

Circulation of Undergraduate Board of Studies Circulation
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ICT.

**CH. BANSI LAL UNIVERSITY,
BHIWANI, HARYANA**



Scheme of Examination for Under-Graduate Programmes

Subject: Computer Science

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020

**(Multiple Entry-Exit, Internships and Choice Based
Credit System)**

(For the Batches Admitted From 2024-2025)

Prashant

Ch. Bansi Lal University, Bhiwani

Scheme of Examination for the Computer Science Subject in Under Graduate Programmes
as per NEP2020 Curriculum and Credit Framework for Undergraduate Programmes
(Multiple Entry-Exit, Internships and Choice Based Credit System LOCF) with effect from the session 2024-25 (in a phased manner)

Semester-I

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits				Contact hours L: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Practical (P)		L	P	Total	T	P	T	P		T	P
CC-1 MCC-1	A,B&C	24UN-ICT-101	Problem Solving through C	4	3	1		3	2	5	20	10	50	20	100	3	3
MCC-2	C	24UN-ICT-102	Computer Fundamentals	4	3	1		3	2	5	20	10	50	20	100	3	3
*CC-M1	A,B,C	24UN-ICT-103	Basics of Computer Science	2	1	1		1	2	3	10	5	20	15	50	3	3
MDC1	A, B & C	24UN-ICT-MDC-104	Fundamentals of Computer Science	3	2	1		2	2	4	15	5	35	15	70	3	3
CC-M1	A,B,C			From Available CC-1/MCC-1 of 4 credits as per NEP													
AEC-1	A,B&C			From Available pool of Ability Enhancement Courses as per NEP													
SEC-1	A,B&C			From Available pool of Skill Enhancement Courses as per NEP													
VAC-1	A,B&C			From Available pool of Value Added Courses as per NEP													

*For students who opt Computer as a minor subject

Pooja

Semester-2

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits			Contact hours L:Lecture P:Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P			
CC-2 MCC-3	A,B&C	24UN-ICT-201	Web Development	4	3	1	3	2	5	20	10	50	20	100	3	3
DSEC-1	C	24UN-ICT-202	Programming with C++	4	3	1	3	2	5	20	10	50	20	100	3	3
*CC-M2	A,B,C	24UN-ICT-203	Programming Methodologies	3	2	1	2	2	4	10	5	20	15	50	3	3
MDC-2	A,B&C	24UN-ICT-MDC-204	Web Technologies Fundamentals	3	2	1	2	2	4	15	5	35	15	70	3	3
AEC-2	A,B&C	From Available pool of Ability Enhancement Courses as per NEP														
SEC-2	A,B&C	From Available pool of Skill Enhancement Courses as per NEP														
VAC-2	A,B&C	From Available pool of Value Added Courses as per NEP														
Internship	A,B&C	24UN-ICT-205	Internship of 4 Credits of 4-6 weeks duration after 2 nd Semester (Mandatory in case of exit)													

*For students who opt Mathematics as a minor subject

Praveen

Semester-3

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits				Contact hoursL: P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Practical (P)	L	P	Total		T	P	T	P		T	P
CC-3 MCC-4	A,B&C	24UN-ICT-301	Operating Systems	4	3	1	3	2	5		20	10	50	20	100	3	3
MCC-5	B&C	24UN-ICT-302	Quantitative Foundations of Computer Science	4	3	1	3	2	5		20	10	50	20	100	3	3
MDC3	A,B&C	24UN-ICT-MDC-303	Programming with C	3	2	1	2	2	5		15	5	35	15	70	3	3
CC-M3	A&C			From Available CC-3/MCC-4 of 4 credits as per NEP													
CC-M3(V)	B			From Available pool of Minor (Vocational) Courses VOC-1													
MCC-2	B			From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP													
AEC-3	A,B&C			From Available pool of Ability Enhancement Courses as per NEP													
SEC-3	A,B&C			From Available pool of Skill Enhancement Courses as per NEP													
VAC-3	C only			From Available pool of Value Added Courses as per NEP													

Semester-4

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits			Contact hours L: P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-4 MCC-6	A,B&C	24UN-ICT-401	Data Management with DBMS	4	3	1	3	2	5	20	10	50	20	100	3	3
MCC-7	B&C	24UN-ICT-402	Introduction to Computer System Design and Organization	4	3	1	3	2	5	20	10	50	20	100	3	3
MCC-8	B&C	24UN-ICT-403	Object-Oriented Programming with Java	4	3	1	3	2	5	20	10	50	20	100	3	3
DSE-1	B&C	24UN-ICT-404	Front-end Development	4	3	1	3	2	5	20	10	50	20	100	3	3
		Or														
		24UC-ICT-405	Linux and Shell Programming	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-M4(V)	A,B&C	From Available pool of Minor (Vocational) Courses VOC-2														
AEC-4	A,B&C	From Available pool of Ability Enhancement Courses as per NEP														
VAC-4	C	From Available pool of Value Added Courses as per NEP														
Internship	A,B&C	24-UN-ICT-406	Internship of 4 Credits of 4-6 weeks duration after 4th Semester (Mandatory in Case of exit if not done after 2 nd Semester)													

Panigrahi

Semester-5

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits				Contact hours			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P	T		T	P
CC-5 MCC-9	A,B&C	24UN-ICT-501	Data Structures	4	3	1	3	2	5	20	10	50	20	3	100	3	3
MCC-10	B&C	24UN-ICT-502	Software Engineering	4	3	1	3	2	5	20	10	50	20	3	100	3	3
DSE-2	B&C	24UN-ICT-503	Foundations of Server-Side Development	4	3	1	3	2	5	20	10	50	20	3	100	3	3
	<u>Or</u>																
		24UN-ICT-504	Cloud Computing	4	3	1	3	2	5	20	10	50	20	3	100	3	3
DSE-3	B&C	24UN-ICT-505	Programming in Python	4	3	1	3	2	5	20	10	50	20	3	100	3	3
	<u>Or</u>																
		24UN-ICT-506	Programming in R	4	3	1	3	2	5	20	10	50	20	3	100	3	3
CC-M5(V)	A&C	From Available pool of Minor (Vocational) Courses VOC-1															
Internship	A,B&C	24UN-ICT-507	Internship of 4 Credits														

Semester-6

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits			Contact hours L:Lecture P:Practical T: Tutorial			Internal Assessment Marks			End term Examination Marks		Total Marks	Examination hours	
				To tal	The ory (T)	Practi cal (P)	L	P	Tot al	T	P	T	P				
CC-6 MCC-11	A,B&C	24UN-ICT-601	Computer Networks	4	3	1	3	2	5	20	10	50	20	100	3	3	
MCC-12	B&C	24UN-ICT-602	Essentials of Computer Architecture and Design	4	3	1	3	2	5	20	10	50	20	100	3	3	
DSE-4	B&C	24UN-ICT-603	Developing Modern Web Applications using React	4	3	1	3	2	5	20	10	50	20	100	3	3	
DSE-5	B&C	24UN-ICT-604	Data Storage Technologies and Networks using AWS	4	3	1	3	2	5	20	10	50	20	100	3	3	
		24UN-ICT-605	Data Analytics using Python	4	3	1	3	2	5	20	10	50	20	100	3	3	
CC-M6	A	24UN-ICT-606	Data Analytics using R	4	3	1	3	2	5	20	10	50	20	100	3	3	
		From Available CC-6/MCC-11 of 4 credits as per NEP															
		From Available pool of Minor(Vocational)Courses VOC-3															
From Available pool of Skill Enhancement Courses as per NEP																	

Semester-7

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits				Contact hours L: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Tutorial/Practical (P)	L	T	Total	T	P	T	P	T		T	P
CC-H1	B&C	24UN-ICT-701	Principles & Paradigms of Programming Languages	4	4	0	4	0	4	30	-	70	-	3	100	-	
CC-H2	B&C	24UN-ICT-702	Software Testing	4	4	0	4	0	4	30	-	70	-	3	100	-	
CC-H3	B&C	24UN-ICT-703	Data Mining and Warehousing	4	4	0	4	0	4	30	-	70	-	3	100	-	
DSE-6	B&C	24UN-ICT-704	NoSQL Databases	4	4	0	4	0	4	30	-	70	-	3	100	-	
		<u>Or</u>															
PC-H1	B&C	24UN-ICT-705	Artificial Intelligence	4	4	0	4	0	4	30	-	70	-	3	100	-	
		24UN-ICT-706	Practical	4	0	4	0	4	8	30	-	70	-	-	100	6	
CC-HM1	B&C	From Available Core Courses in Minor Subject of 4 credits as per NEP															

Pragati

Semester-8 (Honours without research)

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits				Contact hours L: P: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Tutorial/Practical	L	T	Total		T	P	T	P		T	P
CC-H4	B&C	24UN-ICT-801	Emerging Trends in Information Security	4	4	0	4	0	4	4	30	-	70	-	100	3	-
CC-H5	B&C	24UN-ICT-802	Principles of Design and Analysis of algorithms	4	4	0	4	0	4	4	30	-	70	-	100	3	-
CC-H6	B&C	24UN-ICT-803	Software Project Management	4	4	0	4	0	4	4	30	-	70	-	100	3	-
	B&C	24UN-ICT-804	Big Data	4	4	0	4	0	4	4	30	-	70	-	100	3	-
Or																	
		24UN-ICT-805	Machine Learning	4	4	0	4	0	4	4	30	-	70	-	100	3	-
PC-H2	B&C	24UN-ICT-806	Practical (Advanced Web Frameworks)	4	0	4	0	8	8	8	-	30	-	70	100	-	3
CC-HM2	B&C	From Available Core Courses in Minor Subject of 4 credits as per NEP															

Pragathi

Semester-8 (Honours with Research)

Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits				Contact hours			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (T)	Tutorial (T)	L	T	Total	T	P	T	P				
CC-H4	B&C	24UN-ICT-801	Emerging Trends in Information Security	4	4	0	4	0	4	4	30	-	70	-	100	3	-
				4	4	0	4	0	4	30	-	70	-	100	3	-	
Research	B&C	24UN-ICT-807	Project/Dissertation	12									300	300	-	-	
CC-HM2	B&C	From Available Core Courses in Minor Subject of 4 credits as per NEP															

Pr. Shanti

Semester-1

Session: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	I		
Name of the Course	Problem Solving through C		
Course Code	24UN-ICT-101		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the basics of C program, data types and input/output statements. 2. understand different types of operators, their hierarchies and also control statements of C. 3. implement programs using arrays and strings. 4. get familiar with advanced concepts like structures, union etc. in C language. 5*. to implement the programs based on various concepts of C.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter			
Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			

Pragathi

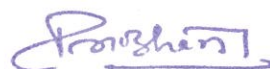
Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant. Input/output: Formatted I/O Function-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), output functions viz. printf(), putchar(), puts().	10
II	Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion. Decision making with if statement, if-else statement, nested if statement, else-if ladder, switch and break statement, goto statement, Looping Statements: for, while, and do-while loop, jumps in loops.	10
III	Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation. Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference, recursive functions. Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate etc., Search for a Substring.	10
IV	Pointers in C: Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays. User defined data types: Structures - Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions - Union definition; difference between Structure and Union.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: - To read radius of a circle and to find area and circumference - To read three numbers and find the biggest of three - To check whether the number is prime or not - To read a number, find the sum of the digits, reverse the number and check it for palindrome - To read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers - To read percentage of marks and to display appropriate message (Demonstration of else-if ladder) - To find the roots of quadratic equation - To read marks scored by n students and find the average of marks (Demonstration of single dimensional array)	25

Prashant

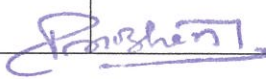
	• To remove Duplicate Element in a single dimensional Array • To perform addition and subtraction of Matrices • To find factorial of a number • To generate Fibonacci series • To remove Duplicate Element in a single dimensional Array • To find the length of a string without using built in function • To demonstrate string functions • To read, display and add two m x n matrices using functions • To read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters • To Swap Two Numbers using Pointers • To demonstrate student structure to read & display records of n students • To demonstrate the difference between structure & union.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Gottfried, Byron S., Programming with C, Tata McGraw Hill. • Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill. • Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley. • Yashwant Kanetker, Let us C, BPB. • Rajaraman, V., Computer Programming in C, PHI. • Yashwant Kanetker, Working with C, BPB.		

*Applicable for courses having practical component.



Session: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	I		
Name of the Course	Computer Fundamentals		
Course Code	24UN-ICT-102		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MCC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basics of computer 2. learn about I/O devices and operating systems 3. understand internet and its services 4. learn about the threats and security concepts on computers 5*. to understand the working of operating system, internet and security related concepts.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Prashant

Unit	Topics	Contact Hours
I	Computer Fundamentals: Evolution of Computers through generations, Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functional Components of a Computer System, Applications of computers in Various Fields. Types of Software: System software, Application software, Utility Software, Shareware, Freeware, Firmware, Free Software. Memory Systems: Concept of bit, byte, word, nibble, storage locations and addresses, measuring units of storage capacity, access time, concept of memory hierarchy. Primary Memory - RAM, ROM, PROM, EPROM. Secondary Memory - Types of storage devices, Magnetic Tape, Hard Disk, Optical Disk, Flash Memory.	10
II	I/O Devices: I/O Ports of a Desk Top Computer, Device Controller, Device Driver. Input Devices: classification and use, keyboard, pointing devices - mouse, touch pad and track ball, joystick, magnetic stripes, scanner, digital camera, and microphone Output Devices: speaker, monitor, printers: classification, laser, ink jet, dot-matrix. Plotter. Introduction to Operating System: Definition, Functions, Features of Operating System, Icon, Folder, File, Start Button, Task Bar, Status Buttons, Folders, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.	10
III	The Internet: Introduction to networks and internet, history, Internet, Intranet & Extranet, Working of Internet, Modes of Connecting to Internet. Electronic Mail: Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, mailer features. Browsers and search engines.	10
IV	Threats: Physical & non-physical threats, Virus, Worm, Trojan, Spyware, Keyloggers, Rootkits, Adware, Cookies, Phishing, Hacking, Cracking. Computer Security Fundamentals: Confidentiality, Integrity, Authentication, Non-Repudiation, Security Mechanisms, Security Awareness, Security Policy, anti-virus software & Firewalls, backup & recovery.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Operating System: - Starting with basics of Operating Systems and its functionalities Computer Basics: - Identify the various computer hardware - Understanding the working of computer - Understanding various types of software Internet and E-mail: - Using Internet for various tasks 	25

	• Creating and using e-mail. Security: • Understanding various threats • How to be safe from virus threats • Various software to get safe from virus attacks.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA	End Term Examination: A three hour exam for both theory and practicum.	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB. • Dromey, R.G., How to Solve it By-Computer, PHI. • Norton, Peter, Introduction to Computer, McGraw-Hill. • Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World. • Rajaraman, V., Fundamentals of Computers, PHI.		

*Applicable for courses having practical component.



Session: 2024-25			
PartA - Introduction			
Subject	COMPUTER SCIENCE		
Semester	I		
Name of the Course	Basics of Computer Science		
Course Code	24UN-ICT-103		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After learning this course student will be able: 1. To introduce to the students, the basic understanding of the working of a computer system. 2. To familiarize the students with the concept of algorithms and flowchart. 3. To familiarize the students with the various types of software. 4. To make the students familiar with the basic internet technology and concepts.		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
Max. Marks:50(30(T)+20(P)) Internal Assessment Marks:15(10(T)+5(P)) End Term Exam Marks:35(20(T)+15(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
PartB-Contentsofthe Course			
<u>Instructions for Paper- Setter</u>			
Unit	Topics		Contact Hours
I	Introduction to Computers: Definition of Computers, History and Generations of Computers, Characteristics of computer, Classification of Computers. Fundamental Block diagram of Computer: CPU, Input & Output Unit.		4



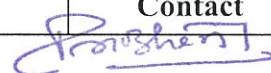
II	Software: Definition of Software, Types of Software-System software, Application software and Utility software. Types of Computer Languages, Assemblers, Interpreters, Compiler.	4
III	Introduction to Operating Systems: Types of Operating System, Functions of Operating System. Windows: Introduction to Windows, Starting Windows, Desk Top, Task Bar, Opening and closing applications, icons-creating, renaming and removing. Date and Time setting, Working with files and folders-creating, deleting, opening, finding, copying, moving, and renaming.	4
IV	Networking: Concept, Basic Elements of a Communication System, Data Transmission Media, LAN, MAN, WAN. Introduction of Internet and WWW, Basic working of a Web Browser, Introduction to popular web browsers.	4
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • Dismantling the system unit, recognize all major components inside a PC, describe function of each component and define the relationship of internal components • Explore and describe some system utility like regedit, memory portioning, control panel, window tools. • Understanding control panel • Date and Time setting. • Working with files and folders-creating, deleting, opening, finding, copying, moving, and renaming.	25
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 6 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
PartC-Learning Resources		
Text /Reference Books: • Fundamentals of Computers, V. Rajaraman 6th edition PHI Learning Private Limited 2014		

- Peter Norton: Computing Fundamentals. 6th Edition, McGraw Hill-Osborne, 2007
- Alexis Leon and Marthews Leon: Introduction to Computers, Leon Vikas, 1999.
- Internet Basics. E. Douglas Commer PHI.

*Applicable for courses having practical component.

P. Norton

Session: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	I		
Name of the Course	Fundamentals of Computer Science		
Course Code	24UN-ICT-MDC-104		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MDC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of operating systems 2. do the basic editing and formatting in a document 3. create basic spread-sheets for different purposes 4. create basic presentations for different applications 5*. to understand the working of operating system and various office tools practically.		
Credits	Theory	Practical	Total
	2	1	3
	Contact Hours	2	4
Max. Marks:70 Internal Assessment Marks:20(15(T)+5(P)) End Term Exam Marks: 50(35(T)+15(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact



		Hours
I	Computer Fundamentals: Evolution of Computers through generations, Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functional Components of a Computer System, Applications of computers in Various Fields. Types of Software: System software, Application software, Utility Software.	7
II	Memory Systems: Concept of bit, byte, word, nibble, storage locations and addresses, measuring units of storage capacity, access time, concept of memory hierarchy. Primary Memory - RAM, ROM, PROM, EPROM. Secondary Memory - Types of storage devices, Magnetic Tape, Hard Disk, Optical Disk, Flash Memory. I/O Devices: I/O Ports of a Desk Top Computer, Device Controller, Device Driver. Input Devices: classification and use, keyboard, pointing devices - mouse, touch pad and track ball, joystick, magnetic stripes, scanner, digital camera, and microphone Output Devices: speaker, monitor, printers: classification, laser, ink jet, dot-matrix. Plotter.	7
III	Introduction to Operating System: Definition, Functions, Features of Operating System, Icon, Folder, File, Start Button, Task Bar, Status Buttons, Folders, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.	5
IV	The Internet: Introduction to networks and internet, history, Internet, Working of the Internet, Modes of Connecting to Internet. Electronic Mail: Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, mailer features. Browsers and search engines.	6
V*	Operating System: - Starting with basics of Operating Systems and its functionalities Computer Basics: - Identify the various computer hardware - Understanding the working of computer - Understanding various types of software Internet and E-mail: - Using Internet for various tasks - Creating and using e-mail.	25
Suggested Evaluation Methods		
Internal Assessment: > Theory - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.:4 - Mid-Term Exam: 7 > Practicum - Class Participation: 2 - Seminar/Demonstration/Viva-voce/Lab records etc.:3		End Term Examination: A three hour exam for both theory and practicum.

• Mid-Term Exam: NA	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB. • Dromey, R.G., How to Solve it By Computer, PHI. • Norton, Peter, Introduction to Computer, McGraw-Hill. • Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World. • Rajaraman, V., Fundamentals of Computers, PHI.	

*Applicable for courses having practical component.

P. Sinha

Semester-II

Session:2024-25			
Part A-Introduction			
Subject	COMPUTER SCIENCE		
Semester	II		
Nameofthe Course	Web Development		
CourseCode	24UN-ICT-201		
CourseType:(CC/MCC/MDC /CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As perAnnexure-I)	100-199		
Pre- requisiteforthecourse(ifany)			
CourseLearningOutcomes(CLO):	Aftercompletingthis course,thelearner willbeableto: 1. learnthebasicsofweb development. 2. understand different types of web pages and websites. 3. implementHTML and CSS for web page designing. 4. Understand the design of web crawlers and search engines.		
	5*. to implement the programs based on variousweb development concepts.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max.Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) EndTermExamMarks:70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
Part B-Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. The first question will be compulsory.			

Prashant

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Internet and World Wide Web (WWW); Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers; Hypertext Transfer Protocol, URLs; Searching, Search Engines and Search Tools. Web Publishing: Hosting website; Internet Service Provider; Planning and designing website; Web Graphics Design, Steps For Developing website	10
II	Creating a Website and Introduction to Markup Languages (HTML and DHTML), HTML Document Features & Fundamentals, HTML Elements, Creating Links; Headers; Text styles; Text Structuring; Text colour and Background; Formatting text; Page layouts, Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes, HTML5.	10
III	Introduction to CSS (Cascading Style Sheets): Features, Core Syntax, Types, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Positioning, and other useful Style Properties; Features of CSS3.	10
IV	The Nature of JavaScript: Evolution of Scripting Languages, JavaScript-Definition, Programming for Non-Programmers, Introduction to Client-Side Programming, Enhancing HTML Documents with JavaScript. Static and Dynamic web pages	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Create a web page using ordered list and unordered list. • Design a web page to show your institute with hyperlinks. • Create your resume on HTML page. • Create a web page and divide the web page into four frames. In one frame create three links that will display different HTML forms in the remaining three frames respectively. • Create a web page to show the record of the college in the form of a table. • Write an HTML code to add internal CSS on a webpage • Design a blog-style personal website.	25

Prasanth

	• Design a web page to display your college with hyperlinks. • Write a JavaScript function to calculate the sum of two numbers. • Write a JavaScript program to find the maximum number in an array. • Write a JavaScript function to check if a given string is a palindrome (reads the same forwards and backward). • Write a CSS file and attach it to any 3 HTML web pages. • Use Div and span in a page and color two words with the same colors. • Using HTML, CSS create a styled checkbox with animation on state change • Design a web page that is like a compose page of e-mail. It should have: a) Text boxes for To, CC, and BCC respectively. b) Text field for the message. c) Send button. d) Option for selecting a file for attachment e) After clicking a send button a new page should open with the display message “Message has been sent”.	
Suggested Evaluation Methods		
InternalAssessment: ➤ Theory • ClassParticipation:5 • Seminar/presentation/assignment/quiz/classstestetc.:5 • Mid-TermExam:10 ➤ Practicum • ClassParticipation:5 • Seminar/Demonstration/Viva-voce/Labrecordsetc.:5 • Mid-TermExam: NA	End-TermExamination: A three-hourexam for boththeory andpracticum. EndTermExamMarks:70(50(T)+20(P))	
PartC- Learning Resources		
Recommended Books/e-resources/LMS: • Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill. • Ramesh Bangia, Multimedia and Web Technology, Firewall Media. • Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill • Wendy Willard, HTML Beginners Guide, Tata McGraw-Hill. • Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI • David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide. • Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.		

*Applicablefor courseshavingpracticalcomponents.

Pooja

Session:2024-25			
Part A-Introduction			
Subject	COMPUTER SCIENCE		
Semester	II		
Name of the Course	Programming with C++		
Course Code	24UN-ICT-202		
Course Type:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSEC		
Level of the course (As perAnnexure-I	100-199		
Pre-requisiteforthecourse(ifany)			
CourseLearningOutcomes(CLO):	After completing this course,the learner will be able to: 1. understand the basic concept of C++; 2. acquire the knowledge of C++ operators, hierarchy and precedence, and various control structures 3. learn to use arrays and strings in C++ programs; 4. get familiar with OOPS concepts with C++ 5*.tounderstandtheprogramming with C++ for Object-Oriented methodologies.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max.Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) EndTermExamMarks:70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB- Contents of the Course			
<u>InstructionsforPaper-Setter</u> The examiner will set a total of nine questions. Out of which the first question will be compulsory.The remaining eight questions will be set from four units selecting two questions from each unit.The examination will be of three-hour duration. All questions will carry equal marks. The first questionwill compriseshort answer-typequestionscoveringthe entiresyllabus. The candidate will have to attempt five questions, selecting one from each unit. The firstquestionwillbecompulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be ofthree-hourduration.			

Parashar

Unit	Topics	Contact Hours
I	Elements to C++: Character Set, Keywords, Identifiers, Constants, Variables, Data Types: User-Defined, Built-in, Derived Data Types, Reference Variables Constants, Symbolic constants, Type Conversion, and Type Casting. Input Output in C++: Unformatted and Formatted I/O Operations. I/O using insertion and extraction operators and streams in C++. Operators in C++: Arithmetic, Relational, Logical, Ternary, and other type of operators, Precedence & associativity of Operators.	10
II	Decision and Control Structures: if statement, if-else statement, nested if, if-else-if ladder, switch case statement, break and continue, goto statement, nested switch case statement. Loops: while loop, do-while loop, for loop. Arrays and strings: Array definition, initialization, multidimensional arrays, Manipulation of array elements. Functions: Declaration and Definition, return values, arguments, passing parameters by value, call by reference, call by pointer, Recursion, Inline Functions, Function overloading.	10
III	Pointers, structures, and union in C++. Object-oriented features of C++: Class and Objects, Data hiding & encapsulation, abstraction, Data Members and Member Functions, accessing class members, empty class, local class, global class, Scope Resolution Operator and its Uses, Static Data Members, Static Member Functions, Structure vs Class, Friend function and friend class. Constructors and Destructors: Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, , Dynamic initialization of objects.	10
IV	Operator Overloading: Overloading unary and binary operators: arithmetic operators, manipulation of strings using operators. Inheritance: Derived class, base class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class. Virtual Functions, pure virtual functions; Polymorphism & its types	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: - Write a C++ program to print the following lines: - Your introduction - Your institute introduction - Write a program that accepts principle, rate, and time from the user and prints the simple interest. - Write a program to swap the values of two variables. - Write a C++ program to prompt the user to input 3 integer values and print these in forward and reversed order. - WAP to accept and display distance in feet and inches. - Write a program to swap the values of two variables without using a third variable. - Write a program to check whether the given number is even or odd (using ?: ternary operator). - Write a program to check whether the given number is positive or negative (using ?: ternary operator).	25

• Write a program that inputs three numbers and displays the largest number using the ternary operator. • WAP to initialize data members of the class using the constructor. • Pass values to the constructor and initialize the members of that class to those values. • Create a class called cube with the data members Length, Breadth, Height ○ Members functions: ▪ To accept the details. ▪ To calculate the volume of the cube. ▪ To display the details. • WAP to calculate the sum using constructor overloading. • WAP to demonstrate the use of destructor. • Create a C++ Program to show the order of constructor and destructor. • C++ Program to Find the Number of Vowels, Consonants, Digits, and White Spaces in a String • C++ Program to Multiply Two Matrices by Passing Matrix to Function • Increment ++ and Decrement -- Operator Overloading in C++ Programming • C++ Program to Add Two Complex Numbers • C++ Program to Show Function Overriding • C++ Program to Show Polymorphism in Class • C++ Program to Show Function Overloading • C++ Program to Show Inheritance	
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab record setc.: 5 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Herbert Schildt, C++, The Complete Reference, Tata McGraw-Hill ● Robert Lafore, Object Oriented Programming in C++, SAMS Publishing ● Bjarne Stroustrup, The C++ Programming Language, Pearson Education ● Balaguruswami, E., Object Oriented Programming In C++, Tata McGraw-Hill. ● Richard Johnson, An Introduction to Object-Oriented Application Development, Thomson Learning.	

*Applicable for courses having practical components

Prashant

Session:2024-25			
Part A-Introduction			
Subject	COMPUTERSCIENCE		
Semester	II		
Nameofthe Course	Programming Methodologies		
CourseCode	24UN-ICT-203		
Course Type:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M		
Level of the course (As perAnnexure-I	100-199		
Pre-requisiteforthecourse(ifany)			
CourseLearningOutcomes(CLO):	Afterlearningthiscourse studentswill beable to: 1. Tofamiliarizethestudentswiththeconceptof problem-solving using algorithmsand flowcharts. 2. Tofamiliarizethestudentswiththeconcept of program and debugging. 3. Tomakethestudentsfamiliarwiththebasicprogrammin g constructs. 4. To understand various programming methodologies. 5. To understand the various programming methodologies by implementing these practically.		
Credits	Theory	Practical	Total
	1	1	2
ContactHours	1	2	3
Max.Marks:50(30(T)+20(P)) InternalAssessmentMarks:15(10(T)+5(P)) EndTermExamMarks:35(20(T)+15(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB-Contents oftheCourse			
Instructions for Paper-Setter			
Unit	Topics		Contact Hours
I	Problem Solving: Understanding the problem, Analyzing the problem, and Identifying the solution. Tools for Problem-Solving: Flowcharts and its Symbols. Algorithm designing. Examples of Algorithms with flow chart. Decision Table.		4

Pragathi

II	Program: Concept of a program, Need for writing programs, Characteristics of a good program, Programming style, Documentation, and Program Maintenance. Debugging Programs: Syntax Errors, Run-Time Errors, Logical Errors. Process of conceptualizing a solution to a problem and moving from algorithm to programming.	4
III	General Concepts: Clarity and Simplicity of Expressions, Use of proper names for Identifiers, Comments, Indentation; and Documentation. Programming Constructs: Sequence, Selection, and Iteration; Simulation (dry run) of the program for better understanding of algorithm; Comparison and Analysis of Algorithms through simulations.	4
IV	Methodologies: Structured programming, Top-down approach, Bottom-up approach, Functional programming, Modular programming, and Object-oriented programming.	4
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Draw a flowchart and design an algorithm that calculates simple interest using principle, rate, and time. • Draw a flowchart and write an algorithm to swap the values of two variables. • Draw a flowchart and design an algorithm to check whether the given number is even or odd. • Draw a flowchart and design an algorithm that inputs three numbers and displays the largest number. • Draw a flowchart and design an algorithm to find the smallest from n numbers. • Draw a flowchart and design an algorithm to find the greatest from n numbers. • Draw a flowchart and design an algorithm to find the sum and average of n input numbers. • Draw a flowchart and design an algorithm to find the sum of the digits of the input number. • Identify the requirements for a college system computerization. • Identify the various modules in a banking system. • Identify the complete design of a general grocery store. • Draw the decision table for finding the greatest of three numbers. • Draw to decision table for checking eligibility for admission to college in an undergraduate programme taking your own assumptions.	25

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Suggested Evaluation Methods	
Internal Assessment: > Theory - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.: NA - Mid-Term Exam: 6 > Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab record etc.: 5 - Mid-Term Exam: NA	End Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 35(20(T)+15(P))
Part C-Learning Resources	
Text/Reference Books: - Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB. - Dromey, R.G., How to Solve it By Computer, PHI. - Norton, Peter, Introduction to Computer, McGraw-Hill. - Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World. - Rajaraman, V., Fundamentals of Computers, PHI.	

*Applicable for courses having practical component.

Prashant

Session:2024-25			
Part A-Introduction			
Subject	COMPUTER SCIENCE		
Semester	II		
Name of the Course	Web Technologies Fundamentals		
Course Code	24UN-ICT-MDC-204		
Course Type: (CC/MCC/MDC /CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MDC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. learn the basics of web development. 2. understand different types of web pages and websites. 3. implement HTML and CSS for web page designing. 4. Understand the design of web crawlers and search engines. 5*. to implement the programs based on various web development concepts.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 70 Internal Assessment Marks: 20 (15(T)+5(P)) End Term Exam Marks: 50 (35(T)+15(P))		Time: 3Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. The first question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

For Setter

Unit	Topics	Contact
I	Introduction to Internet and World Wide Web (WWW); Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers; Hypertext Transfer Protocol, URLs; Searching, Search Engines and Search Tools.	6
II	Web Publishing: Hosting website; Internet Service Provider; Planning and designing website; Web Graphics Design, steps for Developing website Creating a Website and Introduction to Markup Languages (HTML and DHTML),	6
III	HTML Document Features & Fundamentals, HTML Elements, Creating Links; Headers; Text styles; Text Structuring; Text colour and Background; Formatting text; Page layouts, Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes, HTML5	7
IV	Introduction to CSS (Cascading Style Sheets): Features, Core Syntax, Types, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Positioning, and other useful Style Properties; Features of CSS3. Introduction to Client-Side Programming	6
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Create a web page using an ordered list and an unordered list. • Design a web page to show your institute with hyperlinks. • Design a blog-style personal website. • Create your resume on an HTML page. • Create a web page and divide the web page into four frames. In one frame create three links that will display different HTML forms in the remaining three frames respectively. • Create a web page to show the record of the college in the form of a table. • Write an HTML code to add internal CSS on a webpage • Design a web page to display your college with hyperlinks. • Write a JavaScript function to calculate the sum of two numbers. • Write a CSS file and attach it to any 3 HTML web pages. • Use Div and span in a page and color two words with the same colors. • Using HTML, and CSS create a styled checkbox with animation on state change.	25

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Suggested Evaluation Methods	
InternalAssessment: ➤ Theory • ClassParticipation:4 • Seminar/presentation/assignment/quiz/classtestetc.:4 • Mid-TermExam:7 ➤ Practicum • ClassParticipation:2 • Seminar/Demonstration/Viva-voce/Labrecordsetc.:3 • Mid-Term Exam: NA	End TermExamination: A three-hourexam for boththeory andpracticum. EndTermExamMarks: 55(35(T)+20(P))
PartC- Learning Resources	
RecommendedBooks/e-resources/LMS: • Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill. • Ramesh Bangia, Multimedia and Web Technology, Firewall Media. • Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill • Wendy Willard, HTML Beginners Guide, Tata McGraw-Hill. • Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI • David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide. • Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.	

Rajesh

Semester: III

Session: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	III		
Name of the Course	Operating Systems		
Course Code	24UN-ICT-301		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Basic Knowledge of Computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of operating systems and its services along with process management. 2. understand concept of process scheduling and acquire knowledge of process synchronization. 3. learn about memory management and virtual memory concepts. 4. learn to work with directory structure and security aspects. 5*. to implement the programs based on operating systems.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			

Prashant

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introductory Concepts: Operating System, Functions and Characteristics, Historical Evolution of Operating Systems, Operating System Structure. Types of Operating System: Real time, Multiprogramming, Multiprocessing, Batch processing. Operating System Services, Operating System Interface, Service System Calls, System Programs. Process Management: Process Concepts, Operations on Processes, Process States and Process Control Block. Inter-Process Communication.	10
II	CPU Scheduling: Scheduling Criteria, Levels of Scheduling, Scheduling Algorithms, Multiple Processor Scheduling, Algorithm Evaluation. Synchronization: Critical Section Problem, Semaphores, Classical Problem of Synchronization, Monitors. Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.	10
III	Memory Management Strategies: Memory Management of Single-User and Multiuser Operating System, Partitioning, Swapping, Contiguous Memory Allocation, Paging and Segmentation; Virtual Memory Management: Demand Paging, Page Replacement Algorithms, Thrashing.	10
IV	Implementing File System: File System Structure, File System Implementation, file operations, Type of Files, Directory Implementation, Allocation Methods, and Free Space Management. Disk Scheduling algorithm- SSTF, Scan, C- Scan, Look, C-Look. SSD Management.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: - Working with various operating systems, and performing different operations using operating system. - Write a program to print file details including owner access permissions, file access time, where file name is given as argument. - Write a program to copy files using system calls. - Write a program to implement FCFS scheduling algorithm. - Write a program to implement Round Robin scheduling algorithm. - Write a program to implement SJF scheduling algorithm. - Write a program to implement non-preemptive priority based scheduling algorithm.	25

Prashant

	• Write a program to implement preemptive priority based scheduling algorithm. • Write a program to implement SRJF scheduling algorithm. • Write a program to calculate sum of n numbers using thread library. • Write a program to implement first-fit, best-fit and worst-fit allocation strategies.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Silberschatz A., Galvin P.B., and Gagne G., Operating System Concepts, John Wiley & Sons. • Godbole, A.S., Operating Systems, Tata McGraw-Hill Publishing Company, New Delhi. • Deitel, H.M., Operating Systems, Addison- Wesley Publishing Company, New York. • Tanenbaum, A.S., Operating System- Design and Implementation, Prentice Hall of India, New Delhi.		

*Applicable for courses having practical component.

Prashant

Session: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	III		
Name of the Course	Quantitative Foundation of Computer Science		
Course Code	24UN-ICT-302		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Must have studied mathematics at 10+2 level		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Define mathematical structures (relations, functions, sets) and use them to model real life situations 2. Solve puzzles based on counting principles. 3. Organize, manage, present and Analyze Statistical data using measures of central tendency 4. Analyze Statistical data using measures of dispersion and Study the relationship between variables using techniques of correlation 5*. to implement the programs based on various mathematical and statistical function.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			

Prashant

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Sets, relations and functions: Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction.	10
II	Introduction to counting: Basic counting techniques - inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating function.	10
III	Data Types and Data Presentation: Data types: Attribute, Variable, Discrete and Continuous variable, Univariate and Bivariate distribution. Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio. Data presentation: Frequency distribution, Histogram, Ogive curves. Measures of Central tendency: Concept of average/central tendency, characteristics of good measure of central tendency. Arithmetic Mean (A.M.), Median, Mode - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined arithmetic mean. Partition Values: Quartiles, Deciles and Percentiles - examples for ungrouped and grouped data	10
IV	Measures of dispersion: Concept of dispersion, Absolute and Relative measure of dispersion, characteristics of good measure of dispersion. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.) Correlation: Concept of correlation, Types and interpretation, Measure of Correlation: Scatter diagram and interpretation; Karl Pearson's coefficient of correlation (r): Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, properties; Spearman's rank correlation coefficient: Definition, examples of with and without repetition. Concept of Multiple correlation.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Functions: - Identify if the given mapping is a function - Finding domain and range of a given function - Check if the given function is injective/surjective/bijective - Find the inverse of a given function - Operations on functions - Graphs of functions using any online tool Sets:	25

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- Performing various set operations Relations: - Representation of relations - Determine if the given relation satisfies equivalence relation/partial order relation - Draw Hasse diagrams - Find maximal, minimal, greatest, least element in a poset - Determine if a given poset is a lattice Counting Principles: - Sum and product rule - Pigeonhole Principle - Inclusion Exclusion Principle Permutations and Combinations: - Permutations - Permutations with repetitions - Combinations - Combinations with repetitions Frequency distribution and data presentation - Frequency Distribution (Univariate data/ Bivariate data) - Diagrams - Graphs Measures of Central Tendency - Arithmetic Mean - Median - Mode - Partition Values Measures dispersion - Range and Coefficient of range - Quartile deviation and Coefficient of quartile deviation - Standard deviation, Variance and Coefficient of variation (C.V.) Correlation - Karl Pearson's correlation coefficient - Spearman's Rank correlation	
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: 5 - Seminar/Demonstration/Viva-voce/Lab records etc.: 5 - Mid-Term Exam: NA	End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw-Hill.	

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- C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill.
- Norman L. Biggs, Discrete Mathematics, Oxford University Press.
- Kenneth Bogart, Clifford Stein and Robert L. Drysdale, Discrete Mathematics for Computer Science, Key College Publishing.
- Thomas Koshy, Discrete Mathematics with Applications, Elsevier.
- Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education, Asia.
- Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.
- Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi
- Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, NewDelhi.
- Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, NewDelhi.
- Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, NewDelhi.
- Schaum's Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum's Outline Series McGraw-Hill

*Applicable for courses having practical component.

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Session: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	III		
Name of the Course	Programming with C		
Course Code	24UN-ICT-MDC-303		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the concepts of problem solving on computer 2. understand the basics of C programming along with various I/O functions 3. understand various operators and branching statements in C 4. understand loops, functions and arrays in C 5*. to design programs based on theoretical concepts of C.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:70 Internal Assessment Marks:20(15(T)+5(P)) End Term Exam Marks: 50(35(T)+15(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
Unit	Topics		Contact Hours
I	Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant.		6

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	Input/output: Unformatted & Formatted I/O Function, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), output functions viz. printf(), putch(), putchar(), puts().	
II	Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators Operator Hierarchy & Associativity. Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion.	6
III	Decision making with if statement, if-else statement, nested if statement, else-if ladder, switch and break statement, goto statement Looping: for, while, and do-while loop, jumps in loops.	6
IV	Functions: definition, prototype, function call, passing arguments to a function: call by value, call by reference, recursive functions. Arrays: Definition, types, Initialization, multidimensional arrays, Processing on Arrays.	6
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Write a C Program to read radius and find area and volume of a sphere • Write a C Program to read three numbers and find the biggest of three • Write a C Program to demonstrate library functions in math.h (at least 5) • Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome • Write a C Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers • Write a C Program to read percentage of marks and to display appropriate grade (using switch case) • Write a C Program to find the roots of quadratic equation (if else ladder) • Write a C program to read marks scored in 3 subjects by n students and find the average of marks and result (Demonstration of single dimensional array) • Write a C Program to remove Duplicate Element in a single dimensional Array • Program to perform addition and subtraction of Matrices • Write a C Program to generate n prime number by defining isprime () function • Write a C Program to find the trace of a square matrix using function • Write a C Program to read, display and multiply two matrices using functions	25

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Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam: 7 ➤ Practicum • Class Participation: 2 • Seminar/Demonstration/Viva-voce/Lab records etc.:3 • Mid-Term Exam: NA	End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Gottfried, Byron S., Programming with C, Tata McGraw Hill. • Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill. • Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley. • Yashwant Kanetker, Let us C, BPB. • Rajaraman, V., Computer Programming in C, PHI. • Yashwant Kanetker, Working with C, BPB	

*Applicable for courses having practice

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Semester: IV

Session:2024-25			
PartA-Introduction			
Subject	COMPUTER SCIENCE		
Semester	IV		
Name of the Course	Data Management with DBMS		
Course Code	24UN-ICT-401		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course(As per Annexure-I)	200-299		
Pre-requisite for the course(if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn basic concept Of databasea long with its functions and components 2. understand data models. 3. understand SQL as a query language and Learn the concept of relational algebra and calculus. 4. acquire knowledge of advanced concepts of DBMS. 5*.implement the queries based on database management.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max. Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB-Contents of the Course			
Instructions for Paper-Setter			
Theexaminerwillsetatotalofninequestions.Outofwhich,thefirstquestionwillbecompulsory. Theremaining eight questionswillbeset from fourunitsselectingt two questions fromeachunit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.			



The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Basic Concepts: Data, Information, Records, Files, Schema and Instance etc. Limitations of File-Based Approach, Characteristics of Database Approach, Database Management System (DBMS), DBMS Functions and Components, Database Interfaces, Advantages and Disadvantages of DBMS. Database Users: Data and Database Administrator, Role and Responsibilities of Database Administrator, Database Designers, Application Developers etc. Database System Architecture: 1-Tier, 2-Tier & Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances, Data Independence—Logical and Physical Data Independence	11
II	Data Models: Hierarchical, Network, and Relational Data Models. Entity-Relationship Model: Entity, Entity Sets, Entity Type, Attributes: Type of Attributes, Keys, Integrity Constraints, Designing of ER Diagram, Symbolic Notations for Designing, ER Diagram	11
III	SQL: Meaning, Purpose, and Need of SQL, Data Types, SQL Components: DDL, DML, DCL and DQL, Basic Queries, Join Operations and Sub-queries, Views, Specifying Indexes. Constraints and its Implementation in SQL. Relational Algebra: Basic Operations: Select, Project, Join, Union, Intersection, Difference, and Cartesian Product, etc. Relational Calculus: Tuple Relational and Domain Relational Calculus. Relational Algebra Vs. Relational Calculus.	12
IV	Relational Model: Functional Dependency, Characteristics, Inference Rules for Functional Dependency, Types of Functional Dependency, Normalization: Benefits and Need of Normalization, Normal Forms Based on Primary Keys-(1NF, 2NF, 3NF, BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF, Domain Key Normal Form.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Write a SQL query for creating and describing a table of the salesman in a company. • Write a query to insert data into a table. • Write a SQL statement to display all the information of all salesmen. • Write a query that will retrieve the value of the salesman if of all salesman, getting orders from the customers in the orders table without any repeats.	30

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	• Write a SQL statement to display the name and city of the salesman, who belongs to the city of Paris. • Write a SQL statement to display all the information for those customers with a grade of 200. • Write a SQL statement to delete a particular record from a table • Write an SQL statement that selects the highest grade for each of the cities of customers using the GROUP BY clause. • Write an SQL statement that selects the particular record using the ORDER BY clause. • Write a SQL statement to prepare a list with the salesman's name, the customer's name, and their cities for the salesman and customer who belong to the same city, • Write a SQL statement to know which salesman is working for which customers. • Write an SQL statement to create a view of the table. • Write an SQL statement to rename, update, and delete a view. • Write an SQL statement to update the record in a table. • Write a SQL statement to drop and truncate a table. • Understanding relational model concepts • Converting a table into various normal forms. • Understanding various concepts of databases	
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Elmasri & Navathe: Fundamentals of Database Systems, Pearson Education. • Thomas Connolly Carolyn Begg: Database Systems, Pearson Education. • Korth & Silberschatz: Database System Concept, McGraw Hill International Edition. • Raghu Ramakrishnan & Johannes Gehrke: Database Management Systems, McGraw Hill. • Ivan Bayross: SQL, PL/SQL-The Program Language of ORACLE, BPB Publication.		

*Applicable for courses having practical components.

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Session:2024-25			
PartA-Introduction			
Subject	COMPUTER SCIENCE		
Semester	IV		
Name ofthe Course	Introduction to Computer System Design and Organization		
CourseCode	24UN-ICT-402		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MCC		
Levelofthecourse(Asper Annexure-I	200-299		
Pre-requisite for thecourse(if any)	24UN-ICT-102		
CourseLearningOutcomes(CLO):	After completing thi scourse,thelearner willbeableto: 1. understand number systems, error detecting and correctingcode,andrepresentationsofnumbersina computer system. 2. understandcomputerarithmeticandBooleanalgebra and simplification of Boolean expressions. 3. understand the working of logic gates and design variouscombinationalcircuitsusingtheselogicgates. 4. understandtheworkingofdifferentsypesofflip-flops and design different types of registers. 5*.understand thepracticalaspectsofcomputer systemdesignandorganizationof computers.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max. Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB-ContentsoftheCourse			
<u>InstructionsforPaper-Setter</u> Theexaminerwillsetatotalofninequestions.Outofwhichthefirstquestionwillbecompulsory. Theremaining eight questionswillbeset fromfour unitsselectingtwo questions fromeachunit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory. Thepracticumwillbeevaluatedbyanexternalandaninternalexaminer. Theexaminationwillbe of three-hour duration.			
Unit	Topics		Contact Hours

For sheet

I	Number Systems: Binary, Octal, Hexadecimal, etc. Conversions from one number system to another, BCD Number System. BCD Codes: Natural Binary Code, Weighted Code, Self-Complimenting Code, Cyclic Code. Error Detecting and Correcting Codes. Character representations: ASCII, EBCDIC, and Unicode. Number Representations: Integer numbers - sign-magnitude, 1's & 2's complement representation. Real Numbers normalized floating point representations.	11
II	Binary Arithmetic: Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division using 1's and 2's Complement representations, Addition and subtraction with BCD representations. Boolean Algebra: Boolean Algebra Postulates, basic Boolean Theorems, Boolean Expressions, Boolean Functions, Truth Tables, Canonical Representation of Boolean Expressions: SOP and POS, Simplification of Boolean Expressions using Boolean Postulates & Theorems, Karnaugh-Maps (upto four variables), Handling Don't Care conditions.	11
III	Logic Gates: Basic Logic Gates – AND, OR, NOT, Universal Gates - NAND, NOR, Other Gates – XOR, XNOR, etc. Their symbols, truth tables, and Boolean expressions. Combinational Circuits: Design Procedures, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers, Demultiplexers, Decoder, Encoder, Comparators, Code Converters.	11
IV	Sequential Circuits: Basic Flip-Flops and their working. Synchronous and Asynchronous Flip-Flops, Triggering of Flip-Flops, Clocked RS, D Type, JK, T type, and Master-Slave Flip-Flops. State Table, State Diagram, and State Equations. Flip-flops characteristics & Excitation Tables. Sequential Circuits: Designing registers – Serial-In Serial-Out (SISO), Serial-In Parallel-Out (SIPO), Parallel-In Serial-Out (PISO), Parallel-In Parallel-Out (PIPO), and shift registers.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Number System: • Problems based on the Number System and their conversion. • Programs based on Number System conversion. Binary Arithmetic • Problems based on Binary Arithmetic. • Programs based on Binary Arithmetic. • Problems based on Boolean Expression and their simplification	30

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Logic Gates - Understanding the working of logic Gates. Combinatorial Circuits: - Designing and understanding various combinational circuits. Sequential Circuits: - Designing and understanding various sequential circuits.	
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab record etc.: 10 - Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall. - Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd. - Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill.	

*Applicable for courses having practical components.

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Session:2024-25			
PartA-Introduction			
Subject	COMPUTER SCIENCE		
Semester	IV		
Name ofthe Course	Object-Oriented Programming with Java		
CourseCode	24UN-ICT-403		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MCC		
Levelofthecourse(Asper Annexure-I	200-299		
Pre-requisite for thecourse(if any)	24UN-ICT-101,24UN-ICT-202and 24UN-ICT-301.		
CourseLearningOutcomes(CLO):	After completingthiscourse,thelearner willbeableto: 1. understand thebasicconceptofJAVA; 2. learnanddevelopvariouscontrolsandbranchingof logic under various cases using language control structures 3. exemplifytheusagetoimplementpolymorphismand Inheritance in Java programs. 4. acquire knowledge of Packages, Interfaces, Exceptions,andMultithreadinginbuildingefficient applications. 5*.understandtheprogrammingwithJAVAfor Object-Oriented methodologies.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max. Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB-Contents of the Course			
InstructionsforPaper-Setter			
Theexaminerwillsetatotalofninequestions.Outofwhich,thefirstquestionwillbecompulsory. Theremaining eight questionswillbeset fromfour unitsselectingtwo questions fromeachunit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Thecandidatewillhavetoattemptfivequestions,selectingonefromeachunit.Thefirstquestion will be compulsory. Thepracticumwillbeevaluatedbyanexternalandaninternalexaminer. Theexaminationwillbe of three-hour duration.			
Unit	Topics		Contact Hours

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I	Key Attributes of Object-Oriented Programming, Introduction to Java, History and Features of Java, Java Virtual Machine(JVM), JDK,Java Runtime Environment; Basic Elements: Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Data types, Operators, Assignments; Input/output in Java: Basics, I/O Classes, Reading Console Input. Control Structures in Java: Decision and Loop Control Statements.	11
II	Class and Object in Java: Class Fundamentals, creation of Objects, Defining Methods, Argument Passing Mechanism, Constructors, Abstract Class, Static Members. Array in Java: Defining an Array, Initializing & Accessing Array, Multi-Dimensional Array. String :String Fundamentals ,Operations on Array and String, String Constructors, Creating Strings using String Class and String Buffer Class.	12
III	Polymorphism in Java: Basic Concept, Types, Overriding vs Overloading, Run-time and Compile-time polymorphism. Inheritance: Benefits of Inheritance, Types of Inheritance. Interface: Implementing Interface, extending Interface.	11
IV	Package: creating a package, importing and using package. Exception handling: try/catch, handling multiple exceptions, throw/throws keyword, finally keyword, user-defined exception. Concepts of Multithreading and Synchronization in Java.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • WAP to find the sum of 10 numbers, entered as command line arguments. • Write a program that inputs the radius and length of a cylinder and displays its area and volume. ($\text{area} = \pi r^2$, $\text{Volume} = \text{area} * \text{length}$) • Input a string from the user using String data type and String Buffer Class. • Write a Program that demonstrates the use of various String functions. • Write a program that demonstrates the use of various String Buffer functions.	30

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• WAP to handle the Exception using try and multiple catch blocks and a finally block • Write a program to illustrate the use of super keyword. • Write a program to demonstrate constructor hierarchy. • WAP to find the area of rectangle and circle using Interface. • Write a program to demonstrate function overriding. • Write a program to restrict class from overriding base class function. • Write a Program for Exception Handling for Divide by zero error and Null values. • WAP to implement multiple inheritance. • WAP to show the concept of packages. • WAP to show the working of threads in JAVA	
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record setc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Ivor Horton, Beginning JAVA 2, WROX Publications, New Delhi • Patrick Naughton and Herbert Schilitz, JAVA-2 Complete Reference, TMH, New Delhi • Paul Deitel & Harvey Deitel, Java: How to Program, Pearson Education. • Balaguruswamy, Programming with Java, TMH, New Delhi. • Java 6 Programming, Black Book, KoGen T, Dreamtech Press.	

*Applicable for courses having practical components.

Prashant

Session:2024-25			
Part A-Introduction			
Subject	COMPUTER SCIENCE		
Semester	IV		
Name ofthe Course	Front-End Development		
CourseCode	24UN-ICT-404		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE		
Levelofthecourse(Asper Annexure-I	200-299		
Pre-requisite for thecourse(if any)	24UN-ICT-201		
CourseLearningOutcomes(CLO):	After completingthiscourse,thelearner willbeableto: 1. understandthebasicconceptofobjectsandregular expressions in JavaScript; 2. acquireknowledgeofJavaScripteventsandDOM 3. learntouseformsandBOMinJavaScript; 4. get familiarwithjQuery 5*.understandtheprogrammingofwebpagesand handlingeventsusingJavaScriptandjQuery.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max. Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB-Contents of the Course			
<u>Instructions for Paper-Setter</u> Theexaminerwillsetatotalofninequestions.Outofwhichthefirstquestionwillbecompulsory. Theremaining eight questionswillbeset fromfour unitsselectingt two questions fromeachunit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Thecandidatewillhavetoattemptfivequestions,selectingonefromeachunit.Thefirstquestion will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

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Unit	Topics	Contact Hours
I	Objects in JavaScript: Introduction to objects, Type of objects in JavaScript, Creating objects, Object methods, Constructor function, Prototype in JavaScript, Inheritance using prototype chain. Regular Expressions: Introduction to RegExp, Regular expression usage, Modifiers, Reg Exp patterns, RegExp methods, String methods For RegExp, Type conversion in JavaScript.	11
II	Event handling: JavaScript events, Event handler, Event flow, Event bubbling and capturing, Event listeners, Event types. Document Object Model (DOM): Introduction to DOM, Types of DOM, DOM standards and methods, Manipulating documents using DOM, Handling images, Table manipulation, Animation, Node and Node-list handling	11
III	Browser Object Model (BOM): Introduction to BOM, DOM vs BOM differences, Window object and methods, BOM navigator, BOM history, BOM location, BOM timer, Introduction to Cookies, Session and persistent cookies. Form Handling: Introduction to forms, Form processing, Forms object, Accessing data from forms, Form validation, Additional features in forms, Validation APIs	12
IV	Introduction to jQuery: jQuery Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery HTML, jQuery Traversing, jQuery AJAX, jQuery Misc.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Use of JavaScript in Web page designing • Effective web page design • Creation of Event listeners in JavaScript • Update and modify website elements dynamically using asynchronously retrieved data • Style HTML content with JavaScript	30

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	• Iterate over arrays and objects using JavaScript for syntax. • JavaScript Program to Create Objects (4 Different Ways) • JavaScript Program to Iterate Over an Object • JavaScript Program to Find Max/Min Value of an Attribute in an Array of Objects • JavaScript Program to Remove Duplicates from an Array of Objects • Writing programs for event handling in JavaScript. • Write a JavaScript function to add rows to a table. • Write a JavaScript program to remove items from a drop-down list. • Write a JavaScript program to calculate sphere volume. • Write a JavaScript program to get the window width and height • Using BOM navigation and location • Creating cookies and sessions. • How can you create forms and perform validations on the forms? • How can you use jQuery and perform various functions using jQuery?	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide. • Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd. • JavaScript and jQuery: Interactive Front-End Web Development by Jon Duckett • Head First JavaScript Programming: A Brain-Friendly Guide by Elisabeth Robson and Eric Freeman		

*Applicable for courses having practical components.

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Session:2024-25			
Part A-Introduction			
Subject	COMPUTER SCIENCE		
Semester	IV		
Name of the Course	Linux and Shell Programming		
Course Code	24UN-ICT-405		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	24UN-ICT-301		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understand Linux architecture; 2. ability to use various Linux commands that are used to manipulate system operations. 3. acquire knowledge of Linux File System; 4. understand and make effective use of I/O and shell scripting language to solve problems 5*. understand the Linux operating system working and programming Shell.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 (70(T)+30(P)) Internal Assessment Marks: 30 (20(T)+10(P)) End Term Exam Marks: 70 (50(T)+20(P))		Time: 3 Hrs. (T), 3 Hrs. (P)	
Part B-Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. The first question will be compulsory. The practical will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			
Unit	Topics		Contact Hours

Prashant

I	Introduction to Linux: Linux distributions, Overview of Linux operating system, Linux architecture, Features of Linux, Accessing Linux system, Starting and shutting down system, Logging in and Logging out, Comparison of Linux with other operating systems	11
II	Commands in Linux: General-purpose commands, File oriented commands, directory-oriented commands, Communication-oriented commands, process-oriented commands, etc. Regular expression & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, grep; Introducing regular expressions	11
III	Linux file system: Linux files, inodes and structure and file system, file system components, standard file system, file system types. Processes in Linux: starting and stopping processes, initialization processes, mechanism of process creation, Job control in Linux using at, batch, cron & time	11
IV	Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in Linux	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Basic Linux command • Basic Shell Programming (Fibonacci Series generation, Factorial of a given number, Checking for Armstrong number) • Designing an Arithmetic calculator • Generation of Multiplication table • Base Conversion (Decimal to Binary, Binary to Decimal) • Finding the information about the Login name and Filename. • Write a shell script to exchange the content of two variables. • Write a shell script, which accepts three subject marks scored by a student and declares the result. • Write a shell script program to find the area of a square, rectangle, circle, and triangle. • Write a shell script to print integer numbers from 1 to 20.	30

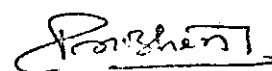
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	

Prashant

Recommended Books/e-resources/LMS:

- Kanetkar, UNIX & Shell programming – BPB.
- M.G. Venkateshmurthy, Introduction to UNIX & Shell Programming, Pearson Education.
- Richard Petersen, The Complete Reference – Linux, McGraw-Hill.
- Stephen Prata, Advanced UNIX – A programmer's Guide, SAMS.
- Sumitabha Das, Your UNIX – The Ultimate Guide, Tata McGraw-Hill

*Applicable for course having practical components.



SEMESTER: 5

Syllabus: 2024-25			
Part A - Introduction			
Subject	Computer Science		
Semester	V		
Name of the Course	Data Structures		
Course Code	24UN-ICT-501		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC-5/MCC-9		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the basics of data structure and algorithm complexities. 2. acquire knowledge of arrays and strings. 3. understand the idea of implementation for linked lists and stacks. 4. learn various searching and sorting techniques along with the implementation of queues. 5* develop the project with data structures.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

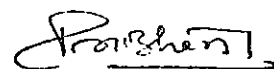


Unit	Topics	Contact Hours
I	Data Structure Definition, Data Type vs. Data Structure, Classification of Data Structures, Data Structure Operations, Applications of Data Structures. Algorithm Specifications: Performance Analysis and Measurement (Time and Space Analysis of Algorithms- Average, Best and Worst Case Analysis). Arrays: Introduction, Linear Arrays, Representation of Linear Array in Memory, Two Dimensional and Multidimensional Arrays, Sparse Matrix and its Representation, Operations on Array: Algorithm for Traversal, Selection, Insertion, Deletion and its implementation.	11
II	String Handling: Storage of Strings, Operations on Strings viz., Length, Concatenation, Substring, Insertion, Deletion, Replacement, Pattern Matching Linked List: Introduction, Array vs. linked list, Representation of linked lists in Memory, Traversing a Linked List, Insertion, Deletion, Searching into a Linked list, Type of Linked List.	11
III	Stack: Array Representation of Stack, Linked List Representation of Stack, Algorithms for Push and Pop, Application of Stack: Polish Notation, Postfix Evaluation Algorithms, Infix to Postfix Conversion, Infix to Prefix Conversion, Recursion. Introduction to Queues: Simple Queue, Double Ended Queue, Circular Queue, Priority Queue, Representation of Queues as Linked List and Array, Applications of Queue. Algorithm on Insertion and Deletion in Simple Queue and Circular Queue. Priority Queues.	12
IV	Tree: Definitions and Concepts, Representation of Binary Tree, Binary Tree Traversal (Inorder, postorder, preorder), Binary Search Trees – Definition, Operations viz., searching, insertions and deletion; Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort, Quick sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Write a program that uses functions to perform the following operations on an array i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on strings i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on a singly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on a doubly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal • Write a program that implement stack (its operations) using i) Arrays ii) Linked list(Pointers).	30

	• Write a program that implements Queue (its operations) using i) Arrays and ii) Linked lists (Pointers). • Write a program that implements the following sorting i) Bubble sort ii) Selection sort iii) Quick sort. • Write programs for various types of tree traversals.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Seymour Lipschutz, Data Structures, Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines. • Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Data Structures Using C, Pearson Education. • Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw-Hill. • Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison- Wesley. * Applicable for courses having practical components.		

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Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	V		
Name of the Course	Software Engineering		
Course Code	24-UN-ICT-502		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MCC-10		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of any Programming language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the various models for software development. 2. understand how to analyze software. 3. plan a software design and the risks associated with software. 4. test and validate software 5*. Implement the various tools and techniques used in software engineering.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter			
Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			



Unit	Topics	Contact Hours
I	Introduction: Program vs. Software, Software Engineering, Programming paradigms, Software Crisis – problem and causes, Phases in Software development: Requirement Analysis, Software Design, Coding, Testing, Maintenance, Software Development Process Models: Waterfall, Prototype, Evolutionary and Spiral models, Role of Metrics.	11
II	Feasibility Study, Software Requirement Analysis and Specifications: SRS, Need for SRS, Characteristics of an SRS, Components of an SRS, Problem Analysis, Information gathering tools, Requirement specification, validation and metrics. Structured Analysis and Tools: Data Flow Diagram, Data Dictionary, Decision table, Decision trees, Structured English, Entity-Relationship diagrams	11
III	Software Project Planning: Cost estimation: COCOMO model, Project scheduling, Staffing, and personnel planning, team structure, Software configuration management, Quality assurance plans, Project monitoring plans, Risk Management. Software Design: Design fundamentals, problem partitioning, and abstraction, design methodology, Cohesion & Coupling.	12
IV	Software testing strategies: unit testing, integration testing, Validation testing, System testing, Alpha and Beta testing. Software Maintenance: Type of maintenance, Management of Maintenance, Maintenance Process, maintenance characteristics.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Development of 0 level DFD • Development of 1 level DFD • Development of 2 level DFD • data dictionary, • E-R diagram for Student Teacher Relationship • E-R diagram for Library Management, • Draw ER Diagram for Hospital Management System. • ER diagram for (ANY 5) • Student Result Management System • Library management system • Inventory control system • Accounting system • Fast food billing system • Bank loan system • Blood bank system • Railway reservation system • Automatic teller machine • Video library management system • Hotel management system • Hostel management system	30

	• E-ticking • Share online trading • Hostel management system • Resource management system • Court case management system	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Pressman R. S., "Software Engineering – A Practitioner's Approach", Tata McGraw Hill. • Jalote P., "An Integrated Approach to Software Engineering", Narosa. • Sommerville, "Software Engineering", Addison Wesley. • Fairley R., "Software Engineering Concepts", Tata McGraw Hill. • James Peter, W Pedrycz, "Software Engineering", John Wiley & Sons.		

*Applicable for courses having practical components.

Prashant

Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	V		
Name of the Course	Foundations of Server-Side Development		
Course Code	24UN-ICT-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE-2		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	24UN-ICT-201		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the principles of server-side development. 2. Gain proficiency in server-side programming languages and frameworks. 3. Learn to design and manage databases. 4. Develop skills to create server-side applications. 5*. to equip with the knowledge of server-side frameworks.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Unit	Topics	Contact Hours
I	Introduction to Server-Side Development: Definition and importance of server-side development, Client-Server architecture, Overview of server-side technologies Server-Side Programming Languages: Introduction to server-side languages (e.g., Node.js), Syntax and semantics of chosen server-side language	11
II	Server-Side Programming Languages: Setting up the development environment, Writing and executing basic server-side scripts Web Servers: Understanding web servers (e.g., Apache, or Nginx), Installing and configuring a web server, Handling HTTP requests and responses, Serving static and dynamic content	11
III	Database Management: Introduction to databases and DBMS (SQL and NoSQL), Designing a database schema, CRUD operations (Create, Read, Update, Delete), Connecting server-side applications to a database	11
IV	Server-Side Frameworks: Overview of popular server-side frameworks (e.g., Express.js), Building a simple application using a framework, Routing and middleware, Template engines	12
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Setting up the development environment • Hands-on practice with server-side programming languages • Building and deploying a simple web application • Connecting and managing a database • Implementing user authentication	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- "Node.js Design Patterns" by Mario Casciaro and Luciano Mammino
- "Learning PHP, MySQL & JavaScript" by Robin Nixon
- Online documentation and tutorials for the chosen programming language and frameworks

*Applicable for courses having practical component.

Prashant

Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	V		
Name of the Course	Cloud Computing		
Course Code	24UN-ICT- 504		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-2		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the basic concepts and principles of cloud computing. 2. Describe the architecture and components of cloud computing systems. 3. Evaluate different cloud deployment models and service models. 4. Analyze the benefits, challenges, and risks associated with cloud computing. 5*. Apply cloud computing principles to solve real-world problems.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Part B- Contents of the Course			

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Unit	Topics	Contact Hours
I	Introduction to Cloud Computing: Definition and characteristics of cloud computing, Historical evolution of cloud computing Cloud Computing Architecture: Cloud service models: IaaS, PaaS, SaaS, Cloud deployment models: Public, private, hybrid, community clouds	11
II	Key Technologies and Concepts: Virtualization and containerization, Scalability, elasticity, and resilience, Service-oriented architecture (SOA), and microservices Cloud Infrastructure: Data centers and virtualization technologies. Network fundamentals for cloud computing Major Cloud Platforms: Overview of leading cloud service providers (e.g., AWS, Azure, Google Cloud), Hands-on experience with deploying applications on a cloud platform	12
III	Cloud Security and Privacy: Security challenges and issues in cloud computing, Authentication, authorization, and encryption in the cloud Managing Cloud Services: Monitoring and managing cloud resources, Cost management and optimization strategies	11
IV	Emerging Trends in Cloud Computing: Serverless computing and Function as a Service (FaaS), Edge computing, and Internet of Things (IoT) integration with cloud	11
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: • Setting up a basic cloud environment using a free tier service (e.g., AWS, Google Cloud, Azure). • Exploring different cloud service models using practical examples. • Creating and managing virtual machines using virtualization software (e.g., VirtualBox, VMware). • Deploying and managing infrastructure on a cloud platform (e.g., creating VMs, storage, and networking in AWS). • Developing and deploying applications using a PaaS platform (e.g., Google App Engine, AWS Elastic Beanstalk). • Exploring popular SaaS applications and understanding their architecture. • Implementing and managing cloud storage solutions (e.g., AWS S3, Google Cloud Storage). • Implementing security measures in a cloud environment (e.g., setting up IAM, encryption).	30
Suggested Evaluation Methods		

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Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood. • "Cloud Computing: A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti. • "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)" by Michael J. Kavis. • "Mastering Cloud Computing" by Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi.	

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	V		
Name of the Course	Programming in Python		
Course Code	24UN-ICT- 505		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-3		
Level of the course (As per Annexure-I	200-299		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of Python programming 2. learn various data structures used in Python programming. 3. develop the simple programs of Python using arrays and functions. 4. illustrate the process of data file manipulations using python 5* develop the programs using Python.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours

For Sheet

I	Introduction to Python: Python Interpreter, Python as calculator, Python shell, Indentation, identifier and keywords, literals, strings, Operators: Arithmetic, Relational, Logical, comparison, Bitwise, Assignment, Identity operator and Membership operator; Input & output statements; Control statements: Branching, looping, Conditional statement, Exit function	11
II	String Manipulations: Subscript operator, indexing, slicing a string, other functions on strings, string module. Strings and number system: Format functions, converting strings to numbers & Vice Versa. List, Tuples, Sets, Dictionaries: Basic list operators, replacing, inserting, removing an element, searching, Sorting lists, dictionary literals, adding & removing keys, accessing & replacing values, traversing dictionaries.	11
III	Array in Python, Design with Functions: hiding redundancy, complexity, arguments & return values; Formal/Actual arguments, named arguments, program structure and design, Recursive functions, scope & Global statements, Importing modules, Math modules & Random modules.	11
IV	Exception Handling: Exceptions, except clause, try and finally clause, user-defined exceptions. File Handling: Manipulating files & directories, OS & SYS modules, Reading, writing text & numbers from/to file. Graphics: "Turtle" module, drawing colors, shapes, digital images, image file formats.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • WAP to find the roots of a quadratic equation. • WAP to accept a number 'n' and (a). Check if 'n' is prime (b). Generate all prime numbers till 'n' (c). Generate first 'n' prime numbers (d). This program may be done using functions. • WAP that accepts a character and performs the following: (a). print whether the character is a letter or numeric digit or a special character (b). if the character is a letter, print whether the letter is uppercase or lowercase (c). if the character is a numeric digit, print its name in the text (e.g., if the input is 9, the output is NINE) • WAP to perform the following operations on a string (a). Find the frequency of a character in a string. (b). Replace a character by another character in a string. (c). Remove the first occurrence of a character from a string. (d). Remove all occurrences of a character from a string. • WAP to swap the first n characters of two strings. • Write a function that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1. • WAP to create a list of the cubes of only the even integers appearing in the input list (may have elements of other types also) using the following: (a). 'for' loop (b). list comprehension	30

Prashant

- WAP to read a file and (a). Print the total number of characters, words, and lines in the file. (b). Calculate the frequency of each character in the file. Use a variable of dictionary type to maintain the count. (c). Print the words in reverse order. (d). Copy even lines of the file to a file named 'File1' and odd lines to another file named 'File2'. - Write a function that prints a dictionary where the keys are numbers between 1 and 5 and the values are cubes of the keys. - Consider a tuple t1= (1, 2, 5, 7, 9, 2, 4, 6, 8, 10). WAP to perform the following operations: (a). Print half the values of the tuple in one line and the other half in the next line. (b). Print another tuple whose values are even numbers in the given tuple. (c). Concatenate a tuple t2= (11,13,15) with t1. (d). Return maximum and minimum values from this tuple - WAP to accept a name from a user. Raise and handle the appropriate exception(s) if the text entered by the user contains digits and/or special characters.	
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.: 10 - Mid-Term Exam: NA	End-Term Examination:A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - Sheetal Taneja, Naveen Kumar, Python Programming: A Modular approach, 5th Impression, Pearson. - Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press. - Mark Lutz, Learning Python (available online at pdf derive). - Gutttag John V, Introduction to Computation and Programming Using Python with Application to Understanding Data, PHI. - Charles Diiorbach, Introduction to Computer Science using Python, Wiley. - Balaguruswamy E., Introduction to Computing and Problem Solving using Python, 2nd edition, McGraw Hill Education, 2018. - Brown, Martin C., Python: The Complete Reference, 2nd edition, McGraw Hill Education, 2018.	
* Applicable for courses having practical components.	

Prashant

Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	V		
Name of the Course	Programming in R		
Course Code	24UN-ICT- 506		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-3		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand R programming structures 2. Recognize and make appropriate use of different types of data structures, vectors, and list. 3. Learn Matrices, arrays, and data frames in R. 4. Gain knowledge on input/output operations and learn to install packages in R. 5* develop the various programs using R.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			
The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

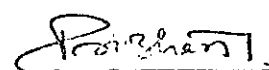
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Unit	Topics	Contact Hours
I	Introduction to R: Installing R and running commands/scripts R, Functions, Start-up Files, Reading and Writing R, and Arithmetic operations in R. R Programming Structures: Control Statements, Loops, If-Else, Arithmetic and Boolean Operator values, Type Conversions-Functions.	11
II	R Data Structures: Lists Creation, Accessing List Elements, Adding or Deleting List Elements, Recursive Lists, Data Frames. Vectors: Declaration, Arithmetic and logic operations, Indexing, Vector Operations on vectors, Filtering, Matrices, Math Functions, and Set operations.	11
III	Matrices and Arrays: Creating Matrices, Applying Functions to Matrix Rows and Columns, Adding and Deleting Matrix Rows and Columns, Naming Matrix Rows and Columns, Higher-Dimensional Arrays. Data Frames: Creating Data Frames, Merging Data Frames, Applying Functions to Data Frames, Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, and Other Factor- and Table-Related Functions.	12
IV	Input /Output: Reading from the keyboard, Reading and Writing to a File, reading a Matrix or Data Frame from a file, accessing files on Remote Machines, String Manipulations, Interfacing R from other languages. Packages in R, Installation process of various packages in R, Data science packages in R, Building R packages.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Introduction to R and RStudio • Installing R and RStudio • Overview of RStudio interface • Basic R syntax and commands • Writing and executing R scripts Data Types and Structures • Vectors, lists, matrices, and data frames • Indexing and subsetting data • Applying basic functions on data structures Data Import and Export • Reading data from CSV, Excel, and other formats • Writing data to files • Working with APIs to fetch data • Data cleaning and preprocessing	30
Suggested Evaluation Methods		

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Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Norman Matloff, The Art of R Programming A Tour of Statistical Software Design, No Starch Press • W. N. Venables, D. M. Smith, and the R Core Team, An Introduction to R. • "R for Data Science" by Hadley Wickham and Garrett Grolemund • "Hands-On Programming with R" by Garrett Grolemund	

*Applicable for courses having practical components.



SEMESTER: 6

Syllabus: 2024-25			
Part A - Introduction			
Subject	Computer Science		
Semester	VI		
Name of the Course	Computer Networks		
Course Code	24UN-ICT- 601		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC-6/MCC-11		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basic understanding of computer systems and programming.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the fundamental concepts of computer networks. 2. learn about network protocols, architectures, and applications. 3. develop skills for designing and managing networks. 4. <u>learn about network security and wireless networks.</u> 5*. Understand the practical aspects of computer networks.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.			

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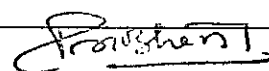
The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Computer Networks: Overview of computer networks, types of networks (LAN, WAN, MAN), network topologies, and network models (OSI and TCP/IP). Physical Layer: Data transmission methods, signal encoding techniques, transmission media, and network devices (hubs, switches, routers).	11
II	Data Link Layer: Error detection and correction, flow control, MAC protocols, Ethernet, and switching. Network Layer: IP addressing and subnetting, routing algorithms, IPv4 vs. IPv6, and ARP.	11
III	Transport Layer: Transport layer protocols (TCP, UDP), congestion control, and quality of service (QoS). Application Layer: Application layer protocols (HTTP, FTP, DNS, SMTP), web services, and network applications.	11
IV	Network Security: Fundamentals of network security, cryptography, firewalls, VPNs, and intrusion detection systems (IDS). Wireless Networks: Wireless communication principles, Wi-Fi, Bluetooth, mobile networks, and ad hoc networks.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Setting up a basic LAN • Implementing error detection and correction algorithms. • Analyzing signal encoding techniques • Configuring routers and switches, subnetting exercises. • Implementing and analyzing TCP and UDP protocols. • Developing simple client-server applications. • Setting up and configuring firewalls and VPNs. • Setting up and securing a wireless network.	30

Suggested Evaluation Methods

Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
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Part C-Learning Resources



Recommended Books/e-resources/LMS:

- "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.
- "Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall.
- "Data and Computer Communications" by William Stallings.
- "Network Security Essentials" by William Stallings.

*Applicable for courses having practical components.

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Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	VI		
Name of the Course	Essentials of Computer Architecture and Design		
Course Code	24UN-ICT- 602		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MCC-12		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Must have basic knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand basic computer organization and architecture. 2 learn various register transfer and micro-operations. 3 acquire knowledge of CPU working. 4 understand and make effective use of memory organization 5*. to implement the programs based on computer organization using assembly language.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.			

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Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Basic Computer Organization and Design: Instruction Codes, Computer registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instructions, Input-Output and Interrupt, Design of Basic computer, Design of accumulator logic	11
II	Register Transfer and Micro operations: Register Transfer Language (RTL), register transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit, Microprogrammed Control: Control memory; address sequencing, microprogram sequencer, Design of Control Unit	11
III	Central Processing Unit: General registers Organization, Stack Organization, Instruction formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Program Interrupt, RISC, CISC.	11
IV	Memory Organization: Memory hierarchy, Auxiliary Memory, Associative Memory, Interleaved memory, Cache memory, Virtual Memory, Memory Management Hardware, Input Output Organization: Peripheral devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access(DMA), Input-Output Processor(IOP).	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Assembly Language Programming • Introduction to assembly language • Writing simple programs • Understanding and using different instructions Data Path and Control Unit Design • Designing a simple data path • Implementing control signals Input/output System Design • Implementing interrupt handling mechanisms	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA		End Term Examination: A three hour exam for both theory and practicum.

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• Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "Computer Organization and Design" by David A. Patterson and John L. Hennessy • "Structured Computer Organization" by Andrew S. Tanenbaum	

*Applicable for courses having practical component.

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Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	VI		
Name of the Course	Developing Modern Web Applications using React		
Course Code	24UN-ICT- 603		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-4		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Must have basic knowledge of JavaScript		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of React and its ecosystem. 2. Learn to create and manage React components. 3. Explore state management and React hooks. 4. Develop skills in routing, form handling, and API integration. 5*. Gain practical experience in building, testing, and deploying React applications.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter			
Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.			

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Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to React: Overview of React and its features, setting up the development environment, Introduction to JSX, Creating and rendering React components. Components and Props: Functional and class components, Passing and accessing props, Component composition, Best practices for component design	11
II	State and Lifecycle: Understanding state in React, managing state with class components, Lifecycle methods, and their use cases, Introduction to React Hooks (useState, useEffect) Handling Events: Handling events in React, Synthetic events, Passing arguments to event handlers, Event handling best practices	11
III	React Router: Introduction to React Router, setting up routing in a React application, Navigating between routes, Dynamic routing and route parameters Managing State with Redux: Introduction to Redux, Setting up Redux in a React application, Actions, reducers, and the store, Connecting React components to Redux	12
IV	Form Handling: Controlled vs. uncontrolled components, Handling form inputs and submissions, Validation and error handling Fetching Data from APIs: Introduction to RESTful APIs, Fetching data using fetch and axios, Handling loading states and errors, Displaying data in components	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Setting Up the Environment - Installing Node.js and npm - Setting up a React project with Create React App - Overview of project structure and configuration Building Basic Components - Creating functional and class components - Using props and state - Building a simple to-do list application Working with Events and Forms - Handling button clicks and form submissions - Building a contact form with validation - Using controlled components Implementing Routing - Setting up React Router - Creating navigation menus - Building a multi-page application with dynamic routes	30

	State Management with Redux • Setting up Redux in a React project • Creating actions and reducers • Connecting Redux to components • Building a simple shopping cart application Fetching and Displaying Data • Fetching data from a public API • Displaying data in lists and tables • Handling loading states and errors	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: A three hour exam for both theory and practicum.	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • "React - The Complete Guide" by Maximilian Schwarzmüller • "Learning React" by Alex Banks and Eve Porcello • React official documentation and tutorials		

*Applicable for courses having practical component.

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Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	VI		
Name of the Course	Data Storage Technologies and Networks using AWS		
Course Code	24UN-ICT- 604		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-4		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	24UN-ICT- 504		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand fundamental concepts of data storage and networking. 2. Learn basic AWS storage and networking services. 3. Develop practical skills in using AWS for data storage and network setup.		
	4* Apply knowledge to real-world scenarios and simple projects.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units, selecting two questions from each. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.			

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The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Data Storage: Overview of data storage technologies, Storage types: Block storage, file storage, and object storage, Basic storage performance metrics AWS Storage Services Basics: Introduction to Amazon S3 (Simple Storage Service): Creating and managing buckets, Uploading and retrieving data; Introduction to Amazon EBS (Elastic Block Store): Creating and managing EBS volumes; Hands-on: Setting up and using S3 and EBS	12
II	Introduction to Networking: Basic networking concepts, Understanding IP addressing, Introduction to network protocols AWS Networking Services Basics: Introduction to Amazon VPC (Virtual Private Cloud): Creating a VPC, Configuring subnets;	11
III	AWS Networking Security: Basic network security: Security groups and NACLs, Hands-on: Setting up a simple VPC and configuring basic security Data Security and Management: Introduction to data encryption, Basic backup and recovery strategies, Hands-on: Implementing basic data security and backup in AWS	11
IV	Introduction to Scalable and Resilient Design: Basics of scalability and resilience, Simple load balancing concepts, Hands-on: Setting up a basic load balancer in AWS	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Setting up Amazon S3 and managing buckets • Configuring a basic Amazon EBS volume • Creating a simple VPC and configuring subnets • Setting up security groups and basic network ACLs • Implementing basic data encryption and backup solutions • Configuring a simple load balancer in AWS	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		

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Recommended Books/e-resources/LMS:

- AWS Documentation and Basic Tutorials
- "AWS Certified Cloud Practitioner Study Guide" by Ben Piper and David Clinton

*Applicable for courses having practical component.

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Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	VI		
Name of the Course	Data Analytics using Python		
Course Code	24UN-ICT- 605		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	24UN-ICT- 505		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of data analytics. 2. Learn to use Python for data analysis and visualization. 3. Develop the ability to apply data analytics techniques to various domains. 4. Learn the basics of machine learning using case studies. 5* Gain practical skills in handling real-world data sets.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units, selecting two questions from each. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.			

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The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Data Analytics: Overview of data analytics, Importance and applications of data analytics, Data analytics process: Collecting, cleaning, analysing, and interpreting data Introduction to Python for Data Analytics: Basics of Python programming, Python libraries for data analytics: NumPy, pandas, matplotlib, and seaborn, Hands-on: Setting up the Python environment and basic scripting	12
II	Data Collection and Cleaning: Methods of data collection, Handling missing data, Data cleaning techniques, Hands-on: Collecting and cleaning data using pandas Exploratory Data Analysis (EDA): Descriptive statistics, Data visualization techniques, Identifying patterns and trends, Hands-on: Performing EDA using matplotlib and seaborn	11
III	Data Manipulation with pandas: Data frames and series, Data manipulation techniques, Merging, joining, and concatenating data, Hands-on: Manipulating data using pandas Statistical Analysis: Introduction to statistical concepts, Hypothesis testing, Correlation, and regression analysis, Hands-on: Conducting statistical analysis with Python	11
IV	Machine Learning Basics: Introduction to machine learning, Supervised vs. unsupervised learning, Basic machine learning algorithms, Hands-on: Implementing simple machine learning models using scikit-learn Case Studies and Real-World Applications: Analysis of real-world data sets, Best practices, and challenges in data analytics, Applying data analytics techniques to a chosen data set	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Setting up Python and installing necessary libraries • Collecting and cleaning data with pandas • Exploratory data analysis using matplotlib and seaborn • Data manipulation techniques with pandas • Conducting basic statistical analysis • Implementing a simple linear regression model	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5		End Term Examination: A three hour

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• Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "Python for Data Analysis" by Wes McKinney • "Data Science from Scratch" by Joel Grus	

*Applicable for courses having practical component.

Syllabus: 2024-25			
Part A - Introduction			
Subject	COMPUTER SCIENCE		
Semester	VI		
Name of the Course	Data Analytics using R		
Course Code	24UN-ICT- 606		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	24UN-ICT- 506		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of data analytics. 2. Learn to use R for data analysis and visualization. 3. Develop the ability to apply data analytics techniques to various domains. 4. Learn the basics of machine learning using case studies.		
	5* Gain practical skills in handling real-world data sets.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units, selecting two questions from each. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.			

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The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Data Analytics: Overview of data analytics, Importance and applications of data analytics, Data analytics process: Collecting, cleaning, analysing, and interpreting data Introduction to R for Data Analytics: Basics of R programming, RStudio setup and basics, Key R packages for data analytics: dplyr, ggplot2, tidyr, and readr, Hands-on: Setting up R and RStudio, and basic scripting	12
II	Data Collection and Cleaning: Methods of data collection, Handling missing data, Data cleaning techniques, Hands-on: Collecting and cleaning data using dplyr and tidyr Exploratory Data Analysis (EDA): Descriptive statistics, Data visualization techniques, Identifying patterns and trends, Hands-on: Performing EDA using ggplot2	11
III	Data Manipulation with dplyr: Data frames and tibbles, Data manipulation techniques, Merging, joining, and concatenating data, Hands-on: Manipulating data using dplyr Statistical Analysis: Introduction to statistical concepts, Hypothesis testing, Correlation, and regression analysis, Hands-on: Conducting statistical analysis with R	11
IV	Machine Learning Basics: Introduction to machine learning, supervised vs. unsupervised learning, Basic machine learning algorithms, Hands-on: Implementing simple machine learning models using caret Case Studies and Real-World Applications: Analysis of real-world data sets, Best practices, and challenges in data analytics, Applying data analytics techniques to a chosen data set	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Setting up R and RStudio, and installing necessary packages • Collecting and cleaning data with dplyr and tidyr • Exploratory data analysis using ggplot2 • Data manipulation techniques with dplyr • Conducting basic statistical analysis • Implementing a simple linear regression model	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: A three hour exam for both theory and practicum.

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➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "R for Data Science" by Hadley Wickham and Garrett Grolemund • "Hands-On Programming with R" by Garrett Grolemund	

*Applicable for courses having practical component.

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