

INDIRA GANDHI UNIVERSITY

Meerpur-Rewari, Haryana (122502)

(A State University Established under Haryana Act No.29 of 2013)

(Recognized u/s 12(B) & 2(f) of UGC Act, 1956)



SCHEME OF EXAMINATION & SYLLABI

in accordance with National Education Policy-2020

for

Undergraduate Programme

in

Computer Applications

(Effective from Academic Session: 2026-27)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

FACULTY OF ENGINEERING & TECHNOLOGY

www.igu.ac.in

VISION AND MISSION OF THE UNIVERSITY

VISION

To be a globally renowned university, recognized for excellence in teaching, innovative research and welfare of the society, imbibing the spirit of “*Vasudhaiv kutumbkam*”.

MISSION

- To introduce and implement innovation in teaching and learning process matching up the global standards to strengthen academic delivery through curriculum design, teaching pedagogy and usage of ICT.
- To develop a mechanism that attracts talented, qualified and experienced faculty from across the globe for pursuing their academic and research careers at the University.
- To offer academic programmes at UG, PG, Doctoral, Post-Doctoral levels which are learner-centric, industry focused and adhere to outcome based international models.
- To create an ambiance that is conducive for undertaking sponsored research, innovation and consultancy services to a wide spectrum of societal and industrial requirements while encouraging interdisciplinary approach of learning, team work and research.
- To establish state of art centres of excellence in frontier areas of research and design innovation through industry collaboration to innovate and incubate the products and services.
- To establish smart campus and promote e-governance activities in the university for the digitally empowered society and knowledge economy.
- To provide a hygienic, modern, environment friendly and vivacious campus attuned to the urgent needs of Green Technology.
- To consider and implement norms, metrics, standards, procedures and benchmarks for assessing and improving the quality in every aspect of University system and achieve quality certifications by National and International bodies.
- To make society self-reliant by organizing various programmes including literacy, gender sensitization, health awareness and dissemination of information about livelihood generation.

VISION AND MISSION OF THE DEPARTMENT

VISION

To train students to be highly effective instructors, researchers, developers and contributors to IT companies globally. Be regarded as a prestigious centre of scholarly achievement worldwide.

MISSION

1. To foster advance research and best education in IT domain.
2. To create skilled employees for businesses and industries based on latest IT technologies like artificial intelligence, data science and IoT etc.
3. To offer learning environment that is centered on the needs of the students in order to help in their overall development.

ABOUT THE PROGRAMME

The Computer Applications (CA) Programme aims to provide students with comprehensive knowledge and practical skills in Computer Science and Applications. It is designed to prepare students for professional careers in the IT industry, higher education, research, and entrepreneurship. The programme equips students with the technical expertise, analytical abilities, and problem-solving skills required to meet the demands of the rapidly evolving technological world.

INTAKE IN THE PROGRAMME

As per institution

MINIMUM ELIGIBILITY CRITERIA

The candidate must have completed the Senior Secondary Examination (10+2) with at least 45% marks.

For SC/ST: The candidate must have passed the Senior Secondary Examination (10+2) with at least 42.75% aggregate from the Haryana Board of School Education

PASSING CRITERIA

Minimum 40% marks in (Theory as well as Sessional separately)

ELIGIBILITY FOR EXAMINATION

75% attendance in each subject

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	To have fundamental as well as advanced knowledge of information technologies.
PEO2	To provide professional services to IT industries, research organisations in the domain of super specialization.
PEO3	To opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.

PROGRAMME LEARNING OBJECTIVES (POs)

PLO1	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PLO2	Capability to ask relevant/ appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis.
PLO3	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PLO4	Capability of applying knowledge to solve scientific and other problems
PLO5	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, multidisciplinary settings.
PLO6	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PLO7	Ability to use and learn techniques, skills and modern tools for scientific practices
PLO8	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PLO9	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life.
PLO10	Capability to identify and apply ethical issues related to one's work; avoid unethical behaviour such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work.
PLO11	Ability to demonstrate knowledge and understanding of the latest IT technologies and apply these to manage projects.

Scheme of Examination for Undergraduate Programme

Subject	Computer Applications
Total number of Semesters	08
Total Marks	4600
Total Credit	180
Scheme	-

Indira Gandhi University, Meerpur, Rewari

Scheme of Examination for the Computer Applications Subject in Under Graduate Programmes

as per NEP 2020 Curriculum and Credit Framework for Undergraduate Programmes

(Multiple Entry-Exit, Internships and Choice Based Credit System LOCF) with effect from the session 2026-27 (in a phased manner)

Semester-1

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-1 MCC-1	Scheme A, B & C	26 L4.5-CAC-101	Programming with Python	4	3	1	3	0	2	5	25	5	50	20	100	3	2
MCC-2	Scheme C	26 L4.5-CAC-102	Computer Fundamentals	4	3	1	3	0	2	5	25	5	50	20	100	3	2
*CC-M1	Scheme A,B & D	26 L4.5-CAC-103	Mathematical Foundations for Computer Science-I	2	2	0	2	0	0	2	15	0	35	0	50	2	0
CC-M1	Scheme C	From Available CC-1/MCC-1 of 4 credits as per NEP															
MDC 1	Scheme A, B & C	From Available pool of Multidisciplinary Courses from a subject of different discipline 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 _____ as a minor subject

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-2 MCC-3	Scheme A, B & C	26 L4.5-CAC-201	Object Oriented Programming using C++	4	3	1	3	0	2	5	25	5	50	20	100	3	2
DSEC-1	Scheme C	26 L4.5-CAC-202	Database Management Systems	4	3	1	3	0	2	5	25	5	50	20	100	3	2
*CC-M2	Scheme A, B & D	26 L4.5-CAC-203	Mathematical Foundations for Computer Science-II	2	2	0	2	0	0	2	15	0	35	0	50	2	0
CC-M2	Scheme C	From Available CC-2/MCC-3 of 4 credits as per NEP															
MDC-2	A, B & C	From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP															
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		Internship of 4 Credits of 4-6 weeks duration after 2 nd Semester (Mandatory in case of exit)												100		

*For students who opt----- as a minor subject

Semester-3

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-3 MCC-4	Scheme A, B & C	26 L5.0-CAC-301	Data Structures and Applications	4	3	1	3	0	2	5	25	5	50	20	100	3	2
MCC-5	Scheme B & C	26 L5.0-CAC-302	Concept of Operating Systems	4	4	0	4	0	0	4	30	0	70	0	100	3	0
MCC-2	Scheme B			4											100		
CC-M3	Scheme A & C	From Available CC-3/MCC-4 of 4 credits as per NEP															
CC-M3(V)	Scheme B	From Available pool of Minor (Vocational) Courses VOC-1															
MDC 3	Scheme A, B & C	From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP															
AEC-3	Scheme A, B & C	From Available pool of Ability Enhancement Courses as per NEP															
SEC-3	Scheme A, B & C	From Available pool of Skill Enhancement Courses as per NEP															
VAC-3	Scheme 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: Lecture P: Practical T: Tutorial				Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
				Total	Theory (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-4 MCC-6	Scheme A, B & C	26 L5.0-CAC-401	Java OOP Foundations	4	3	1	3	0	2	5	25	5	50	20	100	3	2
MCC-7	Scheme B & C	26 L5.0-CAC-402	Management Information System	4	4	0	4	0	0	4	30	0	70	0	100	3	0
MCC-8	Scheme B & C	26 L5.0-CAC-403	Computer Graphics	4	3	1	3	0	2	5	25	5	50	20	100	3	2
DSE-1	Scheme B & C	26 L5.0-CAC-404	Data Communication and Networking	4	4	0	4	0	0	4	30	0	70	0	100	3	0
		OR															
		26 L5.0-CAC-405	Logical Organization of Computer	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-M4(V)	B	From Available pool of Minor (Vocational) Courses VOC-2															
	A & C	From Available pool of Minor (Vocational) Courses VOC-1															
AEC-4	A, B & C	From Available pool of Ability Enhancement Courses as per NEP															
VAC-3	A & B	From Available pool of Value Added Courses as per NEP															
VAC-4	C	From Available pool of Value Added Courses as per NEP															
Internship	A, B & C		Internship of 4 Credits of 4-6 weeks duration after 4th Semester (Mandatory in case of exit if not done after 2 nd Semester)													100	

Semester-5

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-5 MCC-9	Scheme A, B & C	26 L5.5-CAC-501	Artificial Intelligence	4	4	0	4	0	0	4	30	0	70	0	100	3	0
MCC-10	Scheme B & C	26 L5.5-CAC-502	Data Analytics using Spreadsheets	4	3	1	3	0	2	5	25	5	50	20	100	3	2
DSE-2	Scheme B & C	26 L5.5-CAC-503	Linux and Shell programming	4	3	1	3	0	2	5	25	5	50	20	100	3	2
		Or															
		26 L5.5-CAC-504	Web Development	4	3	1	3	0	2	5	25	5	50	20	100	3	2
DSE-3	Scheme B & C	26 L5.5-CAC-505	Mobile Application Development	4	4	0	4	0	0	4	30	0	70	0	100	3	0
		Or															
		26 L5.5-CAC-506	Multimedia Technology	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-M5(V)	A & C	From Available pool of Minor (Vocational) Courses VOC-1															
Internship	A, B & C	26 L5.5-UG-INT500	Internship of 4 Credits of 4-6 weeks duration (After 4 th Semester)												100		

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	
				Total	Theory (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-6 MCC-11	Scheme A, B & C	26 L5.5-CAC-601	Programming in R	4	3	1	3	0	2	5	25	5	50	20	100	3	2
MCC-12	Scheme B & C	26 L5.5 -CAC-602	Advanced Web Development Techniques	4	3	1	3	0	2	5	25	5	50	20	100	3	2
DSE-4	Scheme B & C	26 L5.5 -CAC-603	Software Testing	4	4	0	4	0	0	4	30	0	70	0	100	3	0
		Or															
		26 L5.5 -CAC-604	Security Threats and Trends	4	4	0	4	0	0	4	30	0	70	0	100	3	0
DSE-5	Scheme B & C	26 L5.5 -CAC-605	Ethical Hacking	4	4	0	4	0	0	4	30	0	70	0	100	3	0
		Or															
		26 L5.5 -CAC-606	Cyber Forensics and Investigations	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-M6	A	From Available CC-6/MCC-11 of 4 credits as per NEP															
CC-M5(V)	B	From Available pool of Minor (Vocational) Courses VOC-3															
CC-M6(V)	C																
CC-M7(V)	A																
SEC-4	C	From Available pool of Skill Enhancement Courses as per NEP															

Semester-7 (Honours/Honours with Research)

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-H1	Scheme B & C	26 L6.0-CAC-701	E-Commerce	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-H2	Scheme B & C	26 L6.0-CAC-702	Software Engineering	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-H3	Scheme B & C	26 L6.0-CAC-703	Data Mining and Warehousing	4	4	0	4	0	0	4	30	0	70	0	100	3	0
DSE-6	Scheme B & C	26 L6.0-CAC-704	Cloud Applications and Web Security	4	4	0	4	0	0	4	30	0	70	0	100	3	0
		Or															
		26 L6.0-CAC-705	Cyber Security	4	4	0	4	0	0	4	30	0	70	0	100	3	0
PC-H1	Scheme B & C	26 L6.0-CAC-706	Practicum (Practical Based on 26L6.0-CAC- 703-704/Case Study Report Based on 26 L6.0-CAC-705)	4	0	4	0	0	8	8	0	30	0	70	100	0	3
CC-HM1	B & C	From Available Core Courses in Minor Subject of 4 credits as per NEP															

Semester-8 (Honours)

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-H4	Scheme B & C	26 L6.0-CAC-801	Design & Analysis of Algorithms	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-H5	Scheme B & C	26 L6.0-CAC-802	Internet of Things (IoT)	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-H6	Scheme B & C	26 L6.0-CAC-803	Emerging Trends in Information Security	4	4	0	4	0	0	4	30	0	70	0	100	3	0
DSE-7	Scheme B & C	26 L6.0-CAC-804	Big Data	4	4	0	4	0	0	4	30	0	70	0	100	3	0
		Or															
		26 L6.0-CAC-805	Machine Learning	4	4	0	4	0	0	4	30	0	70	0	100	3	0
PC-H2	Scheme B & C	26 L6.0-CAC-806	Practicum (Practical Based on 26L6.0-CAC- 801-804-805/Case Study Report Based on 26 L6.0-CAC-803)	4	0	4	0	0	8	8	0	30	0	70	100	0	3
CC-HM2	B & C	From Available Core Courses in Minor Subject of 4 credits as per NEP															

Semester-8 (Honours with Research)

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 (Th)	Practical (P)	L	T	P	Total	Th	P	Th	P		Th	P
CC-H4	Scheme B & C	26 L6.0-CAC-801		Design & Analysis of Algorithms	4	4	0	4	0	0	4	30	0	70	0	100	3	0
CC-H5	Scheme B & C	26 L6.0-CAC-802		Internet of Things (IoT)	4	4	0	4	0	0	4	30	0	70	0	100	3	0
Research	Scheme B & C	26 L6.0-CAC-808		Dissertation	12									300		300		
CC-HM2	B & C		From Available Core Courses in Minor Subject of 4 credits as per NEP															

Semester I

Part A–Introduction			
Name of the Programme	Computer Applications		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Programming with Python		
Course Code	26 L4.5-CAC-101		
Course Type	CC-1 (Core Course)		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Write simple programs using built-in data structures in Python. CLO ₂ : Implement arrays and user defined functions in Python. CLO ₃ : Solve problems in the respective domain using suitable programming constructs in Python. CLO ₄ : Solve problems in the respective domain using the concepts of object-oriented programming in Python.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
Instructions for Theory Paper-Setter			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
Instructions for Practical Examiner			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction to Programming: Problem solving strategies; Structure of a Python program; Syntax and semantics; Executing simple programs in Python. Creating Python Programs: Identifiers and keywords; Literals, numbers, and strings; Operators, Expressions		15/CLO ₁
II	Input/output statements; Defining functions; Control structures (conditional statements, loop control statements, break, continue and pass, exit function), default arguments. Built-in data structures: Mutable and immutable objects.		15/CLO ₂
III	Strings, built-in functions for string, string traversal, string operators and operations; Lists creation, traversal, slicing and splitting operations, passing list to a function; Tuples, sets, dictionaries and their operations. File and exception handling: File handling through libraries; Errors and exception handling.		15/CLO ₃
Practical	Students are advised to do laboratory/practical practice not limited to, but		30/CLO ₄

	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, prints its name in text (e.g., if input is 9, 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 25 9 also) using the following: (a). 'for' loop (b). list comprehension • 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 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 value from this tuple. • WAP to accept a name from a user. Raise and handle appropriate exception(s) if the text entered by the user contains digits and/or special characters.				
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					
Recommended Books/e-resources/LMS:					
• Taneja, S., Kumar, N., Python Programming- A Modular Approach, Pearson Education India, 2018. • 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. • Guttag, J.V. Introduction to computation and programming using Python, 2nd edition, MIT Press, 2016					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A–Introduction			
Name of the Programme	Computer Applications		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Computer Fundamentals		
Course Code	26 L4.5-CAC-102		
Course Type	MCC-2		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Understand the basics of computer. CLO ₂ : Learn about I/O devices and operating systems. CLO ₃ : Understand internet and its services CLO ₄ : Learn about the threats and security concepts on computers.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B – Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics	Contact Hours/ CLOs	
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, and Flash Memory.	15/CLO ₁	
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	15/CLO ₂	

	Buttons, Folders, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.				
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. 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.	15/CLO ₃			
Practical	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: MS-Office: - Starting with basics of MS-Office - Understand basics of MS-Word, Excel, Powerpoint Internet and E-mail: - Using Internet for various tasks - Creating and using e-mail. Security: - Understanding various threats - How to be safe from virus threats Various software to get safe from virus attacks.	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
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.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	1	3	2	2	2	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	I		
Nature of Course/Course Composition	Theory		
Name of the Course	Mathematical Foundations for Computer Science-I		
Course Code	26 L4.5-CAC-103		
Course Type	CC-M1(Minor)		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO₁: Gain the knowledge of set theory, types of sets and operations on sets. Understand various concepts of matrices and determinants and acquire the cognitive skills to apply different operations on matrices and determinants. Have the knowledge of the basic concepts of complex numbers and acquire skills to solve linear quadratic equations. CLO₂: Gain the knowledge of the concepts of Arithmetic progression, Geometric progression and Harmonic progression, and find A.M., G.M. and H.M. of given numbers. Understand the concept of differentiation.		
	Theory	Practical	Total
Credits	2	0	2
Teaching hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Duration (in Hours)	2	0	
Part B - Contents of the Course			
<u>Instructions for Paper- Setter:</u>			
The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.			
Units	Topics		Contact Hours/ CLOs
I	Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Cardinality of Set, Practical applications of set theory. Relations And Functions: Properties of Relations, Equivalence Relation, Partial Order Relation. Function: Domain and Range, Types of Functions. Trigonometry: Introduction, Measurement of angles, trigonometric functions, relation between trigonometric functions, signs of trigonometric functions. Limits & Continuity: Limit at a Point, properties of limit, computation of limits of various types of functions, Continuity of a function at a point, Continuity over an interval.		15/CLO ₁
II	Differentiation: Derivative of a function, Derivatives of sum, differences, product & quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions. Matrices: Definition, Types & operation on Matrices, Multiplication of Matrices. Determinants: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Adjoint & Inverse of matrix, solving a system of linear equations using matrix method.		15/CLO ₂
	Total Contact hours		30

Evaluation Methods		
Internal Assessment: 15 Marks		End Term Examination: 35 Marks
• Class Participation:	5	Written Examination: 35
• Seminar/presentation/assignment/quiz /class test etc.:	5	
• Mid-Term Exam:	5	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: • C. Y. Young (2021). Algebra and Trigonometry. Wiley. • S.L. Loney (2016). The Elements of Coordinate Geometry (Cartesian Coordinates) (2nd Edition). G.K. Publication Private Limited. • Seymour Lipschutz and Marc Lars Lipson (2013). Linear Algebra. (4th Edition). • Schaum’s Outline Series, McGraw-Hill. • C.C. Pinter (2014). A Book of Set Theory. Dover Publications. • J. V. Dyke, J. Rogers and H. Adams (2011). Fundamentals of Mathematics (10th Edition), Brooks/Cole. • A. Tussy, R. Gustafson and D. Koenig (2010). Basic Mathematics for College Students (4th Edition). Brooks Cole		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	30
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	30

Semester-II

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	II		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Object Oriented Programming Using C++		
Course Code	26 L4.5-CAC-201		
Course Type	CC-2 (Core Course)		
Course Level	100-199		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Understand basic concepts of C++. CLO ₂ : Learn operators, hierarchy and their precedence and different control structures of C++. CLO ₃ : Develop programs using arrays, strings and functions. CLO ₄ : Implement OOPS concepts with C++.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction to C++: About C++, Character Set, Keywords, Identifiers, Constants, Punctuators, Data Types: User Defined, Built-in, Derived Data Types, Access Modifiers. Unformatted and Formatted I/O Operations. I/O using extraction and extraction operators, Type Conversion, Type Casting. Operators in C++: Arithmetic, Relational, Logical, Bitwise, Ternary, Precedence & associativity of Operators. Control Structures: if statement, if-else statement, nested if, if-else-if ladder, switch case statement, breaks and continues, goto statement, nested switch...case statement, Loops: while loop, do...while loop, for loop.		15/CLO ₁
II	Arrays and strings: Array definition, initialization, multidimensional arrays, Manipulation of array elements, String declaration and initialization, Manipulations, String handling functions. Functions: Declaration and Definition, return values, arguments, passing parameters by value, call by reference, call by pointer, Recursions, Inline and external linkage Functions, storage classes.		15/CLO ₂
III	Object-Oriented Features of C++: Class and Objects, Data hiding & encapsulation, abstraction, constructors & destructors. Data Members and		15/CLO ₃

	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.				
Practical	Practicum: Students are advised to do laboratory/practical practice by including following types of problems: • Programs for showing use of different operators • Program for array • Program for constructor and destructor • Program for structure.	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS:					
Text Books:					
• Herbert Scildt, C++, The Complete Reference, Tata McGraw-Hill • Robert Lafore, Object Oriented Programming in C++, SAMS Publishing					
Reference Books:					
• 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.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	1	3	2	2	2	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	75

Part A–Introduction			
Name of the Programme	Computer Applications		
Semester	II		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Database Management Systems		
Course Code	26 L4.5-CAC-202		
Course Type	DSEC-1		
Course Level	100-199		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Describe major components of DBMS and their functions CLO ₂ : Model an application's data requirements using conceptual modelling tools like ER diagrams and design database schemas based on the conceptual model. CLO ₃ : Write queries in relational algebra / SQL. CLO ₄ : Normalize a given database schema to avoid data anomalies and data redundancy.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Database Management System – Introduction and Purpose, Database Architectures: Centralised, Client-Server, Parallel, Distributed, Web based system: Web architecture (2 tier, 3 tier, N-tier Architecture) Database Storage Structures: Introduction, Indexing, Hashing, Data Dictionary.		15/CLO ₁
II	Data Models: Introduction to various data models, Cardinality Ratio & Relationships, Representation of entities, attributes, relationship attributes, relationship set, Generalization, aggregation, Structure of relational Database and different types of keys, Codd's rules and Relational data model.		15/CLO ₂
III	Relational Database design: Basic System Development Life Cycle, Database Design – ER to Relational, Functional dependencies, Normalization, Normal forms based on primary keys (1NF, 2NF, 3NF). SQL queries: SQL data definition, data types, specifying constraints, Queries for retrieval, insertion, deletion, updation, introduction to views		15/CLO ₃
Practical	Practicum:		30/CLO ₄

	• Create and use the following database schema to answer the given queries. EMPLOYEE Schema: • Field Type NULL KEY DEFAULT • Eno Char(3) NO PRI NIL • EnameVarchar(50) NO NIL • Job_typeVarchar(50) NO NIL • Manager Char(3) Yes FK NIL • Hire_date Date NO NIL • Dno Integer YES FK NIL • Commission Decimal(10,2) YES NIL • Salary Decimal(7,2) NO NIL • DEPARTMENT Schema: • Field Type NULL KEY DEFAULT • Dno Integer No PRI NULL • DnameVarchar(50) Yes NULL • Location Varchar(50) Yes New Delhi • Query List • Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first. • Query to display unique Jobs from the Employee Table. • Query to display the Employee Name concatenated by a Job separated by a comma. • Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT. • Query to display the Employee Name and Salary of all the employees earning more than \$2850. • Query to display Employee Name and Department Number for the Employee No= 7900. • Query to display Employee Name and Salary for all employees whose salary is not in the range of \$1500 and \$2850. • Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name. • Query to display Name and Hire Date of every Employee who was hired in 1981. • Query to display Name and Job of all employees who don't have a current Manager. • Query to display the Name, Salary and Commission for all the employees who earn commission. • Sort the data in descending order of Salary and Commission. • Query to display Name of all the employees where the third letter of their name is 'A'. • Query to display Name of all employees either have two „R“s or have two A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788. • Query to display Name, Salary and Commission for all employees whose Commission amount is 14 greater than their Salary increased by 5%. 16. • Query to display the Current Date. • Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment. • Query to display Name and calculate the number of months between today and the date each employee was hired. • Query to display the following for each employee earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.	
	Contact Hours	75
Evaluation Methods		
Internal Assessment	TH-25	PR-5
End Term Examination:70		
TH-50	PR-20	

Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Text books & Reference Books: - Elmasri, R., & Navathe, S.B. (2015). Fundamentals of Database Systems. 7th edition. Pearson Education. - Date, C. J. (2004). An Introduction to database systems. 8th edition. Pearson Education. - Silberschatz, A., Korth, H. F., & Sudarshan, S. (2010). Database System Concepts. 6th edition. McGrawHill.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	1	3	2	2	2	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	II		
Nature of Course/Course Composition	Theory		
Name of the Course	Mathematical Foundations for Computer Science-II		
Course Code	26 L4.5-CAC-203		
Course Type	CC-M2(Minor)		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Understand concept of algorithms. CLO ₂ : Understand graph theory CLO ₃ : Understand concept of recursion. CLO ₄ : In-depth understanding of number theory		
	Theory	Practical	Total
Credits	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Duration (in Hours)	2	0	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter:</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.			
Units	Topics		Contact Hours/ CLOs
I	Logic: Propositions, Logical operations, Conditional Statements, Tautologies, Contradictions, Logical Equivalence, The use of Quantifiers, Basic Counting Techniques: Fundamental Principle of Counting, Permutation and Combination, Addition and Multiplication Principles, Permutations as an Arrangement, Combinations as Selections. Algebraic Structures: Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups; Congruence Relation and Cyclic groups, Normal Subgroups. Boolean Algebra, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.		15/CLO ₁
II	Graph Theory: Graphs and their properties, Types of graphs, degree of vertex, Adjacent, Isomorphic graphs, Homeomorphic graphs, Multigraph and Weighted graph, shortest path in Weighted graphs, Hamiltonian path, Planar Graphs, Graph Coloring. Tree: Introduction to Trees, terminology and its properties, Binary trees and its traversals, BST, Minimum weight and Minimum distance spanning trees, Types of MST, DFS and BFS in trees.		15/CLO ₂
	Total Contact hours		30
Evaluation Methods			
Internal Assessment: 15 Marks		End Term Examination: 35 Marks	
• Class Participation:	5	Written Examination:30	
• Seminar/presentation/assignment/quiz/class test etc.:	5		
• Mid-Term Exam:	5		
Part C-Learning Resources			

Text Books:

- Discrete Mathematics and Structures by Satinder Bal Gupta.
- A Textbook of Graph Theory by R. Balakrishnan and K. Ranganathan

Reference Books:

- Schaum's Outline of Graph Theory: Including Hundreds of Solved Problems. by V. K. Balakrishnan
- Algorithms, 4th Edition by Robert Sedgewick and Kevin Wayne.

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	30
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	30