



Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Four Year B.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

CBCS Syllabus

F.Y.B.Sc.(Computer Science) Semester -II

For Department of Computer Science

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2023 Pattern)

(As Per NEP 2020)

To be implemented from Academic Year 2023-2024

(Eligibility : 12th Science with Mathematics)

Title of the Programme: F.Y.B,Sc (Computer Science)

Preamble

AES's Tuljaram Chaturchand College has made the decision to change the syllabus of across various faculties from June, 2023 by incorporating the guidelines and provisions outlined in the National Education Policy (NEP), 2020. The NEP envisions making education more holistic and effective and to lay emphasis on the integration of general (academic) education, vocational education and experiential learning. The NEP introduces holistic and multidisciplinary education that would help to develop intellectual, scientific, social, physical, emotional, ethical and moral capacities of the students. The NEP 2020 envisages flexible curricular structures and learning based outcome approach for the development of the students. By establishing a nationally accepted and internationally comparable credit structure and courses framework, the NEP 2020 aims to promote educational excellence, facilitate seamless academic mobility, and enhance the global competitiveness of Indian students. It fosters a system where educational achievements can be recognized and valued not only within the country but also in the international arena, expanding opportunities and opening doors for students to pursue their aspirations on a global scale.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Computer Science and related subjects, the Board of Studies in Computer Science at Tuljaram Chaturchand College, Baramati - Pune, has developed the curriculum for the first semester of F.Y.B.Sc.(Computer Science), which goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, LOCF (UGC), NCrf, NHEQF, Prof. R.D. Kulkarni's Report, Government of Maharashtra's General Resolution dated 20th April and 16th May 2023, and the Circular issued by SPPU, Pune on 31st May 2023.

A degree in Computer Science subject equips students with the knowledge and skills necessary for a diverse range of fulfilling career paths-Career in Computer Science is considered one of the most high-paying jobs and is full of opportunities; particularly when India's prowess in information technology industry is recognized across the globe. The pool of talented computer professionals working in IT companies of the USA, Canada and other

countries shows that IT can take a person to higher levels. Numerous IT companies from India employ huge number of computer professionals in their Indian and overseas offices. Students who are interested in programming, software development, and have good analytical and reasoning skills may pursue this course. Job opportunities are available for Graduates and Post Graduates in Government as well as Private sector. Graduates may take up the following job posts- Software Engineer, Software Tester, Data Analyst, Project Manager, Network Administrator, database administrator and Application Developer.

Overall, revising the Computer Science syllabus in accordance with the NEP 2020 ensures that students receive an education that is relevant, comprehensive, and prepares them to navigate the dynamic and interconnected world of today. It equips them with the knowledge, skills, and competencies needed to contribute meaningfully to society and pursue their academic and professional goals in a rapidly changing global landscape.

Programme Specific Outcomes (PSOs)
for
B.Sc. (Computer Science)

PSO1: Apply fundamental principles and methods of Computer Science to a widerange of applications.

PSO2: Design, correctly implement and document solutions to significant computational problems.

PSO3: Impart an understanding of the basics of our discipline.

PSO4: Prepare for continued professional development.

PSO5: Understand the impact of the IT analyst solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

PSO6: Develop proficiency in the practice of computing.

PSO7:Develop the capacity to study and research independently that will help to develop skills for transition to employment in hardware/software companies.

Anekant Education Society's
Tuljaram Chaturchand College, Baramati
(Autonomous)

Board of Studies (BOS) in Computer Science

From 2022-23 to 2024-25

Sr.No.	Name	Designation
1.	Dr. Upendra Choudhari	Chairman
2.	Dr. Vilas Kardile	Member
3.	Mr. Abhijeet Mankar	Member
4.	Mr. Vishal Shaha	Member
5.	Mrs. Prajakta Kulkarni	Member
6.	Mrs. Asmita Bhagat	Member
7.	Mr. Rahul Shah	Member
8.	Dr. Shashikant Nakate	Member
9.	Mr. Purushottam Dixit	Member
10.	Mr. Swapnil Chemte	Member
11.	Mrs. Kalyani Londhe	Member
12.	Mrs. Poornima Gavimath	Member
13.	Dr. Kavita A. Khobragade	Vice-Chancellor Nominee
14.	Dr. Sudhakar Bhoite	Expert from other University
15.	Dr. Suhas S. Satonkar	Expert from other University
16.	Mr. Rohit Shah	Industry Expert
17.	Mr. Yogesh More	Meritorious Alumni
18.	Mr. Abhijeet Chopade	Student Representative
19.	Miss. Rutuja Harihar	Student Representative
20.	Mr. Akshada Kulkarni	Student Representative
21.	Mr. Prajwal Nimbalkar	Student Representative

Credit Distribution Structure for F.YB.Sc.(Computer Science)-2023-2024

Level	SEM	Major		Minor	GE/OE	VSC, SEC (VSEC)	AEC, VEC, IKS	OJT, FP, CEP, CC, RP	Cum. Cr./ Sem.	Degree/ Cum. Cr.
		Mandatory	Electives							
4.5	I	COS-101-MJM: Basic Programming using C COS-102-MJM: DBMS COS-103-MJM: Computer Science Practical – I Credits-2+2+2	--	--	COS-116-OE: Internet Awareness (TH) COS-117-OE: Introduction to MS-Office (PR) Credit- 2+2	COS-126-SEC(ST): Introduction to Statistical Software OR (PR) COS-126-SEC(MT) Mathematics for Computer Science OR COS-126-SEC(EL) Electronics Pract.-I COS-121-VSC:(TH) Problem Solving Skills & DBMS Using PostgreSQL Credit- 2+2	ENG-131-AEC: Functional English – I COS-137-IKS: Evolution of Computer COS-135-VEC: Environmental Science Credit- 2+2+2	CC: NSS/NCC/Yoga/ Cultural Activity/Sports Credit- 2	22	UG Certificate 44
	II	COS-151-MJM::: Advanced Programming Using C COS-152-MJM: Relational Database Management System COS-153-MJM: Computer Science Practical – II Credits-2+2+2		COS-161-MN (A)::: Exploratory Data Analysis-I OR COS-161-MN(B): Discrete Mathematics Credits-2 OR COS-161-MN (C)::: Fundamentals of Electronics COS-161-MN (D): Computer Fundamentals Credits-2	COS-166-OE Advanced MS-Excel COS-167-OE E-Banking Credit- 2+2	COS-176-SEC: Basic Graphics Design using C COS-171-VSC: Database Applications using PL/pgSQL Credit- 2+2	ENG-181-AEC: Functional English – II COS-185-VEC: Digital and Technological Solutions Credit- 2+2	CC: NSS/NCC/Yoga/ Cultural Activity/Sports Credit- 2	22	
	Cum Cr.	12	-	2	8	8	10	4	44	
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor * 1 Credit = 15 hr.										

Course Structure for F. Y. B. Sc. (Computer Science) (2023 Pattern)

Sem.	Course Type	Course Code	Title of Course	Course Types	No. of Credits
I	Major Mandatory	COS-101-MJM	Basic Programming using C	Theory	2
	Major Mandatory	COS-102-MJM	DBMS	Theory	2
	Major Mandatory	COS-103-MJM	Computer Science Practical	Practical	2
	Open Elective (OE)	COS-116-OE	Internet Awareness	Theory	2
	Open Elective (OE)	COS-117-OE	Introduction to MS-Office	Practical	2
	Skill Enhancement Course (SEC) (Any one)	COS-126-SEC(ST) COS-126-SEC(MT) COS-126-SEC(EL)	Introduction to Statistical Software Mathematics for Computer Science Electronics	Practical	2
	Vocational Skill Course (VSC)	COS-121-VSC	Problem Solving Skills & DBMS Using PostgreSQL	Theory	2
	Ability Enhancement Course (AEC)	ENG-131-AEC	Functional English - I	Theory	2
	Value Education Course (VEC)	COS-135-VEC	Environmental Science	Theory	2
	Indian Knowledge System (IKS)	COS-137-IKS	Evolution of Computers	Theory	2
Co-curricular Course (CC)	-----	To be selected from the Basket	-----	2	
Total Credits I:					22
II	Major Mandatory	COS-151-MJM	Advanced Programming Using C	Theory	2
	Major Mandatory	COS-152-MJM	Relational Database Management System	Theory	2
	Major Mandatory	COS-153-MJM	Computer Science Practical	Practical	2
	Minor (For B.Sc.(CS)) (Any one)	COS-161-MN (A) COS-161-MN (B) COS-161-MN (C)	Exploratory Data Analysis-I Discrete Mathematics Fundamentals of Electronics	Theory	2
	Minor (For Others)	COS-161-MN (D)	Computer Fundamentals	Theory	2
	Open Elective (OE)	COS-166-OE	Advanced MS-Excel	Practical	2
	Open Elective (OE)	COS-167-OE	E-Banking	Theory	2
	Vocational Skill Course (VSC)	COS-171-VSC	Database Applications using PL/pgSQL	Theory	2
	Skill Enhancement Course (SEC)	COS-176-SEC	Basic Graphics Design using C	Practical	2
	Ability Enhancement Course (AEC)	ENG-181-AEC	Functional English – II	Theory	2
	Value Education Course (VEC)	COS-185-VEC	Digital and Technological Solutions	Theory	2
	Co-curricular Course (CC)	-----	To be selected from the Basket	-----	2
Total Credits II:					22
Cumulative Credits Semester I and II:					44

SYLLABUS (CBCS as per NEP 2020) FOR F. Y. B. Sc. (Computer Science)

Sem-II

(w.e.f. A.Y. 2023-24)

Name of the Program	: B.Sc. Computer Science
Program Code	: USCOS
Class	: F.Y.B.Sc. (Computer Science)
Semester	: II
Course Type	: Major
Course Name	: Advanced Programming using C (TH)
Course Code	: COS-151-MJM
No. of Lectures	: 30
No. of Credits	: 02

A) Course Objectives:

1. Introduce students to the advanced concepts of C programming
2. Learn to develop complex programs
3. Enhanced ability to define and manage data structures based on problem subject domain
4. Define and use of pointers with simple applications
5. Master the use of strings, structures, pointers
6. Gain proficiency in working with files and preprocessor directives
7. Introduce file handling and basic I/O operations

B) Course Outcomes:

CO1: Apply appropriate Control structures to solve problems

CO2: Implement strings in C code.

CO3: Manage I/O operations in your C program

CO4: Repeat the sequence of instructions and points for a memory location

CO5: Implement functions towards performing operations on Files

CO6: Improve code efficiency and optimization

CO7: Explain the uses of pre-processors and various memory models

Units	Contents	No. of Lectures
Unit 1	Strings 1.1 String Literals, string variables, declaration initialization, format specifiers 1.2 Standard library functions 1.3 Strings and pointers 1.4 Array of strings 1.5 Command Line Arguments	06
Unit 2	Structures and Unions 2.1 Introduction, definition, initialization 2.2 Accessing structure members 2.3 Use of Typedef	08

	2.4 Array of structures 2.5 Passing structures to functions 2.6 Nested structures 2.7 Pointers and structures 2.8 Concept of Union 2.9 Difference between structures and unions	
Unit 3	Pointers 3.1 Introduction to Pointers, Types of pointers 3.2 Declaration, definition, initialization, dereferencing 3.3 Pointer arithmetic 3.4 Pointer to pointer 3.5 Arrays and pointers 3.6 Functions and pointers – passing pointers to functions, function returning pointers 3.7 Dynamic memory allocation: 3.8 Dangling pointers	08
Unit 4	File Handling 4.1 Streams 4.2 Types of Files 4.3 Operations on files 4.4 Standard library input/output functions 4.5 Random access to files	04
Unit 5	C Preprocessor 5.1 Format of Preprocessor directive 5.2 File Inclusion directive 5.3 Macro substitution, nested macro, argumented macro 5.4 Macros VS Functions	04

Text Books:

1. Mr. Kamil Ajmal Khan and Mrs. Deepali N. Bhoskar: Advanced C programming, Nirali Prakashan
2. Dr. Poonam Ponde. Advanced C programming, Vision Publication

References Books:

1. Yashavant Kanetkar: Let Us C ,7th Edition, PBP Publications
2. E Balaguruswamy : Programming in ANSI C 7th Edition, Tata Mc-Graw Hill Publishing Co.Ltd.-New Delhi
3. Brian W. Kernighan and Dennis M. Ritchie: The C Programming Language 2nd Edition, Prentice Hall Publication
4. Herbert Schildt, The Complete Reference to C
5. Harrow, Problem Solving with C
6. Ajay Mittal, Programming in C,A practical Approach,Pearson

E-Resources links:

1. <https://www.tutorialspoint.com/cprogramming/index.htm>
2. <https://www.w3schools.com/c/index.php>
3. <https://www.guru99.com/c-programming-tutorial.html>
4. <https://www.geeksforgeeks.org/c-programming-language/>
5. <https://nptel.ac.in/courses>

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	2	1
CO2	2	2	2	1	2	2	1
CO3	3	3	3	1	1	2	1
CO4	2	2	2	1	2	1	1
CO5	3	3	2	1	2	1	1
CO6	3	3	2	1	2	2	2
CO7	2	3	3	1	2	1	1

SYLLABUS (CBCS as per NEP 2020) FOR F. Y. B. Sc. (Computer Science)

Sem-II

(w. e. f. A.Y. 2023-2024)

Name of the Programme	: B.Sc. Computer Science
Program Code	: USCOS
Class	: F. Y. B. Sc. (Computer Science)
Semester	: II
Course Type	: Major (TH)
Course Name	: Relational database management system
Course Code	: COS-152-MJM
No. of Lectures	: 30
No. of Credits	: 02

A) Course objective:

1. Understand concepts of transaction processing & concurrency control
2. Learn Deadlock and its detection, Prevention and recovery.
3. Understand concept of database integrity & integrity constraints.
4. Learn Recovery concepts in database.
5. Study of database backup and recovery technique.
6. Understand the other databases like xml, NoSQL, etc.

B) Course Outcomes:

- CO1: Understand the concepts of relational database management system.
 CO2: Understand transaction management concept in RDBMS.
 CO3: Know the concepts of Time stamping and locking.
 CO4: Analyse the recovery system of different databases.
 CO5: Apply normalization concept to real world problems
 CO6: Know the information about different databases.
 CO7: Understand database integrity & security concept.

Units	Title & Content	No. of lectures
Unit 1	<p>Transaction concepts and concurrency control</p> <p>1.1 Describe a Transaction, Properties of Transaction, State of the Transaction</p> <p>1.2 Executing Transaction concurrently Associated Problem in Concurrent Execution</p> <p>1.3 Schedules, Types of Schedules, Concept of Serializability, Precedence graph for Serializability</p> <p>1.4 Ensuring Serializability by locks, different lock modes, 2PL and its variations.</p> <p>1.5 Basic timestamp method for concurrency, Thomas Write Rule.</p> <p>1.6 Locks with multiple granularity, dynamic database concurrency (Phantom Problem).</p>	10

	1.7 Timestamps versus locking. 1.8 Deadlock and deadlock handling - Deadlock Avoidance (wait-die, wound-wait), Deadlock Detection and Recovery (Wait for graph).	
Unit 2	Database Integrity and Security Concepts 2.1 Domain Constraint 2.2 Referential Integrity 2.3 Introduction to database security concepts 2.4 Methods for database security ➤ Discretionary access control method ➤ Mandatory access control ➤ Role base access control for multilevel security. 2.5 Use of views in security Enforcement. 2.6 Overview of encryption technique for security. 2.7 Statistical database security.	12
Unit 3	Crash Recovery 3.1 Failure classification 3.2 Recovery concepts 3.3 Log base recovery techniques (Deferred and Immediate update) 3.4 Checkpoints, Relationship between database manager and buffer Cache. Aries recovery algorithm 3.5 Recovery with concurrent transactions (Rollback, checkpoints, commit) 3.6 Database backup and recovery from catastrophic failure	04
Unit 4	Other Databases 4.1 Introduction to Parallel and distributed Databases 4.2 Introduction to Object Based Databases 4.3 XML Databases 4.4 NoSQL Database 4.5 Multimedia Databases 4.6 Big Data Databases	04

NOTE: To understand, knowing & handling database in small- & large-scale IT industries, so students must visit & observing different IT industries

Book References:

1. Database System Concepts, By Silberschatz A., Korth H., Sudarshan S., 6th Edition, McGraw Hill Education
2. Database Management Systems, Raghu Ramakrishnan, Mcgraw-Hill Education
3. Database Systems, Shamkant B. Navathe, Ramez Elmasri, PEARSON HIGHER EDUCATION
4. Fundamentals of Database Systems, By: Elmasri and Navathe, 4th Edition Practical PostgreSQL O'REILLY

5. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3 editions, ISBN: 9780072465631
6. NoSQL Distilled, Pramod J. Sadalage and Martin Fowler, Addison Wesley
7. An Introduction to Database Systems”, C J Date, Addison-Wesley
8. Database Systems: Concepts, Design and Application”, S.K.Singh, Pearson, Education
9. NoSQL Distilled A Brief Guide to the Emerging World of Polyglot Persistence: by Pramod J. Sadalage, Martin Fowler, Addison-Wesley, Pearson Education, Inc.
10. MongoDB: The Definitive Guide, Kristina Chodorow, Michael Dirolf, O’Reilly Publications

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	1	3
CO2	1	3	1	1	1	1	3
CO3	3	3	3	3	1	1	3
CO4	3	3	3	3	1	3	1
CO5	3	3	1	1	1	1	1
CO6	3	3	3	1	1	1	3
CO7	3	3	3	1	1	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

SYLLABUS (CBCS as per NEP 2020) FOR F. Y. B. Sc. (Computer Science)

Sem-II

(w. e. f. A.Y. 2023-2024)

Name of the Programme	: B.Sc. Computer Science
Program Code	: USCOS
Class	: F. Y. B.Sc. (Computer Science)
Semester	: II
Course Type	: Major
Course Name	: Computer Science Practical – II (PR)
Course Code	: COS-153-MJM
No. of Practical's	: 15 (60 Hours)
No. of Credits	: 02

A) Course Objectives:

1. Implement problem solving skills using pointer concept
2. Learn the functions of Structures and Unions
3. Working with files using the programming language.
4. Master the use of functions and modular programming
5. Understand design and implementation of a relational database system.
6. Study physical, logical database designs and database modelling.
7. Understanding and development of essential RDBMS concepts.

B) Course Outcomes:

- CO1: To solve real world computational problems.
 CO2: To define and manage data structures based on problem subject domain.
 CO3: To work with textual information, characters and strings
 CO4: To Manage I/O operations in your C program.
 CO5: Understand the advanced database concepts and database management system.
 CO6: Apply advanced SQL features like views database Management
 CO7: Analyse PL/SQL structures like functions, procedures, cursors and triggers for Database applications

	Title of Experiment/ Practical
1	Use of pointers and Dynamic Memory allocation
2	Concept of strings, Array of strings.
3	Strings using standard library functions
4	Use of Structures and unions
5	C Pre-processor directives
6	Command line arguments
7	File handling
8	Case study
9	Nested Queries, using aggregate functions

10	Queries using Views
11	Stored Function
12	Cursors
13	Exception Handling
14	Triggers
15	Case study

Mapping of this course outcomes with Programme outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	2	1	2
CO2	2	1	2	2	2	1	2
CO3	3	3	2	1	2	1	1
CO4	3	3	2	1	2	1	1
CO5	3	2	2	1	2	1	1
CO6	3	3	2	1	1	2	1
CO7	3	2	1	1	1	2	1

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

SYLLABUS (CBCS as per NEP 2020) FOR U.G. Courses Semester-II
(w. e. f. 2023-24)

Name of the Program	: B.Sc. Computer Science
Program Code	: USCOS
Class	: U. G. Courses
Semester	: II
Course Type	: Minor
Course Name	: Computer Fundamentals (TH)
Course Code	: COS-161-MN (D)
No. of Lectures	: 30
No. of Credits	: 02

A) Course Objectives:

1. Understand basic concepts of computers.
2. Knowing different computer languages.
3. Understand different components of computer.
4. Knowing structure of computer.
5. Knowing the current technologies and applications.
6. Understand concept of networking and Internet services.

B) Course Outcomes: Students will be able to:-

- CO1: Understand fundamental concepts of computer
 CO2: Know structure and working of computer
 CO3: Know history and different generations of computer
 CO4: Understand an Operating system
 CO5: Understand concept of input and output devices
 CO6: Know the concept of computer networking
 CO7: Understand current technologies in computer science

Units	Title & Content	No. of lectures
Unit 1	Knowing Computers 1.1 Introduction to computer 1.2 History and Generations of computer 1.3 Characteristics of Computer 1.4 Classification of computer 1.5 Basic Applications of Computer	08
Unit 2	Structure and working of Computer 1.1 Fundamental Block diagram of computer 1.2 Input/output Devices 1.3 Concepts of Hardware and Software 1.4 Storage Devices 1.5 Computer Memory 1.6 Computer Languages 1.7 Operating System 1.8 Introduction to DBMS	08
Unit 3	Networking and Internet services 1.1 Need and use of computer network 1.2 Networking topologies 1.3 Concept of networking: LAN, MAN, WAN, PAN 1.4 Networking devices 1.5 Wired and wireless Technologies	10

	1.6 Introduction to internet 1.7 Internet access 1.8 World Wide Web (WWW) 1.9 Applications of internet 1.10 Advantages and Disadvantages of internet	
Unit 4	Introduction to Current Technologies 1.1 Artificial Intelligence 1.2 Machine Learning 1.3 Internet of Things (IOT) 1.4 Augmented Reality (AR) and Virtual reality 1.5 Edge Computing 1.6 Extended Reality (XR) 1.7 Robotics 1.8 Block chain	04

Mapping of this course with Program Outcomes

Course Outcomes	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	3
CO2	2	3	1	1	1	1	3
CO3	2	3	2	3	1	1	3
CO4	3	3	3	3	1	3	1
CO5	3	3	1	1	1	1	1
CO6	2	3	2	1	1	1	3
CO7	3	2	3	1	1	3	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**SYLLABUS (CBCS as per NEP 2020) FOR B. Sc. (Computer Science) Sem - II
(w. e. from AY 2023-24)**

Name of the Programme	: B.Sc. Computer Science
Program Code	: PSCOS
Class	: Arts and Commerce Faculty
Semester	: II
Course Type	: Open Elective (PR)
Course Name	: Advanced Excel
Course Code	: COS-166-OE
No. of Lectures	: 60 (15 Practicals)
No. of Credits	: 2

A) Course Objectives:

1. Edit worksheets using advanced enhancements and worksheet features.
2. Import and export data from the Internet and merge the data in to Excel
3. Worksheets and publish Excel worksheets on the web.
4. Work with named ranges and create lists
5. Import and Export data to and from Excel and other Office applications
6. Enhance lists using pivot tables and pivot table charts
7. Summarize data in worksheets and workbooks
8. Customize Excel worksheets and workbooks
9. Use case studies to create worksheets and workbooks.

B) Course Outcomes:

CO1: Able to handle MS-Excel data feeding and formatting

CO2: Able to manipulate data lists using Outline, Auto filter and PivotTables.

CO3: To Use Consolidation to summarize and report results from multiple worksheets.

CO4: Use advanced functions and productivity tools to assist in developing worksheets.

CO5: Able to create various data representation charts.

CO6: Understand to use various data validations

CO7: Applying advanced Excel skills to real-world projects and business scenarios, demonstrating the ability to solve complex problems using Excel.

Unit	Title and Contents	No. of Practical
Unit-1	Review of Basic Excel Skills <ul style="list-style-type: none"> • Recap of fundamental Excel functions and features. 	01
Unit-2	Advanced Formulas and Functions: <ul style="list-style-type: none"> • Nested functions • Array formulas • Logical functions (IF, AND, OR, etc.) 	05

	<ul style="list-style-type: none"> • Lookup and reference functions (VLOOKUP, HLOOKUP, INDEX, MATCH, etc.) • Text functions • Date and time functions 	
Unit-3	Data Analysis Techniques: <ul style="list-style-type: none"> • Data validation • What-if analysis with scenarios • Goal seek and solver • Data tables • Pivot tables and Pivot Charts 	05
Unit 4	Advanced Formatting and Conditional Formatting: <ul style="list-style-type: none"> • Advanced formatting options • Creating custom cell styles • Advanced conditional formatting rules 	03
Unit 5	Collaboration and Security: <ul style="list-style-type: none"> • Workbook protection and security • Sharing workbooks and managing changes 	01

References:

1. Excel 2019 Bible, 1st Edition by Michel Alexander, Richard Kulseika, John Walkenbatch.

Web links:

www.tutorialspoint.com

Course Outcomes	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	2	-	-	2	3
CO2	3	1	3	-	-	2	2
CO3	3	1	3	-	-	2	1
CO4	3	-	3	1	-	-	-
CO5	3	1	2	1	2	-	-
CO6	3	-	1	2	3	-	-
CO7	3	1	1	1	2	2	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**SYLLABUS (CBCS as per NEP 2020) FOR F. Y. B. Sc. (Computer Science) Sem-II
(w. e. f. 2023-2024)**

Name of the Program	: B.Sc. Computer Science
Program Code	: USCOS
Class	: F. Y. B. Sc. (Computer Science)
Semester	: II
Course Type	: OE (Theory)
Course Name	: E-Banking
Course Code	: COS-167(OE)
No. of Lectures	: 30
No. of Credits	: 02

A) COURSE OBJECTIVES:

7. Provide an overview of e-banking and explain the basic concepts and terminologies associated with electronic banking.
8. Introduce the various technologies and platforms used in e-banking, such as mobile banking apps, online banking websites, and ATM networks.
9. Highlight the importance of security in e-banking.
10. Provide an overview of the different e-banking services, including checking account balances, fund transfers, bill payments, mobile banking, and digital wallets.
11. Teach students how to perform common e-banking transactions, such as fund transfers, setting up recurring payments, and managing accounts online.
12. Explore the various types of security threats and cybercrimes that target e-banking, such as phishing, malware, and account takeovers.
13. Explore the various E-Locking Techniques.

B) COURSE OUTCOMES:

- CO1.** Gain a comprehensive understanding of electronic banking.
- CO2.** Learn about various digital banking services, including online account management, electronic funds transfer, mobile banking, and more.
- CO3.** Develop skills in evaluating and using mobile banking applications for various devices, including smartphones and tablets.
- CO4.** Promote financial literacy among students by understanding how e-Banking can be used to educate students about personal finance.
- CO5.** Explore the concept of green banking and how e-Banking can contribute to sustainable finance and environmental responsibility.
- CO6.** Develop a strong awareness of cybersecurity threats and vulnerabilities in e-Banking and understand best practices for mitigating risks.
- CO7.** Learn about the many digital payment methods, including RTGS, IMPS, NEFT, and debit cards.

Unit	Topic	No. of Lectures
Unit – 1	E-Banking: Introduction <ol style="list-style-type: none"> 1. Meaning 2. Definition 3. Features 4. Mobile Banking 5. Internet Banking 6. Digital wallets 7. Online Bill Payments 8. IFSC, IMPS, NEFT, RTGS. 	[6]
Unit – 2	ATM: <ol style="list-style-type: none"> 1. Meaning, Features Functions 2. Service available from ATM <ol style="list-style-type: none"> a. Different types of cards, virtual debit cards b. Cash Deposit, Withdraw, Last few transactions, Balance & fund transfer. 	[6]
Unit – 3	Internet Banking: <ol style="list-style-type: none"> 1. Introduction 2. Net banking account opening <ol style="list-style-type: none"> a. Username and Password b. Secrecy of maintaining One Time Password (OTP) 3. Net Banking Services <ol style="list-style-type: none"> a. Fund Transfer b. Make Payment. 	[6]
Unit – 4	E-Banking Securities: <ol style="list-style-type: none"> 1. Introduction needs for security 2. E-banking Attack: Phishing, Man-in-the-Middle, Account Takeover, Cross-Site Scripting. 3. Cybercrimes: Malware and Banking Trojans, Ransomware, Identity Theft. 	[6]
Unit –5	E-banking Security System <ol style="list-style-type: none"> 1. Digital certificate 2. Digital Signature & Electronic Signature-E-Security solutions 3. Solutions providers-E-locking technique <ol style="list-style-type: none"> a. E-locking services b. Transaction security c. Security devices d. Public Key Infrastructure-(PKI) e. Firewalls Secure Ledger-(FSL) 	[6]

Text and Reference Books

1. Meaning with information by H. Jerome Lenter
2. Computer information Technology Global business by Puri and Vidin Puri
3. Fundamentals of data base systems by Jerome Lenter, Pearson
4. An introduction to Information Technology by Dr. Srinivasa Vallabhan, Sultan Chand & Sons
5. Law of Information Technology by D. P. Mittal, Tax Man, E-Markets, Macmillan 2007.
6. C.S. Rayudu, E-Business, Himalaya Publishing House.
7. Roger Hunt & John Shelly, Computers and Commonsense.
8. Bhushan Dewan, E-Commerce.

Mapping of this course with Program Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2				2
CO2	3	2	2				
CO3	2	2	3				2
CO4	2	3	1				2
CO5	2	3	3				2
CO6	3	2	3				2
CO7	3	3	3				3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

SYLLABUS (CBCS as per NEP 2020) FOR F. Y. B. Sc. (Computer Science)

Sem-II

(w. e. f. A.Y. 2023-2024)

Name of the Programme	: B.Sc. Computer Science
Program Code	: USCOS
Class	: F. Y. B. Sc. (Computer Science)
Semester	: II
Course Type	: VSC (TH)
Course Name	: Database application using PL/PostgreSQL.
Course Code	: COS-171-VSC
No. of Lectures	: 30
No. of Credits	: 02

A) Course objectives:

1. Learn basic for PL/pgsql.
2. Know the language structure of PL/pgsql.
3. Handle error and exceptions in PL/pgsql.
4. Learn programming control flow statements like conditional statements, Loops etc.
5. Understanding creation, manipulation and querying of data in database.
6. Understand stored function, trigger, cursor, stored Procedures etc...
7. Study physical database design and database modelling.

B) Course Outcomes:

- CO1: The broad understanding of database concept.
- CO2: Understand database techniques such as SQL & PL/pgSQL
- CO3: Understand about query execution and its performance.
- CO4: Master the advanced of database concepts and database management system.
- CO5: Understand application of database system.
- CO6: Know the syntax of trigger, function, cursor etc.
- CO7: Understand conditional statements and loops in relational database concept.

Units	Title & Content	No. of lectures
Unit 1	<p>2. Introduction to PL/pgSQL and relational database concept</p> <p>2.1 Normalization (1NF,2NF,3NF, BCNF,4NF, 5 NF)</p> <p>2.2 Introduction to PL/pgSQL</p> <ul style="list-style-type: none"> ➤ Features of PL/pgSQL ➤ Advantages of PL/pgSQL ➤ Developing in PL/pgSQL. ➤ To add language PL/pgSQL to database. 	08

	<p>2.3 PL/pgsql: Language Structure</p> <ul style="list-style-type: none"> ➤ Structure of PL/pgsql code block ➤ Data types in PL/pgsql ➤ Statement and Expressions ➤ Declarations (function parameter, Attribute, Record) <p>2.4 Controlling the program flow</p> <ul style="list-style-type: none"> ➤ Conditional statements ➤ Loops <ul style="list-style-type: none"> ✓ Simple/basic loop ✓ While loop ✓ For loop ✓ Looping through query result ✓ For –In-Execute statements. 	
Unit 2	<p>3. Stored Procedures and Stored Function.</p> <p>3.1 Introduction to stored procedure</p> <p>3.2 Advantages and disadvantages of stored procedure</p> <p>3.3 Syntax</p> <p>3.4 Introduction to stored Function</p> <ul style="list-style-type: none"> ➤ Calling a function ➤ Dropping a function 	06
Unit 3	<p>4. Cursor, Handling errors and exceptions</p> <p>4.1 Declaring cursor variables</p> <p>4.2 Opening cursor</p> <p>4.3 Fetching rows</p> <p>4.4 Closing cursor</p> <p>4.5 Returning cursor</p> <p>4.6 Looping through cursor results</p> <p>4.7 Handling error and exception examples</p>	08
Unit 4	<p>5. Trigger and Views</p> <p>5.1 Creating trigger</p> <p>5.2 Listing triggers</p> <p>5.3 Dropping trigger</p> <p>5.4 Views syntax and examples</p>	08

References:

11. Database System Concepts, By Silberschatz A., Korth H., Sudarshan S., 6th Edition, McGraw Hill Education
12. Database Management Systems, Raghu Ramakrishnan, Mcgraw-Hill Education
13. Database Systems, Shamkant B. Navathe, Ramez Elmasri, PEARSON HIGHER EDUCATION
14. Fundamentals of Database Systems, By: Elmasri and Navathe, 4th Edition Practical PostgreSQL O'REILLY

15. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3 editions, ISBN: 9780072465631
16. NoSQL Distilled, Pramod J. Sadalage and Martin Fowler, Addison Wesley
17. An Introduction to Database Systems”, C J Date, Addison-Wesley
18. Database Systems: Concepts, Design and Application”, S.K.Singh, Pearson, Education
19. NoSQL Distilled A Brief Guide to the Emerging World of Polyglot Persistence : by Pramod J. Sadalage, Martin Fowler, Addison-Wesley, Pearson Education, Inc.
20. MongoDB: The Definitive Guide, Kristina Chodorow, Michael Dirolf, O’Reilly Publications

Mapping of this course with Program Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	3	3
CO2	3	3	3	1	1	3	3
CO3	3	3	3	1	1	3	3
CO4	3	3	1	1	1	1	3
CO5	3	3	1	1	1	3	3
CO6	3	3	1	1	1	1	3
CO7	3	3	1	1	1	1	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**SYLLABUS (CBCS as per NEP 2020) FOR F. Y. B. Sc. (Computer Science) Sem-II
(w. e. from A.Y.- 2023-2024)**

Name of the Programme	: B.Sc. Computer Science
Program Code	: USCOS
Class	: F.Y.B.Sc. (Computer Science)
Semester	: II
Course Type	: Major (PR)
Course Name	: Basic Graphics Design using C
Course Code	: COS-176-SEC
No. of Practical's	: 15 (60 Hours)
No. of Credits	: 02

A) Course Objectives:

1. To introduce to the students the concepts of computer graphics
2. To provide comprehensive introduction about computer graphics system,
3. Prepares students for activities involving in design, development
4. To know and understand interaction techniques.
5. To develop programming skills in computer graphics through programming assignments.
6. Detailed knowledge about basic shading and texture mapping technique.
7. To generate real-time graphics.

B) Course Outcomes:

- CO1. Understand the basics of computer graphics
- CO2. Knowing graphics different graphics systems and
- CO3. Understand applications of computer graphics.
- CO4. Use of geometric transformations on graphics objects
- CO5. Design two dimensional transformations.
- CO6. Testing of modeling, shading and animation.
- CO7. Understand of the structure of an interactive computer graphics system

	Title of Experiment/ Practical
1	Introduction to use of basic graphics using C
2	Introduction to use of basic graphics using C
3	Color filling functions
4	Color filling functions
5	Drawing shapes and graphics simulation
6	Drawing shapes and graphics simulation
7	Formatting Text
8	Formatting Text
9	Applying Hashing pattern

10	Applying Hashing pattern
11	Printing graphics
12	Charts using graphics
13	Case studies
14	Case studies
15	Case studies

Mapping of this course outcomes with Program outcomes

Course Outcomes	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	1	2	2	1
CO2	3	2	3	1	2	1	2
CO3	3	3	2	1	1	1	1
CO4	3	2	2	1	2	1	1
CO5	2	2	3	2	1	2	1
CO6	3	2	3	2	2	1	2
CO7	3	3	2	1	2	1	1

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**SYLLABUS (CBCS as per NEP 2020) FOR F.Y. B.Sc., F. Y. B. Sc. (Computer Science), F.Y. B.Com., FYBBA(CA), FYBBA Sem - II
(w. e. f. A.Y. 2023-2024)**

Name of the Programme	: F.Y. B.Sc., F. Y. B. Sc. (Computer Science), F.Y. B.Com., FYBBA(CA), FYBBA
Program Code	: USCOS
Class	: F. Y. B. Sc. (Computer Science)
Semester	: II
Course Type	: Value Education Course (VEC) (TH)
Course Name	: Digital and Technological Solutions
Course Code	: COS-185-VEC
No. of Lectures	: 30
No. of Credits	: 02

Course Objectives:

- To gain familiarity with digital paradigms
- To sensitize about role & significance of digital technology.
- To provide know how of communications & networks
- To bring awareness about the e-governance and Digital India initiatives
- To provide a flavour of emerging technologies - Cloud, Big Data, AI 3D printing

Course Outcome:

- CO1. Knowledge about digital paradigm.
 CO2. Realisation of importance of digital technology, digital financial tools, e-commerce.
 CO3. Know-how of communication and networks.
 CO4. Familiarity with the e-governance and Digital India initiatives
 CO5. An understanding of use & applications of digital technology.
 CO6. Basic knowledge of all machine learning and big data.
 CO7. Knowledge about social networking.

Units	Couse Contents	No. of Lectures
Unit - I	Introduction & Evolution of Digital Systems: Role & Significance of Digital Technology. Information & Communication Technology & Tools. Computer System & it's working, Software and its types. Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts. Communication Systems: Principles, Model & Transmission Media.	8
Unit - II	Computer Networks & internet: Concepts & Applicators, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based information System: Significance & Types.	7

	E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.	
Unit –III	Digital India & e-Governance: initiatives, infrastructure, Services and Empowerment. Digital Financial Tools: Unified Payment interface, Aadhar Enabled Payment System, USSD, Credit/Debit Cards, e-Wallet's internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and pos.	8
Unit- IV	Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, internet of Things, Virtual Reality, Blockchain, Robotics, Artificial intelligence, 3-D Printing. Future of Digital Technologies.	7

REFERENCE BOOKS:

1. Fundamentals of Computers by E Balagurusamy- Tata Mc GrawHill
2. Data Communications and Networking by Behrouz A. Forouzan - McGraw Hill
3. "Cloud Computing- Principals and Paradigms" by Buvya, Broberg, and Goscinski- Wiley
4. "E commerce" by Laudon.
5. "Artificial Intelligence- A Modern Approach by Russel and Norving" - Pearson Education.
6. "Internet of Things" by Samuel Greengard - MIT press
7. "Introduction to Computers by Peter Norton" - Tata McGraw Hill
8. "E-Commerce Concepts, Models, Strategies"- C.S.V. Murthy
9. "Basics of Artificial Intelligence and Machine Learning" by Dheeraj Mehrotra - Notion press.
10. "Big Data for dummies" by Hurwith, Nugent, Halper, Kaufman, Wiley & Sons - Wile

Mapping of this course outcomes with Program outcomes

Course Outcomes	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	1	2	2	1
CO2	3	2	3	1	2	1	2
CO3	3	3	2	1	1	1	1
CO4	3	2	2	1	2	1	1
CO5	2	2	3	2	1	2	1
CO6	3	2	3	2	2	1	2
CO7	3	3	2	1	2	1	1

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Examination Pattern / Evaluation Pattern

Teaching and Evaluation (for Major, Minor, AEC, VEC, IKS courses)

Course Credits	No. of Hours per Semester Theory/Practical	No. of Hours per Week Theory/Practical	Maximum Marks	CE 40 %	ESE 60%
1	15 / 30	1 / 2	25	10	15
2	30 / 60	2 / 4	50	20	30
3	45 / 90	4 / 6	75	30	45
4	60 / 120	4 / 8	100	40	60

Teaching and Evaluation (for VSC, SEC & CC courses)

- Evaluation to be done by Internal & External Experts
- No descriptive end semester written examination
- Evaluation to be done at Department level preferably prior to commencement of Theory /Practical Examinations
- Evaluation to be done on the Skills gained by student