meaning, objectives and importance decision making Critical Thinking. iii. SCAMPER Technique. **14. PEST Analysis:** i. P – Political: Government policies, taxation, stability ii. E – Economic: Inflation, income level, growth rate iii. S – Social: Culture, lifestyle, demographics	**1** **1** **2** **1** **2**

	iv. T – Technological: Innovation, automation, AI **15. Opportunity Selection:** i. Meaning and objectives of Opportunity Selection ii. Convergent Thinking iii. SWOT Analysis iv. Market Survey **16. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur**	**1**
Unit III	**MSMEs: Problems, Finance and Government Schemes**	**8**
	1. Ministry of Micro, Small and Medium Enterprises (MSME): i. Meaning of Micro, Small and Medium Enterprises. ii. Objectives and functions of the Ministry of MSME. iii. Challenges faced by MSMEs. **2. Industrial Sickness in Small Enterprises:** i. Meaning of industrial sickness ii. Symptoms of industrial sickness iii. Causes and process of industrial sickness in India iv. Prevention of sickness in enterprises v. Specific management problems leading to sickness **3. Financial Assistance for Small Enterprises:** i. Meaning and need of financial assistance ii. Institutional finance for small enterprises iii. Bank Loans for small enterprises iv. Venture Funding v. Angel Funding vi. Self-Employment Schemes of Government of Maharashtra: **4. Financial Institutions Supporting Small Enterprises:** i. Khadi and Village Industries Board (KVIB) ii. Rajiv Gandhi Udyami Mitra Yojana (RUGMY) iii. National Small Industries Corporation (NSIC). iv. Small Industries Development Bank of India (SIDBI) v. Industrial Development Bank of India (IDBI)	**2** **2** **2** **2**
Unit IV	**Study of Women-founded Start-ups in India and Entrepreneurs biography**	**6**
	1. Study of Women Entrepreneurs in India i. Concept and importance of women entrepreneurship in India ii. Financial Challenges and Gender Gap in Startup Funding **2. Case study on Women-led startup success story:** i. Upasana Taku (Co-founder – MobiKwik) ii. Anisha Singh (Founder – SheCapital) iii. Sabina Chopra (Co-founder – Yatra.com) iv. Shehnaaz Hussain (Founder – Shahnaz Husain Group) v. Aditi Gupta (Co-founder – Menstrupedia) **3. SWOT analysis of a women-founded Indian startup** **4. Comparative study of two women entrepreneurs**	3 1 1 1

Suggested Reading	
1	Entrepreneurship Development — *S. S. Khanka*
2	Innovation and Entrepreneurship — *Peter F. Drucker*
3	Entrepreneurship and Small Business Management — *H. K. Singh*
4	Entrepreneurship and Women — *Anju Verma & Gurpreet Kaur*

Website Reference Link:	
1	The Entrepreneur: General concept and definition https://ddceutkal.ac.in/Syllabus/MCOM/Entrepreneurship_Development.pdf
2	Definition and characteristics of intrapreneurship https://en.wikipedia.org/wiki/Intrapreneurship
3	*Entrepreneurship fundamentals and business opportunity identification* https://online.rnbglobal.edu.in/pdf/BA%20IV%20Semester%20Entrepreneurship.pdf
4	Foundations of Entrepreneurship Development https://tcc.tolani.edu/wp-content/uploads/2024/06/2.-Major-Business-Planning-and-Entrepreneurial-Management.pdf
5	*Types of entrepreneurs and entrepreneurial competencies* https://themba.institute/entrepreneurship/

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Course Title	**Digital Marketing**		
Course Code: 26CBCO11OED			**No. Of Credits: 02**
Course Type: GE/OE			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	To introduce the fundamentals of digital marketing and its role in the modern business environment.
2.	To provide foundational knowledge of Google-based digital marketing tools including search, ads, and analytics.
3.	To develop awareness of social media, influencer, and community-based marketing practices.
4.	To familiarize students with video, mobile, and e-commerce marketing techniques.
5.	To inculcate ethical, legal and responsible practices in digital marketing activities.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Explain the basic concepts, structure, and planning process of digital marketing and the digital consumer journey.
2.	Apply foundational Google-based digital marketing tools such as SEO, Google Ads, and web analytics to improve online visibility and performance.
3.	Use basic social media, content, video, mobile, and email marketing techniques suitable for the current digital marketing environment.
4.	Analyze digital marketing performance using basic metrics and analytical tools.
5.	Demonstrate responsible use of digital marketing tools by adhering to ethical practices, data privacy regulations, and cyber laws.

Unit No	Title with Contents	No. of Lectures
Unit I	**Introduction to Digital Marketing & Consumer Journey**	**8**
	1.Introduction to Digital Marketing in the Current Era	**1**
	2. Digital Marketing vs Traditional Marketing	**1**
	3. Inbound vs Outbound Marketing	**1**
	4. Digital Consumer Behavior & Customer Journey	**1**
	5. Digital Marketing Funnel (Awareness → Conversion → Retention)	**2**
	6. Content Marketing Basics (Blogs, Videos, Reels)	**1**
	7. Strategic Flow of Digital Marketing Activities	**1**
Unit II	**Google Digital Marketing Foundations**	**8**
	1. Google Digital Ecosystem Overview	**1**
	2. How Google Search Works (Crawling, Indexing, Ranking)	**1**
	3. Search Engine Results Page (SERP) Analysis	**1**
	4. Google SEO Fundamentals	**2**
	i. Keyword Types & Search Intent	
	ii. On-page, Off-page & Technical SEO (Basics)	**1**
	5. Introduction to Google Ads	
	i. Search, Display & YouTube Ads	
	ii. PPC, CPC, Quality Score (Conceptual)	**1**
	6. Google Analytics (GA4) Basics	
	i. Users, Sessions, Events, Conversions	**1**
	7. Google Business Profile & Local SEO	
Unit III	**Social Media, Influencer & Community Marketing**	**8**
	1. Social Media Marketing : Concepts & Strategy	**1**
	2. Social Media Platforms in Current Use	**2**
	i. Instragram and Reels	
	ii. YouTube & Shorts	
	iii. LinkedIn	
	3. Influencer Marketing(Nano, Micro, and Macro influencers)	**1**
	4. Content Planning and Content Calendar	**1**
	5. Engagement, Reach, and Growth Metrics	**1**
	6. Overview of Social Media Advertising	**1**
	7. Community Management and Brand Building	**1**
Unit IV	**Video, Mobile, E-Commerce & Digital Ethics**	**7**
	1. Video Marketing in the Short-Form Era	**1**
	2. YouTube Channel Basics & Optimization	**1**
	3. Mobile-First Marketing	**1**
	i. WhatsApp Marketing	
	ii. SMS & App-Based Promotions	
	4. E-Commerce Marketing Overview	**1**
	i. Amazon / Flipkart (Basics)	
	5. Conversion Rate Optimization (Landing Pages – Intro)	**1**
	6. Digital Marketing Ethics	**1**
	7. Cyber Laws, Data Privacy & Responsible Advertising	**1**

Suggested Reading	
1.	Concept Building Approach to Digital Marketing — Neeru Kapoor
2.	Digital Marketing — Dr. Shikha Mittal & Dr. Neha Sharma
3.	Foundations of Digital Marketing — Animesh Sharma
4.	Basics of Marketing and Digital Marketing — Dr. Arpita Baijal (Bharti Publications)
Website Reference Link:	
1.	Definition of digital marketing*;* Key areas like content marketing, social media marketing, SEO, email marketing ***https://blog.udemy.com/what-is-digital-marketing***
2.	Digital marketing tools*;* Examples of real-world digital marketing campaigns ***https://www.geeksforgeeks.org/blogs/what-is-digital-marketing/***
3.	Search Engine Optimization (SEO)*;* Social Media Marketing*;* Email Marketing ***https://www.tutorialspoint.com/digital_marketing_tutorials.htm***
4.	SEO & SEM overview; Email marketing fundamental **https://www.digital-coach.com/free-internet-marketing-course/**
5.	Fundamentals of digital marketing*;* SEO basics*;* Social media marketing overview ***https://gomaxoo.com/free-digital-marketing-course***

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F.Y.BSc (CA) SEM II (NEP Pattern-2026)

Course Title	**Lab III : Web Designing using HTML and CSS**		
Course Code: 26SBCA11VS			**No. Of Credits: 02**
Course Type: Vocational Skill Course			**Total Teaching Hours: 60**

Sr.No.	Course Objectives
1.	Understand the fundamentals of HTML and CSS, including syntax, structure, and semantics.
2.	Learn to design static web pages using HTML tags, attributes, and CSS styling techniques.
3.	Develop the ability to create responsive layouts using CSS properties like flexbox, grid, and media queries.
4.	Gain practical skills to embed multimedia, tables, forms, and links in web pages.
5.	Apply web design principles to develop interactive and visually appealing web pages.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Design structured web pages using HTML elements like headings, paragraphs, lists, links, images, and tables.
2.	Style web pages using CSS including colors, fonts, spacing, borders, and backgrounds to create visually appealing designs.
3.	Implement responsive layouts using CSS flexbox, grid, and media queries for different screen sizes.
4.	Create interactive forms and multimedia content for enhanced user experience.
5.	Develop small web projects integrating HTML and CSS to demonstrate practical web designing skills.

Assignment No	Assignment Name	No. of Sessions
1.	**Assignment: Understanding HTML structure; create a basic web page with headings, paragraphs, and lists.**	2
2.	**Assignment: Add hyperlinks, images, audio, and video elements;**	2
3.	**Assignment: Create tables for data presentation; design basic forms with input fields, buttons, and validation attributes.**	2
4.	**Assignment: Apply CSS for styling text, colors, fonts, and backgrounds; practice internal and external CSS usage**	2
5.	**Assignment: Learn CSS box model concepts (margins, padding, borders); practice element positioning and floating.**	2
6.	**Assignment: Create responsive web page layouts using CSS flexbox and grid; implement media queries for different screen sizes.**	2
7.	**Assignment: Develop a mini project (Portfolio, Student Info Page, or Product Page) integrating HTML structure, CSS styling, and responsive design.**	2
Total Sessions		**14**

Suggested Reading	
1.	Steven Holzner,"HTML Black Book", Dremtech press.
2.	Web Technologies, Black Book, Dreamtech Press
3.	Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4.	Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.
Website Reference Link	
1.	Basics of HTML, CSS: https://www.geeksforgeeks.org/web-technology/
2.	HTML Document Structure,Elements and Attributes :https://www.w3schools.com/html/html_intro.asp
3.	CSS Syntax and Selectors,Styling Text, Colors, and Fonts,Layouts: Box Model, Margins, Padding, Borders https://www.w3schools.com/css/
4.	CSS Basics and Types (Inline, Internal, External),Backgrounds, Borders, and Gradients https://www.javatpoint.com/css-tutorial

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F.Y.BSc (CA) SEM I (NEP Pattern-2026)

Course Title	**LAB II: DATABASE MANAGEMENT SYSTEM-I**		
Course Code: 26SBCA11SE			**No. Of Credits: 02**
Course Type: Skill Enhancement Course (SEC)			**Total Teaching Hours: 60**

Sr.No.	Course Objectives
1.	Design and draw E–R diagrams for real-world problem statements.
2.	Create and manage relational databases using SQL DDL commands.
3.	Insert, update, delete, and manipulate data in databases using SQL DML commands.
4.	Retrieve data efficiently using SQL queries, including filtering, sorting, and joining tables.
5.	Perform calculations and summaries on data using SQL aggregate functions and nested queries.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Develop E–R diagrams for given scenarios and translate them into relational database schemas.
2.	Create, alter, and manage database tables using SQL DDL commands.
3.	Perform data operations—insert, update, delete—and retrieve information using SQL DML and SELECT queries with conditions, sorting, and joins.
4.	Apply aggregate functions and nested queries to analyze and summarize data effectively.
5.	Implement learned skills to design and develop small, practical database applications or projects.

Assignment No	Assignment Name	No. of Sessions
1.	To create simple tables, with only the primary key constraint	2
2.	To create more than one table, with various constraints like referential integrity constraint, PK constraint, Check constraint, Unique constraint and Not null constraint	2
3.	To drop a table from the database, to alter the schema of a table in the Database.	2
4.	To insert, update and delete records using tables created in previous Assignments.	2
5.	Queries using Aggregate function, Group by clause, Order by clause, Having clause and queries on join	3
6.	Queries using set operations (union, intersect)	3
Total Sessions		**14**

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F.Y.BSc(CA) SEM II (NEP Pattern-2026)

Course Title	**Programming with C++**		
Course Code:	**26SBCA21MM**		**No. Of Credits: 02**
Course Type:	**Major Mandatory (MM)**		**Total Teaching Hours: 30**

Sr.No.	**Course Objectives**
1.	To study basics of Object Oriented Programming (OOP).
2.	To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism
3.	To use the object-oriented paradigm in program design.
4.	Provide programming insight using OOP constructs.
5.	To lay a foundation for advanced programming.

Sr.No.	**Course Outcome**
After completing the course, students will be able to -	
1.	**Understand** the fundamentals and concepts of Object-Oriented Programming (OOP).
2.	**Analyze** the strengths and advantages of object-oriented programming over procedural programming.
3.	**Design** and **apply** OOP principles such as encapsulation, inheritance, and polymorphism for effective programming.
4.	**Develop** practical programming applications using the C++ language.
5.	**Evaluate** and **demonstrate** the applicability of OOP concepts in solving real-world problems.

Unit No	Title with Contents	No. of Lectures
Unit I	**Basics of Programming**	**3**
	1. Need of Object-Oriented Programming (OOP) **2. Object-Oriented Programming Paradigm** **3. Basic Concepts of Object-Oriented Programming** **4. Advantages of Object-Oriented Programming** **5. Principles of Object-Oriented Programming** **6. C++ as an Object-Oriented Programming Language** **7. Syntax and Structure of C++ Programming** **8. Comments in C++** **9. Header Files**	**1** **1** **1**
Unit II	**Classes, Objects and Functions**	**8**
	1. Classes and Objects i. Class ii. Object iii. Class and Data Abstraction iv. Class Scope and Accessing Class Members v. Separating Interface from Implementation vi. Access Specifiers (Public, Private, Protected) vii. Static Class Members viii. Data Abstraction and Information Hiding 2. **Array of Objects**	 **1** **1** **1** **1** **1** **1** **2**
Unit III	**Functions, Constructor and Destructor**	**5**
	1. **Functions** i. Passing argument and returning values from function ii. Call and return by reference iii. Inline functions iv. Default and Const function arguments v. Friend Function vi. Function overloading **2. Constructors** i. Default constructor ii. Parameterized constructor iii. Copy constructor iv. Multiple constructors v. Constructors with default arguments vi. Dynamic constructor **3. Destructor**	**3** **2**
Unit IV	**Inheritance and Polymorphism**	**9**

	1. Operator Overloading i. Concept of Overloading ii. Operator Overloading iii. Overloading Unary Operators iv. Overloading Binary Operators **2. Inheritance** i. Base Class and Derived Class ii. Protected Members iii. Relationship between Base Class and Derived Class iv. Constructors and Destructors in Derived Class v. Overriding Member Functions vi. Public Inheritance vii. Private Inheritance viii. Levels of Inheritance ix. Multiple Inheritance **3. Polymorphism** i. Concept of Polymorphism ii. Relationship among Objects in an Inheritance Hierarchy iii. Abstract Classes iv. Runtime Polymorphism v. Compile-time Polymorphism	**3** **3** **3**
Unit V	**Virtual Functions**	**5**
	1. Virtual Functions i. Need for Virtual Functions ii. Virtual Function iii. Dynamic Binding **2. Other C++ Concepts** i. Static Functions ii. Assignment and Copy Initialization iii. this Pointer	**2** **3**

Suggested Reading	
1.	Bjarne Stroustrup, "The C++ Programming language", Third edition, Pearson Education. ISBN 9780201889543.
2.	E.Balagurusamy,Programming with C++,Tata McGraw Hill, 3rd Edition
3.	Deitel, "C++ How to Program", 4thEdition, Pearson Education, ISBN:81-297-0276-2
Website Reference Link:	
1.	C++ Basics ,Control Flow ,Object-Oriented Programming concepts https://www.geeksforgeeks.org/cpp/cpp-programming-intro/
2.	C++ Introduction and Getting Started; Variables and Data Types; Functions and Object-Oriented Programming https://www.w3schools.com/cpp/?utm_source=chatgpt.com
3.	Compilation, Execution, Basic Input/Output https://www.tutorialspoint.com/cplusplus/index.htm?utm_source=chatgpt.com

Best IDE Tools:		
Sr.No	**Name of IDE or Tools**	**Operating System**
1	Turbo C++	Window Operating System
2	Eclipse IDE for C/C++ (CDT)	Windows / Linux / macOS

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F.Y.BSc (CA) SEM II (NEP Pattern-2026)

Course Title	**Database Management System-II**		
Course Code: 26SBCA22MM			**No. Of Credits: 02**
Course Type: Major Mandatory (MM)			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	Understand the structure and commands of PL/SQL/PostgreSQL for database programming and manipulation.
2.	Apply control structures, loops, and conditional statements to automate database tasks.
3.	Design and implement views, functions, cursors, and triggers for database operations.
4.	Analyze and manage transactions, concurrency, and conflicting operations to maintain database integrity.
5.	Implement crash recovery, logging, checkpoints, and access control methods for secure and reliable database systems.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Write PL/SQL/PostgreSQL programs using conditional statements, loops, and procedural constructs.
2.	Create and manage database objects such as views, functions, triggers, and cursors for real-world applications.
3.	Control transactions and ensure data consistency using properties of transactions, schedules, locks, and deadlock handling techniques.
4.	Implement recovery mechanisms including deferred and immediate updates, checkpoints, rollbacks, and log-based recovery methods.
5.	Apply access control methods (discretionary, mandatory, and role-based) to enforce security and multilevel database protection.

Unit No	Title with Contents	No. of Lectures
Unit I	**PL/pgSQL Programming in PostgreSQL**	**12**
	1. PL/PostgreSQL: Language structure **2. Controlling the program flow** i. conditional statements ii. loops **3. Views** **4. Functions** **5. Handling errors and exceptions** **6. Cursors** **7. Triggers**	**1** **2** **2** **2** **1** **2** **2**
Unit II	**Transaction and Concurrency Control**	**12**
	1. Transaction i. Properties of transaction ii. States of transactions iii. Concurrent execution of iv. transactions v. conflicting operations **2. Schedules** i. Types of schedules **3. Concept of Serializability** i. Precedence graph for Serializability **4. Ensuring Serializability by locks** i. Different lock modes **5. Basic timestamp method for concurrency** **6. Deadlock handling methods –** i.Detection and Recovery a. Wait for graph ii.Prevention algorithms a. Wound-wait b. Wait-die iii.Deadlock recovery techniques a. Selection of Victim, b. Starvation, c. Rollback	**2** **2** **1** **1** **2** **3**
Unit III	**Crash Recovery**	**06**
	1. Recovery concepts **2. Recovery with concurrent transactions** i. Rollback ii. Checkpoints iii. Commit **3. Log base recovery techniques** i. Deferred and Immediate update **4. Access Control Method** i. Discretionary access control method ii. Mandatory access control iii. Role based access control for multilevel security	**1** **1** **3** **1**

Suggested Reading	
1.	Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan, Tata McGraw-Hill Education, ISBN:9780071289597
2.	Database Systems, Shamkant B. Navathe, Ramez Elmasri, PEARSON, ISBN:9780132144988
3.	An introduction to Database systems, Bipin C Desai, Galgotia Publications
4.	Database Management Systems ,Raghu Ramakrishna, McGraw-Hill, Second Edition, ISBN:9780071254342
5.	Beginning Databases with Postgre SQL: From Novice to Professional, Richard Stones, Neil Matthew, Apress, Second Edition, ISBN: 9781590594780
6.	Fundamentals of Relational Database Management Systems - S. Sumathi and S. Esakkirajan, Springer Berlin Heidelberg New York, ISBN-13 978-3-540-48397- 7
Website Reference Link:	
1.	Overview of PL/pgSQL features, Basic PL/pgSQL programs, control flow, functions and triggers *https://www.geeksforgeeks.org/postgresql/introduction-to-postgresql-pl-pgsql/*
2.	Managing transactions with COMMIT and ROLLBACK in PL/pgSQL https://www.postgresql.org/docs/current/plpgsql-transactions.html
3.	PL/pgSQL blocks, variables, control structures, user-defined functions and procedures https://www.pgtutorial.com/plpgsql/
4.	conceptual overview of crash recovery ,https://www.cybertec-postgresql.com/en/postgresql-recovery-internals/

Best IDE Tools:		
Sr.No	**Name of IDE or Tools**	**Operating System**
1	Postgresql 11.0 onwards	Window Operating System
2	Postgresql 11.0 onwards	Red Hat /Linux / Ubuntu

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F.Y.BSc (CA) SEM II (NEP Pattern-2026)

Course Title	**Lab I : Programming with C++**		
Course Code: 26SBCA23MM			**No. Of Credits: 02**
Course Type: Major Mandatory (MM)			**Total Teaching Hours: 60**

Sr.No.	Course Objectives
1.	To study basics of Object Oriented Programming (OOP).
2.	To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism
3.	To use the object-oriented paradigm in program design.
4.	Provide programming insight using OOP constructs.
5.	To lay a foundation for advanced programming.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Explore the basics of OOP
2.	Analyze the strengths of object oriented programming
3.	Design and apply OOP principles for effective programming.
4.	Develop programming application using object oriented programming language C++
5.	Achieve applicability of OOP

Assignment No	Assignment Name	No. of Sessions
1.	**Apply basic OOP concepts and C++ syntax**	02
2.	**Design programs using classes and objects**	04
3.	**Implement functions, constructors, and destructors**	03
4.	**Use inheritance, operator overloading, and polymorphism**	02
5.	**Implement virtual functions and advanced C++ features**	03
Total Sessions		14

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F.Y.BSc (CA) SEM II (NEP Pattern-2026)

Course Title	**Search Engine Optimization**		
Course Code: 26CBCO21OED			**No. Of Credits: 02**
Course Type: GE/OE			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	To introduce students to the fundamentals of search engines and the role of SEO in digital marketing.
2.	To develop an understanding of on-page, off-page, and technical SEO techniques for website optimization.
3.	To enable learners to perform basic keyword research and create SEO-friendly content.
4.	To familiarize students with essential SEO tools and performance measurement techniques.
5.	To familiarize students with essential SEO tools and performance measurement techniques.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Understand the working of search engines
2.	Apply on-page and off-page SEO techniques
3.	Use basic SEO tools for website optimization
4.	Analyze website performance using analytics
5.	Understand the working of search engines

Unit No	Title with Contents	No. of Lectures
Unit I	**Introduction to Search Engines & SEO Fundamentals**	**7**
	1. Overview of Search Engines (Google, Bing, Yahoo) **2. How Search Engines Work** i. Crawling, Indexing, Ranking **3. Introduction to SEO** i. Definition, Importance, Scope **4. Types of SEO** i. On-Page SEO ii. Off-Page SEO **iii.** Technical SEO **5. White Hat, Black Hat & Grey Hat SEO** **6. Search Engine Algorithms (Basic Understanding)** **7. SEO Terminologies and Metrics**(SERP,CTR,Bounce Rate, Impressions)	**1** **1** **1** **1** **1** **1** **1**
Unit II	**On-Page SEO Techniques**	**6**
	1. Keyword Research i. Short-tail & Long-tail Keywords ii. Search Intent **2. Tools for Keyword Research (Intro Level)** i. Google Keyword Planner ii. Ubersuggest iii. AnswerThePublic iv. Ahrefs (Basic Awareness) **3. On-Page Optimization Techniques** i. Title Tags & Meta Descriptions ii. URL Optimization iii. Header Tags (H1–H6) iv. Image Optimization (Alt Text)	**2** **2** **2**
Unit III	**Off-Page SEO & Technical SEO**	**8**
	1. Backlinks & Link Building **2. Types of Backlinks** **3. Techniques of Off-Page SEO** i. Guest Posting ii. Social Bookmarking iii. Directory Submission **4. Importance of Domain Authority & Page Authority** **5. Technical SEO** i. Website Speed Optimization ii. Mobile-Friendly Websites iii. HTTPS & SSL iv. Robots.txt & XML Sitemap v. Basic SEO Audit Concepts	**1** **1** **2** **1** **3**
Unit IV	**SEO Tools, Analytics & Trends**	**9**

	1. Introduction to SEO Tools i. Google Search Console ii. Google Analytics (Basic metrics) iii. Keyword & SEO Audit Tools **2. Measuring SEO Performance** i. Traffic Analysis ii. Ranking Reports **3. Local SEO Basics** i. Google My Business **4. Common SEO Mistakes** **5. Latest SEO Trends** i. Voice Search ii. AI & SEO iii. Mobile-First Indexing **6. Career Opportunities in SEO**	**2** **2** **2** **2** **1**

Suggested Reading	
1.	The Art of SEO: Mastering Search Engine Optimization Authors: Eric Enge, Stephan Spencer, Jessie Stricchiola, Rand Fishkin
2.	Search Engine Optimisation Authors: Varinder Taprial & Priya Kanwar
3.	Step by Step Guide to SEO Author: Upendra Rana
4.	SEO Workbook: Search Engine Optimization Success in Seven Steps Author: Jason McDonald, Ph.D.
Website Reference Link:	
1.	*Overview of SEO concepts, SEO glossary and prerequisites, Basic SEO guidelines and how SEO works* https://data-flair.training/blogs/seo-tutorial/?utm_source=chatgpt.com
2.	*SEO techniques to improve traffic and ranking, Content optimization, backlink practices, competitor analysis, Internal/external linking and content freshness* https://www.geeksforgeeks.org/seo-techniques-introduction-tips-and-how-it-helps-to-increase-traffic-and-ranking/?utm_source=chatgpt.com
3.	*SEO overview and fundamentals, SEO strategies to boost visibility, Best practices for content and link credibility* https://www.tutorialspoint.com/seo/index.htm?utm_source=chatgpt.com
4.	*Search-friendly content principles, SEO starter concepts for developers, Ensuring site compatibility with Google Search requirements* https://developers.google.com/search/docs/fundamentals/get-started-developers?utm_source=chatgpt.com

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Course Title	**Operating System**		
Course Code: 26SBCA21VS			**No. Of Credits: 02**
Course Type: Vocational Skill Course			**Total Teaching Hours: 30**

Sr.No.	Course Objectives
1.	To introduce the fundamental concepts, structure, types, and role of operating systems
2.	To familiarize students with Linux OS, open-source concepts, and basic Linux operations
3.	To explain process concepts, lifecycle, and basic process coordination mechanisms
4.	To introduce CPU scheduling concepts, algorithms, and performance evaluation methods
5.	To explain memory organization, allocation techniques, and virtual memory concepts

Sr.No.	Course Outcome
After completing course students will be able to -	
1.	Describe the concepts, types, structure, and functions of operating systems
2.	Execute basic Linux commands, file systems, and user operations in a Linux environment
3.	Implement basic concepts of process management, IPC, and multithreading
4.	Apply and evaluate CPU scheduling algorithms using performance measures
5.	Apply memory management techniques and page replacement algorithms

Unit No	Title with Contents	No. of Lectures
Unit I	**Introduction to Operating System**	**06**
	1. Definition of Operating System **2. Objectives and functions of OS** **3. Evolution of Operating Systems** **4. Types of Operating Systems:** i. Batch OS ii. Multiprogramming OS iii. Multitasking OS iv. Multiuser OS v. Real-Time OS **5. OS structure (basic overview)** **6. OS as an interface between user and hardware** **7. System software vs Application software**	1 1 1 1 1 1
Unit II	**Introduction to Linux**	**06**
	1. Introduction to Linux **2. Features of Linux** **3. Linux architecture** **4. Open-source concept** **5. Linux file system structure** **6. Basic Linux commands:** i. File commands (ls, cp, mv, rm, cat, touch) ii. Directory commands (pwd, cd, mkdir, rmdir) iii. Permission commands (chmod, chown) **7. User and group management (basic)** **8. Shell and terminal concept**	1 1 1 2 1
Unit III	**Process Management**	**06**
	1. Program vs Process **2. Process concept** **3. Process states** **4. Process Control Block (PCB)** **5. Process lifecycle** **6. Context switching** **7. Inter-Process Communication (IPC) – basic concept** **8. Threads and multithreading (introduction)**	2 1 1 2
Unit IV	**CPU Scheduling**	**06**
	1. CPU scheduling concept **2. Scheduling criteria** **3. Preemptive and non-preemptive scheduling** **4. Scheduling algorithms:** i. First Come First Serve (FCFS) ii. Shortest Job First (SJF) iii. Priority Scheduling iv. Round Robin Scheduling **5. Performance measures:** i. Turnaround time ii. Waiting time iii. Response time	1 3 2

	6. Introduction to multiprocessor scheduling	
Unit V	**Memory Management**	**06**
	1. Memory hierarchy **2. Logical vs Physical memory** **3. Memory allocation techniques:** i. Fixed partitioning ii. Variable partitioning **4. Fragmentation (internal and external)** **5. Paging** **6. Virtual memory** **7. Demand paging** **8. Page replacement algorithms**: i. FIFO ii. LRU (conceptual)	2 2 2

Suggested Reading
Operating System Concepts, Avi Silberschatz, Peter Galvin, Greg Gagne, 8th Edition, Wiley Asia
Operating Systems: Internals and Design Principles, William Stallings, Prentice Hall of India.
The Design of the UNIX Operating System By Maurice J. Bach., PHI publication
http://www.uobabylon.edu.iq/download/M.S%202013-2014/Operating_System_Concepts,_8th_Edition%5BA4%5D.pdf
Website Reference Link:
Operating System Tutorial https://www.geeksforgeeks.org/operating-systems/operating-systems/
CPU Scheduling in Operating Systems https://www.geeksforgeeks.org/operating-systems/cpu-scheduling-in-operating-systems/
Operating system Overview https://www.tutorialspoint.com/operating_system/os_overview.htm

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F.Y.BSc (CA) SEM II (NEP Pattern-2026)

Course Title	**Lab II: Database Management System-II**		
Course Code:	**26SBCA21SE**	**No. Of Credits:**	**02**
Course Type:	**Skill Enhancement Course(SEC)**	**Total Teaching Hours:**	**60**

Sr.No.	Course Objectives
1.	To introduce students to the fundamentals of search engines and the role of SEO in digital marketing.
2.	To develop an understanding of on-page, off-page, and technical SEO techniques for website optimization.
3.	To enable learners to perform basic keyword research and create SEO-friendly content.
4.	To familiarize students with essential SEO tools and performance measurement techniques.
5.	To familiarize students with essential SEO tools and performance measurement techniques.

Sr.No.	Course Outcome
After completing the course, students will be able to -	
1.	Understand the working of search engines
2.	Apply on-page and off-page SEO techniques
3.	Use basic SEO tools for website optimization
4.	Analyze website performance using analytics
5.	Understand the working of search engines

Assignment No	Assignment Name	No. of Sessions
1.	**Assignments on Functions**	2
2.	**Assignments on Functions : Parameterized Function**	2
3.	**Assignments on Views : Simple View**	2
4.	**Assignments on Views : Complex Views (Create views using joins and aggregate functions)**	2
5.	**Assignments on Cursor : Explicit Cursor**	2
6.	**Assignments on Cursor : Parameterized Cursor**	2
7.	**Assignments on Trigger**	2
Total Sessions		**14**