P.K.R. ARTS COLLEGE FOR WOMEN

(Re-Accredited with 'A' grade by NAAC)
Autonomous Institution- Affiliated to Bharathiar University, Coimbatore
No.127, Pariyur Road, Gobichettipalayam – 638 476.

DEPARTMENT OF COMPUTER SCIENCE

Bachelor of Computer Applications

Syllabus

SCHOLASTIC COURSES

AND

CO-SCHOLASTIC COURSES

(For the candidates admitted from the Academic Year 2024-2025 and onwards)

Under CBCS PATTERN

P.K.R ARTS COLLEGE FOR WOMEN

(Re-Accredited by NAAC with 'A' Grade)
Autonomous Institution- Affiliated to Bharathiar University, Coimbatore
Gobichettipalayam-638476

Scholastic Courses:

BACHELOR OF COMPUTER APLLICATIONS - PROGRAMME STRUCTURE

CBCS Pattern: 2024-2025

Category	Component	No. of Courses	Credit(s) / Course	Total Credits	Proposed Semester
Part – I	Tamil/ Hindi/ French/ Kannada/ Malayalam/ Sanskrit	4	3	12	I – IV
Part – II	English	4	3	12	I – IV
Part - III	**Core Courses** *(Core Theory /Core Practical/ Core Allied/ Elective/Open Elective)*	24	2/3/4/5	94	I - VI
	Institutional Training / Industrial Training / Mini Project	1	1	1	V
Part –IV	**A. Foundation Courses:** i. Environmental Studies ii. Yoga and Ethics	 1 1	 2 2	4	 I II
	B. Ability Enhancement Courses: i. Information Security ii. Consumer Rights	 1 1	 2 2	4	 III IV
	C. Skill Enhancement Courses: i. Tally-Practical ii. Web Programming -Practical iii. Google Colab-Practical	 1 1 1	 2 2 2	6	 IV V VI
	D. Non-Major Elective: i. Indian Women and Society /Advanced Tamil	1	2	2	III
Part –V	**A. Proficiency Enhancement** i. Business Communications (Self Study) **B. Competency Enhancement:** i.NSS/YRC/RRC/CCC/PHY.EDU/ OTHERS ii. Professional Grooming (Life Skills - Jeevan Kaushal) iii. Students Social Activity	 1 1 1 1	 2 1 1 1	5	 V I to VI I to VI I to VI

Total Marks: 3750 **Total Credits: 140**

P.K.R ARTS COLLEGE FOR WOMEN

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Gobichettipalayam-638476

Scholastic Courses: **BACHELOR OF COMPUTER APLLICATIONS**

Programme Scheme and Scheme of Examinations
(For students admitted from 2024-2025 & onwards)
(For branches offering Part-I and Part-II for four semesters)

Category	Component	Course Code	Course Title	Contact Hrs/ week	Exam Duration hrs.	Max. Marks			Credits
						CIA	ESE	Total	
	SEMESTER - I								
Part I	Language : I	24LTU01/ 24LHU01/ 24LFU01/ 24LKU01/ 24LMU01/ 24LSU01	Tamil - I/ Hindi - I/ French - I/ Kannada - I/ Malayalam - I/ Sanskrit-I	4	3	25	75	100	3
Part II	English: I	24LEU01	English – I	4	3	25	75	100	3
Part III	Core : I	24CAU01	Programming in C	5	3	25	75	100	4
Part III	Core : II Practical I	24CAU02	Programming in C - Practical	5	3	40	60	100	4
Part III	Core : III	24CAU03	Digital Computer Fundamentals	5	3	25	75	100	4
Part III	Core : IV Allied : I	24CAU04	Mathematical Structures for Computer Science	5	3	25	75	100	3
Part IV	Foundation : I	24FCU01	Environmental studies	2	3	50	-	50	2
			TOTAL	**30**				**650**	**23**
	SEMESTER – II								
Part I	Language : II	24LTU02/ 24LHU02/ 24LFU02/ 24LKU02/ 24LMU02/ 24LSU02	Tamil- II/ Hindi-II/ French II/ Kannada-II/ Malayalam-II/ Sanskrit-II	4	3	25	75	100	3
Part II	English : II	24LEU02	English: II	4	3	25	75	100	3
Part III	Core : V	24CAU05	Programming in C++	6	3	25	75	100	4
Part III	Core : VI Practical: II	24CAU06	Programming in C++ - Practical	5	3	40	60	100	4
Part III	Core : VII Practical : III	24CAU07	Office Automation –Practical	3	3	40	60	100	2
Part III	Core : VIII Allied : II	24CAU08	Discrete Mathematics	6	3	25	75	100	3
Part IV	Foundation : II	23FCU02	Yoga and Ethics	2	3	50	-	50	2
			TOTAL	**30**				**650**	**21**

	SEMESTER - III								
Part I	Language : III	24LTU03/ 24LHU03/ 24LFU03/ 24LKU03/ 24LMU03/ 24LSU03	Tamil- III/ Hindi-III/ French-III/ Kannada-III/ Malayalam-III/ Sanskrit-III	4	3	25	75	100	3
Part II	English : III	24LEU03	English: III	4	3	25	75	100	3
Part III	Core : IX	24CAU09	Programming in Java	6	3	25	75	100	5
Part III	Core : X Practical : IV	24CAU10	Programming in Java - Practical	6	3	40	60	100	4
Part III	Core : XI Allied : III	24CAU11	Operations Research	6	3	25	75	100	3
Part IV	Ability Enhancement : I	24AEU01	Information Security	2	3	50	-	50	2
Part IV	Non- Major Elective	24NMU01A/ 24NMU01B	Indian Women and Society/ Advanced Tamil	2	3	50	-	50	2
			TOTAL	**30**				**600**	**22**
	SEMESTER – IV								
Part I	Language : IV	24LTU04/ 24LHU04/ 24LFU04/ 24LKU04/ 24LMU04/ 24LSU04	Tamil- IV/ Hindi-IV/ French-IV/ Kannada-IV/ Malayalam-IV/ Sanskrit-IV	4	3	25	75	100	3
Part II	English : IV	24LEU04	English: IV	4	3	25	75	100	3
Part III	Core : XII	24CAU12	Operating system	6	3	25	75	100	5
Part III	Core : XIII Practical : V	24CAU13	Operating system-Practical	5	3	40	60	100	4
Part III	Core : XIV Allied : IV	24CAU14	Data Structures	6	3	25	75	100	5
Part IV	Skill Enhancement : I	24SECAU01	Tally-Practical	3	3	50	-	50	2
Part IV	Ability Enhancement : II	24AEU02	Consumer Rights	2	3	50	-	50	2
			TOTAL	**30**				**600**	**24**
	SEMESTER – V								
Part III	Core : XV	24CAU15	Relational Database Management Systems	6	3	25	75	100	4
Part III	Core : XVI Practical : VI	24CAU16	SQL and PL/SQL- Practical	6	3	40	60	100	4
Part III	Core : XVII	24CAU17	Software Testing	6	3	25	75	100	4
Part III	Core :XVIII	24CAU18A/ 24CAU18B/ 24CAU18C	Institutional Training/ Industrial Training/ Mini Project	-	3	50	-	50	1

Part III	Core : XIX (Open Elective)	***	Opted by the students offered by other departments	4	3	25	75	100	2
Part III	Core : XX Elective : I	24CAU19A/ 24CAU19B/ 24CAU19C/ 24CAU19D	Multimedia using Canva Level-I/ Big data Analytics using Tableau Level-I/ Internet of Things / Data Communications and Networks	5	3	25	75	100	4
Part IV	Skill Enhancement : II	24SECAU02	Web Programming - Practical	3	3	50	-	50	2
Part V	Proficiency Enhancement	24PECAU01	Business Communications (Self Study)	-	3	-	100	100	2
			TOTAL	**30**				**700**	**23**
SEMESTER – VI									
Part III	Core : XXI	24CAU20	Programming in Python	6	3	25	75	100	5
Part III	Core : XXII Practical : VII	24CAU21	Programming in Python - Practical	5	3	40	60	100	4
Part III	Core : XXIII	24CAU22	Mobile Computing	6	3	25	75	100	5
Part III	Core : XXIV Elective : II	24CAU23A / 24CAU23B / 24CAU23C / 24CAU23D	Multimedia using Canva Level-II/ Big data Analytics using Tableau Level-II/ Introduction to Compiler Design/ Green Computing	5	3	25	75	100	4
Part III	Core : XXV Elective :III	24CAU24A/ 24CAU24B/ 24CAU24C/ 24CAU24D	GIS for Land Resource Management / Artificial Intelligence / Ethical Hacking / Android APP Development	5	3	25	75	100	4
Part IV	Skill Enhancement: III	24SECAU03	Google Colab-Practical	3	3	50	-	50	2
			TOTAL	**30**				**550**	**24**
Part V	Competency Enhancement		NSS/YRC/RRC/CCC/PHY.EDU/ Others		SEMESTER I – VI				1
			Professional Grooming (Life Skills – Jeevan Kaushal)		SEMESTER I – VI				1
			Students Social activity (Related to the Curriculum)		SEMESTER I –VI				1

NOTE: CREDIT TRANSFERABILITY FOR ALL COURSES FROM UGC REFERRED SWAYAM AND MOOC COURSES.

Total Marks: 3750 **Total credits: 140**

Chair Person Name, designation

SYLLABUS
SEMESTER I

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART – III	CORE: I	24CAU01	PROGRAMMING IN C	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:

To learn about the C programming language concepts.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basics of C Tokens, Operators, Array and Files	K1
CO2	Summarize the concepts of input and output functions, decision making and looping, string functions, and pointers	K2
CO3	Classify Arrays and functions	K3
CO4	analyze the concepts of Pointers, Structures and files	K4
CO5	Determine the usage of pointers and files	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos .As per UGC Notification

Course Content:

UNIT- I **Overview of C** **(12 Hours)**

History of C – Importance of C – Constants, Variables and Data Types – Character Set – C Tokens – Keywords and Identifiers – Constants - Variables – Data Types –Declaration of Variables – Declaration of Storage Class – Assigning values to Variables – Defining Symbolic Constants – Declaring Variable as Constant – Operators and Expressions – Managing Input and Output Operations.

UNIT- II **Control structures** **(12 Hours)**

Decision Making and Branching – Decision Making and Looping – Sample programs.

UNIT- III **Arrays and Strings** **(12 Hours)**

Introduction – One Dimensional Arrays – Declaration of One-Dimensional Arrays - Initialization of One-Dimensional Arrays - Two Dimensional Arrays – Initialization of Two-Dimensional Arrays – Character Arrays and Strings – Declaring and Initializing String Variables – Reading and Writing Strings – String Handling Functions.

UNIT- IV **Function, Structure and Union** **(12 Hours)**

User Defined Functions – Need for User defined function – Elements of User Defined Functions – Definition of Function – Category of Functions-Recursion –Structure and Unions –Defining a Structure – Declaring a Structure Variables – Accessing Structure Members – Structure Initialization – Unions.

UNIT- V **Pointers and Files** **(12 Hours)**

Understanding Pointers – Accessing the Address of Variables – Declaring the Pointer Variable – Accessing a Variable Through its Pointer – Pointer Expression – Pointer and Arrays - File Management in C – Defining and Opening a File - Closing the File – Input and Output Operations on Files – Sample Programs.

TEXT BOOK:

1. E.Balagurusamy, Programming in ANSI C ,3rd Edition, Tata McGraw-Hill, 2004.

REFERENCE BOOKS:

1.Ashok N Kamthane, Programming with ANSI and Turbo C, Pearson, 2002.
2.E Balagurusamy, Computing Fundamentals & C Programming, Tata McGraw-Hill, Second Reprint 2008.

WEB REFERENCES:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3schools.com/c/
3. https://www.programiz.com/c-programming/online-compiler/
4. https://www.unf.edu/~wkloster/2220/ppts/cprogramming_tutorial.pdf
5. https://techniyojan.com/2019/12/c-programming-basics-notes.html

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART – III	CORE: II PRACTICAL: I	24CAU02	PROGRAMMING IN C-PRACTICAL	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	40	60	**100**

PREAMBLE:

To learn about the C programming language concepts.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Define the basics of arithmetic operations using C tokens.	K1,K2,K3,K4,K5
CO2	Choose the True/ False statements for checking ODD / EVEN numbers.	
CO3	Calculate simple interest, Employee pay Bill, area of shapes and factorial value	
CO4	Experiment matrix addition	
CO5	Validating the file operations	

K1 – Remember;K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation;9- High correlation between COs and POs.

Practical List

1. Evaluate the expression which performs all arithmetic operations in mixed mode.
2. Create a Program to calculate simple interest.
3.Evaluate and Check the given number is odd or even - using if else/switch case/conditional operator
methods.
4. Construct a program to Print all prime numbers between any two given limit.
5. Design a Program to find the sum of the digits of a number.
6. Create a Program to calculate gross salary of an employee
[using formula: gross Sal = basic_sal+hra+da].
7. Create a program to finding area of a square, rectangle, circle using switch case.
8. Generate a program to arrange the given set of numbers in ascending and descending order.
9. Create a program to calculating Matrix addition.
10. Generate a Mark list processing using Structure.
11. Create a program to Calculate the factorial value using recursive function.
12. Create a Program to perform various file operations – Add and Finding no of records in the file.

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:III	24CAU03	DIGITAL COMPUTER FUNDAMENTALS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:

To understand the fundamentals behind digital logic design and the course includes fundamentals of Boolean algebra, Combinational, Sequential circuits, Input-Output organization and Memory organization.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basic computer components and micro-operations	K1
CO2	Explain number conversions, Boolean algebra and logic circuits	K2
CO3	Utilize the components of register, input/output and Flip flops	K3
CO4	Analyze the Boolean expressions using Boolean algebra	K4
CO5	Evaluate the storage concepts using digital logic	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	3	9	9	3
CO5	9	9	9	3	9	9	3
Total Contribution of COs to Pos	**45**	**45**	**45**	**33**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**1.82**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content

UNIT- I **Number System and Logic gates** **(12 Hours)**

Number System and Binary Codes: Decimal- Binary- Octal- Hexadecimal – Binary Addition- Multiplication- Division- Complements- Floating point representation- BCD- Excess3- Gray Code. Digital Logic: The Basic Gates – NOR, NAND, XOR Gates.

UNIT- II **Boolean Algebra** **(12 Hours)**

Boolean Algebra – Karnaugh Map – Canonical Form 1 – Construction and Properties – Don‘t Care Combinations - Product of Sum, Sum of Products, Minimization in SOP using Karnaugh Map- Minimization in POS using Karnaugh Map.

UNIT- III **Combinational Circuits** **(12 Hours)**

Arithmetic and logic combinational circuits: Half adder – Full adder- Half subtractor- Full subtractor- Data handling combinational circuits: Multiplexers – Demultiplexers – Decoder- Encoder.

UNIT- IV **Sequential Circuits** **(12 Hours)**

Flip flops: RS, JK, D, and T Flip-Flops – Master-Slave JK Flip-Flops. Registers: Shift Registers – Shift-left Register-Shift-right Register

UNIT- V **Counters** **(12 Hours)**

Counters: Asynchronous counter - Synchronous Counter-Ring counter-Synchronous Up/Down Counter. Memory Unit-Read only Memories-Random access Memories-Cache Memory

TEXT BOOKS:

1. V.K. Puri, Digital Electronics Circuits and Systems, TMH.
2. Albert Paul Malvino, Donald P Leach, Digital principles and applications, TMH, 1996.
3. M. Morris Mano, Computer System Architecture, PHI.

REFERENCE BOOK:

1. Thomas C. Bartee, Digital Computer Fundamentals, TMH

WEB REFERENCES:

1. https://docs.google.com/file/d/0ByN6aMrh7fkSbDdKdV9vQURXRFU/edit?resourcekey=0-7OMoitUf4Divd09opqW6lA
2. https://poojavaishnav.files.wordpress.com/2015/05/mano-m-m-computer-system-architecture.pdf
3. http://www.scientificlib.com/en/Books/DigitalElectronicsCircuitsAndSystems.html
4. https://scilab.in/textbook_companion/generate_book/1238
5. https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	FOUNDATION: I	24FCU01	ENVIRONMENTAL STUDIES	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	50	-	50

PREAMBLE :

To bring about an awareness of a variety of environmental concerns and to create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyle

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Define environment, ecosystem, biodiversity, environmental pollution and social issues	**K1**
CO2	Explain the natural resources, types of ecosystem, geographical classification of India, causes of environmental pollution and the problems related to the society	**K2**
CO3	Identify the information related to environment and the resources to protect it	**K3**
CO4	Analyze the classification of natural resources, energy flow in the ecosystem, threats to biodiversity, disaster management and the role of information technology in environment and human health.	**K4**
CO5	Assess the environmental issues with a focus on sustainability	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3
CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	**45**	**45**	**39**	**39**	**9**	**7**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**1.93**	**2.15**	**0.52**	**0.43**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content :

Unit- I **(4 Hours)**

Environment: Definition, Components, Segments and Types. **Natural Resources:** Meaning, Components: (1. **Forest**-Meaning, Importance and Types 2. **Water**- Meaning, Types and Problems 3. **Mineral**- Meaning and Classification 4.**Food**-Meaning and Problems 5.**Energy**- Meaning, Forms and Types 6.**Land**- Meaning, Structure and Functions, Components), **Classification**: Renewable and Non-Renewable Resources, Role of an Individual in Conservation of Natural Resources.

Unit -II **(5 Hours)**

Ecosystems – Definition, Features, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in the Ecosystem (Water,Carbon,Nitrogen,Oxygen and Energy), Food Chains, Food Webs and Ecological Pyramids

Introduction Types, Characteristics Features, Structure and Function of the following Ecosystem:

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem
- Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Ocean, Estuaries)

Unit- III **(5 Hours)**

Biodiversity and its Conservation-Introduction – Definition – Genetic, Species and Ecosystem Diversity, Bio geographical Classification of India -Value of Biodiversity – Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Value- Biodiversity at Global, National and Local Levels- India as a Mega-Diversity Nation- Hot-Spots of Biodiversity- Threats to Biodiversity – Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts- Endangered and Endemic Species of India Conservation of Biodiversity – In-situ and Ex-situ and Conservation of Biodiversity.

Unit- IV **(5 Hours)**

Environmental Pollution: Definition, Causes, Effects, control measures and Prevention Acts for Air, Water, Soil, Noise, Thermal Pollutions and Nuclear Hazards. **Solid Waste Management**: Meaning, Causes, effects and control measures of urban and industrial wastes. **Disaster Management**: Meaning, Types of Disasters: floods, earthquake, cyclone and landslides. **Environmental Ethics:** Issues and possible solutions- Climate change, global warming, acid rain, ozone layer depletion, nuclear - accidents and holocaust. Consumerism and waste products, Public Awareness.

Unit- V **(5 Hours)**

Social Issues and the Environment: From Unsustainable to Sustainable development- Urban problems related to energy- Water conservation, rain water harvesting, watershed management- Resettlement and rehabilitation of people; its problems and concerns.

Human Population and the Environment: Population growth and distribution- Population explosion – Family Welfare Programme-Environment and human health- HIV/AIDS- Role of Information Technology in Environment and human health- Medical transcription and bio-informatics.

REFERENCE BOOKS:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
6. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,
10. Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
11. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural
12. History Society, Bombay (R)
13. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment,Cambridge Univ. Press 1140p.
14. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws, Himalaya Pub. House, Delhi 284 p.
15. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
16. Mhaskar A.K., Matter Hazardous, Techno-Science Publication
17. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.
18. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
19. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
20. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
21. Survey of the Environment, The Hindu (M)
22. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:V	24CAU05	PROGRAMMING IN C++	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	25	75	100

PREAMBLE :
To learn about Object Oriented Concepts through C++.

COURSE OUTCOME:
On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basics of OOPS	**K1**
CO2	Summarize the concepts of functions, operator overloading ,pointers ,exceptions	**K2**
CO3	Classify constructors, classes	**K3**
CO4	Analyze pointers, exceptions	**K4**
CO5	Determine operator overloading ,strings ,exceptions	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content:

UNIT -I Introduction to C++ (12 Hours)

Software Evolution - A Look at Procedure-Oriented Programming - Object Oriented Paradigm - Basic Concepts of OOP - Benefits of OOP - Object Oriented Languages - Applications of OOP - Beginning With C++ - Tokens - Expressions and Control Structures.

UNIT- II Function in C++ (15 Hours)

Main Function - Function Prototyping - Call By Reference - Return By Reference - Inline Function - Function Overloading – Classes and Objects: C Structures Revisited - Specifying a Class - Defining Member Function - C++ Program with Class - Nesting of Member Function - Private Member Function - Memory Allocation for Objects - Static Data Members and Functions - Array of Objects - Objects as Function Arguments - Friendly Functions – Constructors and Destructors: Constructor - Parameterized Constructors - Multiple Constructor in a Class - Copy Constructor - Destructor.

UNIT -III Operator Overloading (15 Hours)

Introduction - Defining Operator Overloading - Overloading Unary Operator - Overloading Binary Operator - Overloading Binary Operator Using Friends - Rules for Overloading Operator – Inheritance: Defining Derived Classes - Single Inheritance - Making a Private Member Inheritable - Multilevel Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Virtual Base Classes - Abstract Classes.

UNIT- IV Pointers (15 Hours)

Introduction - Pointers - Array of Pointers - Pointers to Objects - This Pointer - Pointer to Derived Class - Virtual Functions - Rules for Virtual Function - Pure Virtual Function – Managing Console I/O Operations.

UNIT- V Exception Handling and Strings (15 Hours)

Working with Files – Exception Handling: Introduction - Basics of Exception Handling - Exception Handling Mechanism - Throwing Mechanism - Catching Mechanism – Strings: Introduction - Creating (String) Objects - Manipulating String Objects - Relational Operators - String Characteristics.

TEXTBOOK(S):

1. E. Balagurusamy, Object Oriented Programming with C++, Fifth Edition, TMH Publication.

REFERENCE BOOK(S):

1. John R Hubbard, Programming with C++, 2nd Edition, TMH Publication, 2002.
2. Maria Litvin & Gary Litvin, C++ for you, Vikas Publication, 2002.
3. Yashavant Kanetkar, Let us C++, BPB Publication, 2nd Edition, 2010.

WEB REFERENCES

1. https://youtu.be/s0g4ty29Xgg
2. https://www.w3schools.com/c/c_functions.php
3. https://www.programiz.com/cpp-programming/operator-overloading
4. https://youtu.be/zuegQmMdy8M?si=GxV0CLaMYPcynQI7
5. https://www.tutorialspoint.com/cplusplus/cpp_exceptions_handling.htm

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:VI PRACTICAL: II	24CAU06	PROGRAMMING IN C++ - PRACTICAL	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	40	60	100

PREAMBLE:
To experiment C++ Concepts

COURSE OUTCOME:
On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basics of OOPS	K1,K2,K3,K4,K5
CO2	Summarize the concepts of functions, operator overloading, pointers, exceptions	
CO3	Classify constructors, classes	
CO4	Analyze pointers, exceptions	
CO5	Determine operator overloading, strings, exceptions	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Practical List :

1. Write a C++ program to find a factorial for a given number using recursive function.
2. Write a C++ program to find a Fibonacci series using while loop.
3. Define a class to represent a bank account. Include the following members: Data members: Name of the depositor, Account number, Type of account, Balance amount in the account. Member functions: To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display the name and balance. Write a main program to invoke the member functions.
4. Write a C++ program to read an integer number and find the sum of all the digits until it reduces to a single digit using constructors, destructors, and inline member functions.
5. Write a C++ program to swap two numbers using friend function.
6. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_Number, E_Name, Department, Basic, Salary, and Grade. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA, and PF depending on the grade. Create an array of objects for the derived class.
7. Write a C++ program to add two complex numbers using operator overloading concept.
8. Write a C++ Program to check whether the given string is a palindrome or not using Pointers.
9. Write a C++ Program to merge two files into a single file.
10. Write a C++ Program to implement exception handling concept using divide by zero.
11. Write a C++ program to implement the concept of class template.
12. Write a C++ Program to implement any four built-in string functions.

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: VII PRACTICAL: III	24CAU07	OFFICE AUTOMATION-PRACTICAL	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	40	60	100

PREAMBLE:
To enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools.

COURSE OUTCOME:
On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Utilize the basics options of Word in preparation of documents	**K1,K2,K3,K4,K5**
CO2	Demonstrate the concepts in Word such as Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.	
CO3	Apply the various accounting features in spreadsheet, Accessing, overview of toolbars, Saving excel files, Using help and Resources.	
CO4	Analyze the importance of Spreadsheet tool	
CO5	Assess PowerPoint layouts and presentations	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze;K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Practical List :

Word processor:

1. Using word processor to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
2. Create project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Create a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.
4. Create a job offer letter - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Spreadsheet:

5. Create a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
6. Calculations - Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
7. Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
8. Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

Presentation:

9. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
10.Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	FOUNDATION: II	24FCU02	YOGA AND ETHICS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	50	-	50

PREAMBLE:

To enable the learners to acquire the knowledge on basic yogasanas and values and practice them in real life.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recollect the basic terminologies in yoga and value education	**K1**
CO2	Demonstrate the importance of yoga, mental exercises, principles of life and components of values.	**K2**
CO3	Apply the techniques of dynamic & mental exercises and philosophical values in real life	**K3**
CO4	Classify the different types of asanas, stages of mind, analysis of thought, ethical values and social values.	**K4**
CO5	Evaluate how the yoga and value education make a person strong both physically and mentally	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze;K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	1	1	3
CO2	9	9	9	3	3	1	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	3	3	3	3
Total Contribution of COs to POs	**45**	**45**	**45**	**15**	**13**	**11**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**0.83**	**0.75**	**0.67**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

Course Content :

UNIT- I Yoga and Health (4 Hours)

Theory:

Yoga-Meaning-Importance of Yoga-Pancha Koshas - Benefits of Yoga-General Guidelines.

Practice:

Dynamic Exercise- Surya Namaskar-Basic Set of Asanas-Pranayama and Kriya.

UNIT -II Art of Nurturing the Mind (5 Hours)

Theory:

Ten Stages of Mind-Mental Frequency – Methods for Concentration.Eradication of Worries- Benefits of Blessings- Greatness of Friendship- Individual Peace and World Peace.

Practice: Worksheet**.**

UNIT- III Philosophy and Principles of Life (5 Hours)

Purpose and Philosophy of Life- Introspection – Analysis of Thought - Moralization of Desires- Neutralization of Anger. Vigilance and Anti- Corruption- Redressal Mechanism - Urban Planning and Administration.

Practice: Worksheet.

UNIT- IV Value Education (Part-I) (5 Hours)

Ethical Values: Meaning – Need and Significance- Types - Value Education – Aim of Education and Value Education. Components of Value Education: Individual Values – Self Discipline, Self Confidence, Self-Initiative, Empathy, Compassion, Forgiveness, Honesty, Sacrifice, Sincerity, Self-Control, Tolerance and Courage.

Practice: Worksheet.

UNIT- V Value Education (Part-II) (5 Hours)

Family Values: Constitutional or National Values – Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom and Fraternity. Social Values – Pity and Probity, Self-Control, Universal Brotherhood. Professional Values – Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality and Faith. Religious Values – Tolerance, Wisdom, Character.

Practice: Worksheet**.**

REFERENCE BOOKS:

1. Vethathiri Maharishi, Yoga for Human Excellence, Sri Vethathiri Publications, 2015.
2. Value Education for Human Excellence- Study Material by Bharathiar University.
3. Value Education - Study Material by P.K.R Arts College for Women.

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: IX	24CAU09	PROGRAMMING IN JAVA	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	25	75	100

PREAMBLE:

To understand the basic programming constructs of Java Language.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Outline the basic concepts of Java Programming Language	**K1**
CO2	Explain the concepts of tokens, control structures and looping, arrays, applet programming and Exception handling	**K2**
CO3	Classify various Concepts that can be used for practical solutions	**K3**
CO4	Analyze wide range of Applications by using java programming	**K4**
CO5	Determine the usage of all given concepts in the development of programming solutions	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content :

UNIT- I Fundamentals of Object-Oriented Programming (12 Hours)

Basic Concepts of Object-Oriented Programming–Benefits of Object-Oriented Programming – Application of Object-Oriented Programming. Java Evolution: Features –How Java differs from C and C++.Overview of Java: Simple Java Program –Structure –Java Tokens –Statements –Java Virtual Machine.

UNIT- II Control Structures (15 Hours)

Constants, Variables, Data Types -Operators and Expressions –Decision Making and Branching: If, If..Else, Nested If, Switch,? : Operator -Decision Making and Looping: While, Do, For –Jumps in Loops -Labeled Loops –Classes, Objects and Methods.

UNIT- III Arrays, Strings and Vectors (15 Hours)

Arrays, Strings and Vectors –Interfaces: Multiple Inheritance –Packages: Putting Classes together – Multithreaded Programming.

UNIT- IV Programming with JAVA (15 Hours)

Applet Programming – Graphics Programming.

UNIT- V Managing Input / Output Files in Java (15 Hours)

Concepts of Streams-Stream Classes –Byte Stream Classes –Character Stream Classes –Using Streams –I/O Classes –File Class –I/O Exceptions -Creation of Files.

TEXT BOOK:

1.E. Balagurusamy, Programming with Java a Primer,3rd Edition, TMH.

REFERENCE BOOKS:

1. Patrick Naughton &Hebert Schildt, The Complete Reference Java 2, 3rd Edition, TMH.
2. John R. Hubbard,Programming with Java, 2nd Edition, TMH.

WEB REFERENCES:

1. https://www.javatpoint.com/java-basics
2. https://www.w3schools.com/java/
3. https://www.softwaretestinghelp.com/java-basics-and-core-java-concepts/
4. https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf
5. https://www.cp.eng.chula.ac.th/books/wp-content/uploads/sites/5/2018/01/java101.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:X PRACTICAL: IV	24CAU10	PROGRAMMING IN JAVA-PRACTICAL	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	40	60	100

PREAMBLE:

To understand the basic programming constructs of Java Language.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Determine the basic concepts of Java Programming Language	**K1,K2,K3,K4,K5**
CO2	Apply the concepts of arrays and string	
CO3	Summarize the concepts of inheritance	
CO4	Demonstrate the interface and threads	
CO5	Applying Java programming techniques in graphics and applets	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

PRACTICAL LIST

1. Design a Java Program to define a class, define instance methods for setting and Retrieving values of instance variables and instantiate its object

2. Demonstrate a Java Program to demonstrate use of subclass

3. Create a Java Program to implement array of objects

4. Construct a Java program to practice using String class and its methods

5. Apply a Java program to practice using String Buffer class and its methods

6. Design a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods

7. Generate a program to demonstrate use of implementing interfaces

8. Apply a program to Implementing Thread based applications

9. Create a program using Applet to display a message in the Applet

10. Design an applet program working with Colors and Fonts

11. Construct a program using Applet for configuring Applets by passing parameters

12. Design programs for using Graphics class
    - to display basic shapes and fill them
    - draw different items using basic shapes
    - set background and foreground colors

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XI ALLIED : III	24CAU11	**OPERATIONS RESEARCH**	72	3

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	25	75	100

PREAMBLE:

To enable the students to understand how to formulate a real-world problem into a LPP.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	recall the mathematical tools that are needed to solve Operations Research problems.	**K_1**
CO2	discuss the properties of Transportation, Assignment, Game Theory, Replacement models and CPM problems.	**K_2**
CO3	identify the solution of LPP, Transportation, Assignment, Game Theory, Replacement models and CPM problems.	**K_3**
CO4	analyze the salient features of operations research in different problem solving methods.	**K_4**
CO5	evaluate the problems on LPP, Transportation, Assignment, Game Theory, Replacement models and CPM problems.	**K_5**

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	3	3	3	3	1	1	1
Total Contribution of COs to POs	39	39	39	39	12	12	12
Weighted Percentage of COs contribution to POs							
BCA	2.25	2.37	2.37	2.56	1.14	1.08	1.54

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

Course Content :

UNIT-I LINEAR PROGRAMMING PROBLEM (10 Hours)

Linear Programming -Mathematical Model assumption of linear Programming – Graphical method -Simplex method (Simple Problems only).

UNIT-II TRANSPORTATION AND ASSIGNMENT PROBLEM (10 Hours)

Transportation problem-NWC method-Least cost method-VAM method-assignment problem.

UNIT-III GAME THEORY (10 Hours)

Game Theory -Concept of Pure and Mixed Strategies –Solving 2 x 2 matrix with and without saddle point -n x 2 -2 x m games.

UNIT-IV RESPLACEMENT (10 Hours)

Replacement models -Elementary replacement models -Present value -Rate of return -Depreciation -Individual replacement –Group replacement.

UNIT-V CPM (8 Hours)

Network representation - CPM -Backward pass -Forward pass.

TEXT BOOKS:

1. Manmohan, P.K. Gupta, Kanthiswarup, S (2017) –"Operations Research" Chand & sons.

UNIT	CHAPTER	PAGE
I	2,3,4	39-78, 87, 99-106
II	10,11	247,252-258, 298-314
III	17	443-457
IV	18	477-495
V	25	763-780

REFERENCE BOOKS:

1. Hamdy A Taha (2002) – "Operations Research" Pearson Education, 7th edition,
2. P.K. Gupta, D.S. Hira-"Problems in Operations Research",S. Chand Publishers.
3.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Operations_research
2. https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf
3. https://www.researchgate.net/publication/311694393_SIMPLEX_METHOD
4. http://nsdl.niscair.res.in/jspui/bitstream/123456789/1047/1/Chapter%208.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	ABILITY ENHANCEMENT: I	24AEU01	INFORMATION SECURITY	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	50	-	50

PREAMBLE:

To learn about the basics of Information Security.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the fundamental concepts of Information Security, Risk and Security policies	**K1**
CO2	Discuss the concepts of Risks, vulnerabilities, ethical and privacy issues	**K2**
CO3	Apply the ideas in security planning and construct the policies	**K3**
CO4	Categorize the Privacy, Ethical Issues, Laws, Software Issues and Crimes	**K4**
CO5	Summarize Cryptography, cipher text and threats in information security	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate;

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	1	1
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**27**	**25**	**19**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**1.57**	**0.98**	**1.68**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content :

UNIT-I **Introduction to Information Security** **(4 Hours)**

Information Security: Principles, Concepts and Definitions - The need for Information Security - Benefits of Information Security. The Security Problem in Computing: The Meaning of Computer Security - Computer Criminals.

UNIT-II **Information Risk** **(5 Hours)**

Information Risk: Threats and Vulnerabilities of Information Systems – Introduction to Risk Management. Information Security Management Policy, Standards and Procedures.

UNIT-III **Security Planning** **(5 Hours)**

Administering Security: Security Planning - Security Planning Team Members - Assuring Commitment to a Security Plan - Business Continuity Plan - Incident Response Plan - Organizational Security Policies, Physical Security.

UNIT- IV **Privacy and Ethical Issues in Information Security** **(5 Hours)**

Legal Privacy and Ethical Issues in Information Security: Protecting Programs and Data - Information and the Law - Rights of Employees and Employers - Software Failures - Computer Crime - Ethical Issues in Information Security.

UNIT- V **Cryptography** **(5 Hours)**

Cryptography: Introduction to Cryptography -What is Cryptography – Plain Text – Cipher Text – Substitution Ciphers - Transposition Ciphers.

TEXT BOOK:

1. Sumitra Kisan and D.ChandrasekharRao,Information Security Lecture Notes, Department of Computer Science and Engineering & Information Technology, Veer Surendra Sai University of Technology (Formerly UCE, Burla) Burla, Sambalpur, Odisha.

REFERENCE BOOK:

1.Andy Taylor (Editor), David Alexander, Amanda Finch & David Sutton, Information Security Management Principles An ISEB Certificate, The British ComputerSociety, 2008.

WEB REFERENCES:

1. https://www.imperva.com/learn/data-security/information-security-infosec/#:~:text=Information%20security%20protects%20sensitive%20information,financial%20data%20or%20intellectual%20property.
2. https://www.geeksforgeeks.org/what-is-information-security
3. https://www.techtarget.com/searchsecurity/definition/information-security-infosec
4. https://www.exabeam.com/information-security/information-security
5. https://www.sans.org/information-security

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	NON-MAJOR ELECTIVE: I	24NMU01A	INDIAN WOMEN AND SOCIETY	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	50	-	50

PREAMBLE:
To familiarize students with the specific cultural contexts of women in India.

COURSE OUTCOME:
On the successful completion of the course, students will be able to:

COs	CO Statement	Knowledge Level
CO1	Know women status in Indian society as an academic discipline	**K1**
CO2	Interpret the various roles of women, challenges and issues faced by them in the society	**K2**
CO3	Find out solutions to their legal issues and product themselves from the violence against women emphasize on women entrepreneurship for their empowerment	**K3**
CO4	Critically analyze the lifestyle and challenges of women	**K4**
CO5	Discuss the importance of women health and issues related to women in general	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	0	0	0
CO2	9	9	9	9	3	0	3
CO3	9	9	9	9	9	9	9
CO4	3	3	3	9	9	9	9
CO5	3	3	1	1	1	9	9
Total Contribution of COs to POs	**33**	**33**	**31**	**37**	**22**	**27**	**30**
Weighted Percentage of COs Contribution to POs	**1.50**	**1.56**	**1.53**	**2.04**	**1.28**	**1.65**	**2.65**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content :

UNIT- I **Historical Background** **(4 Hours)**

History of Women's status from Vedic times, Women's participation in India's Pre and Post Independence movement and Economic Independence, fundamental rights and importance of women in Modern Society.

UNIT -II **Role of Women (Challenges & remedies)** **(5 Hours)**

Women in Family, Agriculture, Education, Business, Media, Defense, Research and Development, Sports, Civil Services, Banking Services, Social Work, Politics and Law.

UNIT- III **Women and Health** **(5 Hours)**

Women and health issues, Malnutrition, Factors leading to anemia, Reproductive maternal health and Infant mortality, Stress.

UNIT- IV **Issues of Women** **(5 Hours)**

Women's issues, Dowry Related Harassment and Dowry Deaths, Gender based violence against women, Sexual harassment, Loopholes in Practice to control women issues.

UNIT- V **Women Empowerment** **(5 Hours)**

Meaning, objectives, Problems and Issues of Women Empowerment, Factors leading to Women Empowerment, Role and Organization of National Commission for Women, Central and State Social Welfare Board for Women Empowerment, Reality of women empowerment in the era of globalization.

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year of Publication
1	Mala Khullar	Writing the Women's Movement: A Reader	Zubaan	2005
2	IAWS	The State and the Women's Movement in India	IAWS, Delhi	1994
3	Kosambi, Meera	Crossing Thresholds: Feminist Essays in Social History	Permanent Black	2007
4	TRowbotham, Sheila	Hidden from History: Women's Oppression and the Fight against It	Pluto Press, London	1975
5	Susheela Mehta	Revolution and the Status of Women	Metropolitan Book co.pvt ltd, New Delhi	1989

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XII	24CAU12	OPERATING SYSTEM	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	25	75	100

PREAMBLE:

This Paper offers the knowledge Operating System concepts

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basic concepts of Operating System	**K1**
CO2	Understand the basic concepts of process, storage	**K2**
CO3	Apply deadlock avoidance, paging, segmentation	**K3**
CO4	Examine different scheduling algorithm	**K4**
CO5	Evaluate storage and scheduling algorithm	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	3	3
CO5	9	9	9	9	9	3	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**33**	**33**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.02**	**2.92**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

Course Content :

UNIT- I **Introduction** **(15 Hours)**

Introduction-What Operating Systems Do – Computer System Organization – Computer System Architecture- Operating System Operations- Resource Management- Security and Protection – Virtualization – Distributed Systems - Kernel Data Structures- Computing Environments- Free and Open-Source Operating Systems.

UNIT- II **Processes** **(14 Hours)**

Processes Management: Process Concept- Process Scheduling- Operations on Processes- Interprocess Communication- IPC in Shared Memory Systems – IPC in Message Passing Systems - Examples of IPC Systems- Communication in Client–Server Systems .

UNIT- III **CPU Scheduling** **(14 Hours)**

Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multi-Processor Scheduling - Real-Time CPU Scheduling -Operating-System Examples - Algorithm Evaluation.

UNIT -IV **Deadlock** **(14 Hours)**

System Model - Deadlock in Multithreaded Applications - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock

UNIT- V **Memory Management** **(15 Hours)**

Main Memory: Background- Contiguous Memory Allocation- Segmentation- Paging- Structure of the Page Table – Swapping.**Virtual Memory:** Background- Demand Paging- Copy-on-Write - Page Replacement- Allocation of Frames-Thrashing- Memory Compression - Allocating Kernel Memory.

TEXT BOOK:

1. Silberschatz, Galvin, Gagne, Operating System Concepts, 10th Edition, Wiley India Edition, 2018

REFERENCE BOOKS:

1. William Stallings, Operating System: Internals and Design Principals, 6th Edition, Pearson Publication.
2. Flynn, McHoes, Operating System, India Edition.
3. H.M.Deitel,Operating System,2nd Edition, Addison Wesley Publishing Company

WEB REFERENCES:

1.https://www.tutorialspoint.com/operating_system/os_overview.htm
2. https://www.geeksforgeeks.org/types-of-operating-systems/
3.https://www.codecademy.com/learn/fscp-22-fundamentals-of-operating-systems/modules/wdcp-22-memory-management/cheatsheet

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XIII PRACTICAL: V	24CAU13	OPERATING SYSTEM-PRACTICAL	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	40	60	100

PREAMBLE:
To experiment Operating System Concepts

COURSE OUTCOME:
On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Demonstrate the basic concepts of Operating System	**K1,K2,K3,K4,K5**
CO2	Understand the basic concepts of process, storage	
CO3	Apply deadlock avoidance, paging, segmentation	
CO4	Examine different scheduling algorithm	
CO5	Evaluate storage and scheduling algorithm	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	3	3
CO5	9	9	9	9	9	3	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**33**	**33**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.02**	**2.92**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

PRACTICAL LIST:

1. Write a C programs to demonstrate various process related concepts
2. Write a C program to implement system calls and file management
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance
4. Write a C program to simulate contiguous memory allocation techniques
5. Write a C program to simulate producer-consumer problem using semaphores.
6. Write a C program to simulate paging technique of memory management.
7. Write a C program to simulate the Round Robin CPU scheduling algorithms
8. Write a C programs to simulate Page Replacement Algorithms
9. Write a C program to simulate Paging and segmentation memory segment techniques
10. Write a C programs to simulate implementation of Disk Scheduling Algorithms

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XIV ALLIED : IV	24CAU14	DATA STRUCTURES	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	25	75	100

PREAMBLE:

This Paper offers the basic understanding and knowledge of different data structures, sorting algorithms and symbol tables.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the various data structures, algorithms and sorting methods	**K1**
CO2	Describe the basic concepts of data structures, sorting and symbol table	**K2**
CO3	Use appropriate data structures for varied problems	**K3**
CO4	Examine different data structures and algorithms to find best solution for the real time applications	**K4**
CO5	Recommend a specific data structure and sorting algorithm for an application.	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**27**	**27**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**1.57**	**1.65**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Course Content :

UNIT- I **Introduction and Elementary Data Structures** **(12 Hours)**

Introduction - Data structure- Overview - Definition - How to create a program – Arrays - Ordered List –Sparse Matrices - Representation of Arrays - Stacks and Queues – Fundamentals - Evaluation of Expressions.

UNIT- II **Linked List and Tree** **(15 Hours)**

Linked Lists - Singly Linked List - Linked Stacks and Queues – Polynomial Addition - Doubly Linked Lists and Storage Management. Trees: Basic Terminology - Binary Trees - Binary Tree Representation - Binary Tree Traversal.

UNIT- III **Graph and its applications** **(15 Hours)**

Graphs-Introduction – Definition and Terminology - Graph Representation – Traversals - Connected components and spanning Trees - Shortest path - Transitive Closure.

UNIT- IV **Internal Sorting** **(15 Hours)**

Internal Sorting- Insertion sort - Quick sort - Merge sort - Heap sort – Sorting on Several Keys.

UNIT- V **Symbol Tables** **(15 Hours)**

Symbol Tables - Static Tree Tables - Dynamic Tree Tables - Hash Tables - Hashing Functions - Overflow Handling.

TEXT BOOK:

1. Ellis Horowitz, Sartaj Shani, (1994), Fundamentals of Data Structures, First Edition, Galgotia Publication.

REFERENCE BOOK(S):

1. Seymour Lipschutz , Data Structures , Tata McGrawhill, Year 2006.
2. D. Samanta, “Classical Data Structure”, Prentice Hall India.
3. G A V PAI, Data Structures and Algorithns Concepts, Techniques Applications, McGraw Hill Education, New Delhi.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.youtube.com/watch?v=DFpWCl_49i0

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	SKILL ENHANCEMENT : I	24SECAU01	TALLY - PRACTICAL	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	50	-	50

PREAMBLE:

To impart basic accounting knowledge

COURSE OUTCOME:

On successful completion of the course the students should have:

COs	CO Statement	Knowledge Level
CO1	Recall the importance of company creation in Tally	K1,K2,K3,K4,K5
CO2	Explain the concepts of ledgers and voucher details	
CO3	Apply the accounting principles in solving the business problems	
CO4	Analyze the accounting standards through different types of accounts	
CO5	Evaluate the accounting methods in various problems	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

PRACTICAL LIST

1. Creating a company with all relevant details
2. Create the ledgers under appropriate predefined groups
3. Create vouchers and view profit and loss a/c and balance sheet
4. Create stock items, Stock categories, units of measure view the Stock summary
5. Create purchase and sales vouchers for stock items
6. Create stock vouchers using debit note and credit note.
7. Memo voucher
8. Ratio analysis
9. Prepare trading profit and loss account and b/s, with inventory details
10. Prepare budget using relevant details
11. Prepare a E-way bill
12. Prepare a bill with GST

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	ABILITY ENHANCEMENT: II	24AEU02	CONSUMER RIGHTS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	50	-	50

PREAMBLE:

This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights.

COURSE OUTCOME:

On the successful completion of the course, students will be able to:

COs	CO Statement	Knowledge Level
CO1	Memorize the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards	K1
CO2	Explain the Consumer Protection Law in India	K2
CO3	Impart sound practical grounding about the practice of consumer law and the procedure Followed	K3
CO4	Evaluate the regulations and legal actions that helps to protect consumers	K4
CO5	Analyze the knowledge and skills needed for a career in this field	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate;

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	1	0	1
CO2	9	9	9	9	1	0	1
CO3	9	9	9	3	3	1	1
CO4	9	3	1	1	3	3	3
CO5	9	1	3	0	9	9	9
Total Contribution of COs to POs	**45**	**31**	**31**	**22**	**17**	**13**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**1.47**	**1.53**	**1.21**	**0.99**	**0.80**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation;9- High correlation between COs and POs

COURSE CONTENT

UNIT- I Conceptual Framework (4 Hours)

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. **Experiencing and Voicing Dissatisfaction**: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

UNIT- II The Consumer Protection Law in India (5 Hours)

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT- III (5 Hours)

Grievance Redressal Mechanism under the Indian Consumer Protection Law

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal; Offences and penalties. **Leading Cases decided under Consumer Protection law by Supreme Court/National Commission**: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT-IV Role of Industry Regulators in Consumer (5 Hours)

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority

UNIT- V Contemporary Issues in Consumer Affairs (5 Hours)

Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) *Consumer Affairs*, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure*, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), *Consumer is King*, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book,
9. ebook, www.consumeraffairs.nic.in
10. *The Consumer Protection Act, 1986 and its later versions.* www.bis.org

Articles

1. Misra Suresh, (Aug 2017) "Is the Indian Consumer Protected? One India One People.
2. Raman Mittal, SonkarSumit and Parineet Kaur (2016) Regulating Unfair Trade Practices: An Analysis of the Past and Present Indian Legislative Models, Journal of Consumer Policy.
3. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online at www.cuts-international.org/doc01.doc.
4. Kapoor Sheetal (2013) "Banking and the Consumer" Akademos (ISSN 2231-0584)
5. Bhatt K. N., Misra Suresh and Chadah Sapna (2010). Consumer, Consumerism and Consumer Protection, Abhijeet Publications.
6. Kapoor Sheetal (2010) "Advertising-An Essential Part of Consumer's Life-Its Legal and Ethical Aspects", Consumer Protection and Trade Practices Journal, October 2010.
7. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.

Periodicals

1. Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)
2. Recent issues of magazines: International Journal on consumer law and practice, National Law School of India University, Bengaluru
3. '*Consumer Voice*', Published by VOICE Society, New Delhi.

Websites:

www.ncdrc.nic.in
www.consumeraffairs.nic.in
www.iso.org.
www.bis.org.in
www.consumereducation.in
www.consumervoice.in
www.fssai.gov.in
www.cercindia.org

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XV	24CAU15	RELATIONAL DATABASE MANAGEMENT SYSTEMS	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

This course covers the basic concepts of database systems, relational database, queries and database design. It is designed to provide solutions related to the strategies for storing data and transaction management.

COURSE OUTCOME:

On successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basic concepts of database system.	K1
CO2	Explain Normalization and Query language.	K2
CO3	Apply appropriate SQL queries and PL/SQL Programs for database application.	K3
CO4	Analyze different normal forms to design effective database design.	K4
CO5	Verify data in tables against appropriate constraints.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT -I **Introduction to Database System** **(12 Hours)**

Database Concepts: A Relational approach: Database – Relationships – DBMS – Relational Data Model – Integrity Rules – Theoretical Relational Languages. Database Design: Data Modeling and Normalization: Data Modeling – Dependency – Database Design – Normal forms – Dependency Diagrams - Denormalization – Another Example of Normalization.

UNIT -II **Oracle9i and Oracle Tables** **(15 Hours)**

Oracle9i: Overview: Personal Databases – Client/Server Databases – Oracle9i an introduction – SQL *Plus Environment – SQL – Logging into SQL *Plus - SQL *Plus Commands – Errors & Help – Alternate Text Editors - SQL *Plus Worksheet - iSQL *Plus - Oracle Tables: DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information – Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types – Spooling – Error codes.

UNIT- III **Working with Table** **(15 Hours)**

Working with Table: Data Management and Retrieval: DML – adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table – Arithmetic Operations – Restricting Data with WHERE Clause – Sorting – Revisiting Substitution Variables – DEFINE command – CASE structure. Functions and Grouping: Built-in functions – Grouping Data. Multiple Tables: Joins and Set operations: Join – Set operations.

UNIT- IV **PL/SQL** **(15 Hours)**

PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQ L in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

UNIT- V **PL/SQL Composite Data Types** **(15 Hours)**

PL/SQL Composite Data Types: Records – Tables – Varrays. Named Blocks: Procedures – Functions – Packages –Triggers – Data Dictionary Views.

TEXT BOOKS:

1. DATABASE SYSTEMS USING ORACLE – Nilesh Shah, 2nd Edition, PHI.(UNIT-I:Chapters 1 & 2, UNIT-II:Chapters 3 & 4, UNIT-III:Chapters 5 & 6,UNIT-IV:Chapters 10 & 11, UNIT-V:Chapters 12, 13 & 14).

REFERENCE BOOKS:

1. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 5th Edition, TMH.
2. Alexis Leon, Mathews Leon, Fundamentals of Database Management Systems, Vijay Nicole Imprints Private Limited.

WEB REFERENCES:

1. https://www.astera.com/type/blog/relational-database-management-system/
2. https://docs.oracle.com/cd/A97630_01/server.920/a96524/toc.htm

3. https://www.youtube.com/watch?v=vs04JXcRwkY
4. https://www.oracletutorial.com/plsql-tutorial/
5. https://www.youtube.com/watch?v=xofpqdU3cD4

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XVI PRACTICAL: VI	24CAU16	SQL AND PL/SQL-PRACTICAL	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	40	60	100

PREAMBLE :

This course covers the basic concepts of database systems, relational database, queries and database design. It is designed to provide solutions related to the strategies for storing data and transaction management.

COURSE OUTCOME:

On successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Explore the basic concepts of database system.	K1,K2,K3,K4,K5
CO2	Apply the various table keys in real time applications	
CO3	Apply appropriate SQL queries and PL/SQL Programs for database application.	
CO4	Examine different functions to design effective program	
CO5	Assess the data in tables against appropriate constraints.	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate;

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

PRACTICAL LIST

1. Contruct a table Department with Dept id as primary key , Dept name and Location name. Create a table Employee with Employee Id as primary key , Employee Name, Designation, Gender, Age, Date of Joining, Dept Id as foreign key and Salary and insert data in both the tables.
2. Extract queries using Comparison, Logical, Set, Sorting and Grouping operators to retrieve required data from the Employee table created in Question1.
3. Write queries using aggregate functions to summarize the data from the Employee table created in Question1 .
4. Extract Query to

A. Display the Employee id, employee name for all employees who earn more than the average salary.
B. Display the employees who have the highest salary
C. Display all employees who belong to a particular location

5. Construct tables for the library management system which demonstrate the use of primary key and foreign key. Master table should have the following fields: Accno, Title, Author and Rate. Transaction table should have the following fields: User id, Accno, Date of Issue and Date of Return. Create a Report(Select verb) with fields Accno, Title, Date of Issue for the given Date of Return with column formats

6. Create a Student table with following fields and Constraints.

Regno - Primary key
Name - Not null
Marks - Check marks between 0 to 100
Gender - Default value of Female
Aadhar card number -Unique

7. Write a PL/SQL program

A. To check whether a given character is letter or digit.
B. To convert a temperature in scale Fahrenheit to Celsius and vice versa.

8. Create a program in PL/SQL

A. To check whether a number is prime or not using goto statement with for loop.
B. To print the prime numbers between 1 and 50.

9. Create a PL/SQL to update the rate field by 20% more than the current rate in the inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block

10. Write a PL/SQL to split the student table into two tables based on result (One table for Pass and another for Fail). Use a cursor for handling records of the student table. Assume necessary fields and create a student details table

11. Create a database trigger on master and transaction tables which are based on an inventory management system for checking data validity. Assume the necessary fields for both tables

12. Construct a PL/SQL program to raise an Exception in the Bank Account Management table when the deposit amount is zero.

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE :XVII	24CAU17	SOFTWARE TESTING	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

To learn about the software testing concepts.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basics concepts of software testing	K1
CO2	Explain the different software testing methods	K2
CO3	Develop various testing levels for different domains	K3
CO4	Classify various testing techniques that can be used for software testing	K4
CO5	Decide test plans for real time applications	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	1	3	1
Total Contribution of COs to Pos	**45**	**45**	**45**	**45**	**25**	**27**	**25**
Weighted Percentage of COs Contribution to Pos	**2.04**	**2.13**	**2.22**	**2.48**	**1.45**	**1.65**	**2.21**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I **Life Cycle Models** **(15 Hours)**

Software Development Life Cycle Models: Requirements Gathering and Analysis - Quality, Quality Assurance, and Quality Control- Testing, Verification, and Validation**.** White Box Testing: What is White Box Testing? - Static Testing - Static Testing by Humans - Static Analysis Tools -Structural Testing - Unit/Code Functional Testing - Code Coverage Testing - Code Complexity Testing - Challenges in White Box Testing.

UNIT- II **Black Box Testing** **(14 Hours)**

What is Black Box Testing? -Why Black Box Testing? - When to do Black Box Testing? -How to do Black Box Testing? - Requirements Based Testing - Positive and Negative Testing - Boundary Value Analysis - Decision Tables - Equivalence Partitioning - State Based or Graph Based Testing - Compatibility Testing - User Documentation Testing - Domain Testing.

UNIT- III **Integration Testing** **(14 Hours)**

What is Integration Testing? - Integration Testing as a Type of Testing - Integration Testing as a Phase of Testing - Scenario - Defect Bash.

UNIT- IV **System and Acceptance Testing** **(14 Hours)**

System Testing: Why is System Testing Done? - Functional System Testing- Non-Functional Testing- Acceptance Testing: Acceptance Criteria-Selecting Test Cases for Acceptance Testing-Executing Acceptance Tests.

UNIT- V **Performance Testing and Regression Testing** **(15 Hours)**

Performance Testing: Introduction Factors Governing Performance Testing Methodology for Performance Testing -Collecting Requirements - Writing Test Cases - Automating Performance Test Cases - Executing Performance Test Cases - Analyzing the Performance Test Results - Performance Tuning - Performance Benchmarking - Capacity Planning -Tools for Performance -Testing Process for Performance Testing. Regression Testing: What is Regression Testing? - Types of Regression Testing - When to do Regression Testing? - Best Practices in Regression Testing.

TEXT BOOK:

1. Srinivasan Desikan. Gopalaswamy Ramesh "Software Testing Principles and Practices" Pearson Education

REFERENCE BOOKS :

1. B. Beizer, "Software Testing Techniques", II Edn., DreamTech India, New Delhi, 2003.
2. K.V.K. Prasad , "Software Testing Tools", DreamTech. India, New Delhi, 2005.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/types-software-testing/

2. https://www.ibm.com/in-en/topics/software-testing

3. https://www.guru99.com/software-testing-introduction-importance.html

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE : XVIII	24CAU18A/ 24CAU18B/ 24CAU18C	Institutional Training/ Industrial Training/ Mini Project	-	1

Contact hours per week: -

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	50	-	50

PREAMBLE:

To expose the students to practice themselves and find solution for the problems in the respective areas

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Remember the thrust areas of project	K1,K2,K3,K4,K5
CO2	Demonstrate the problem pertaining to the domain	
CO3	Apply various algorithms in their relevant field	
CO4	Explore the real time applications	
CO5	Evaluate demographic variables and factors influencing software development	

K1 – Remember;K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:XIX (OPEN ELECTIVE)	24CSUOE1	INTERNET FOR EVERYONE	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE :

This paper provides an insight of formal introduction to internet, WWW, Finding Information in the Internet and awareness on Internet Security and Privacy, illustrate the Possibilities of Social Networking. Learning discussion forum software, Effective use of video conferencing, Blogging & Making Money in the Internet.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Outline the basic concept of the Internet, World Wide Web and Web browsers	K1
CO2	Explain the Knowledge of Finding Information in the Internet and awareness on Internet Security and Privacy	K2
CO3	Apply tips for effective use of Email, Advantages and Disadvantages of Email	K3
CO4	Analyze the Possibilities of Social Networking, Learning discussion forum software & effective use of video conferencing	K4
CO5	Evaluate the learn Blogging & Making Money in the Internet	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	3	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	3	1
CO5	3	3	3	1	1	3	1
Total Contribution of COs to POs	**33**	**33**	**27**	**17**	**10**	**13**	**5**
Weighted Percentage of COs Contribution to POs	**1.77**	**1.56**	**1.33**	**0.94**	**0.58**	**0.43**	**0.44**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I Introduction to Internet, WWW & Web Browsers (10 Hours)

What is Internet? - How does Internet Work? - What is Special about the Internet? - What is WWW? - Internet and Web - How does the web works? - What are web browsers? - Types of Browsers - Web Browsing Tips.

UNIT- II Searching the Web, Safety & Privacy (10 Hours)

Information Sources - Finding Information on the internet - Searching the Web - Search Engines - Making Your Search- Improving Your Searching - Tips for Internet Research- Privacy - Anonymity - Understanding Security and Privacy.

UNIT -III E-Mail (10 Hours)

Introduction - How E-mail works? - Why use E-mail? - E-mail Names and Addresses - Mailing Basics - How Private is the e-mail?- Email Ethics - Spamming - E-mail Advantages and Disadvantages - Tips for effective E-mail use - E-mail Safety tips.

UNIT- IV Social Networking and Discussion Forums (8 Hours)

Introduction - Social Networking Timeline - Why Social Networking? - Dangers of Social Networking?-Discussion Forums - Discussion Forum Software - Internet Telephony - Video Conferencing.

UNIT- V Making Money on the Internet and Blogging (10 Hours)

What is a Blog? - Why Blog? - Why is Blogging so Popular? - Blog Search Engines and Communities - Blogs and Employment - Pitfalls to avoid while Blogging. Introduction – Writing Product Reviews - Sharing Your Knowledge - Advertising - Affiliate programs -Selling - Online Tutoring.

TEXT BOOK:

1. Alexis Leon, Mathews Leon , INTERNET FOR EVERYONE ,Vikas Publishing Housing Pvt Ltd , 15th Anniversary Edition

REFERENCE BOOKS:

1. Keiko Pitter, Sara Amato,JohnCallahan,Niger Kerr, Eric Tilton, Robert Minato,Tata McGraw-Hill Edition 2003
2. Peter Weverka, The Everyday Internet All-in-One Desk Reference for Dummies,Wiley Publishing Inc, 3rd Edition

WEB REFERENCES

1.**https://www.tutorialspoint.com/computer_concepts/computer_concepts_introduction_to_internet_www_web_browsers.htm**
2.**https://www.tutorialspoint.com/internet_technologies/e_mail_overview.htm**
3.**https://geekflare.com/make-money-with-blogging/**

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:XIX (OPEN ELECTIVE)	24ITUOE1	BASICS OF COMPUTER TECHNOLOGY	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

To learn about the basics of Computer Technology

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basics of Computer	K1
CO2	Illustrate the concepts of data communication and Computer networks	K2
CO3	Utilize Middleware and Gateways	K3
CO4	Analyze the concept of Mobile Computing	K4
CO5	Examine the DBMS Architecture	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	3	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	3	1
CO5	3	3	3	1	1	3	1
Total Contribution of COs to POs	**33**	**33**	**27**	**17**	**11**	**13**	**5**
Weighted Percentage of COs Contribution to POs	**1.77**	**1.56**	**1.33**	**0.94**	**0.58**	**0.43**	**0.44**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I **Computer Basics** **(9 Hours)**

Introduction-Generations of Computers-Classification of Computers- Central Processing Unit-Communication among Various Units-Memory Hierarchy-RAM-ROM-Secondary Storage Devices-Operating System: Introduction- Definition-Types.

UNIT- II **Data Communication and Computer Networks** **(10 Hours)**

Introduction- Data Communication- Transmission Media- Multiplexing- Switching. Computer Network: Types of Computer Networks- Network Topologies- Communication Protocol. Internet: Introduction-Basic Internet Terms- Internet Applications-Search Engines.

UNIT- III **Database Fundamentals** **(9 Hours)**

Introduction-Definition-Logical Data Concepts-Physical Data Concepts-Database Management System-DBMS Architecture-Types of Databases.SQL: Introduction-Getting Started with SQL.

UNIT- IV **Mobile Computing** **(10 Hours)**

Wireless The beginning –Mobile Computing –Dialogue Control-–Networks –Middleware and Gateways –Application and Services-Developing Mobile Computer Applications –Security in Mobile Computing–Architecture for Mobile Computing-Mobile Computing through Telephone-– IVR Applications.

UNIT- V **Cloud Computing** **(10 Hours)**

Introduction- From- Collaboration to cloud- Working of cloud computing-Pros and Cons- Benefits-Developing cloud computing services- Cloud service development-Discovering cloud services-Collaborating on schedules-Collaborating on calendars-Evaluating web conference tools- Creating groups on social networks- Understanding cloud storage- Evaluating on line file storage.

TEXT BOOKS:

1. Alexis Leon, Mathews Leon, Introduction to Information Technology, 2nd Edition, ITL Limited ITL Education Solutions Limited,Publisher(s): Pearson Education India,ISBN: 9789332525146
2. Asoke K Talukder , Roopa R Yavagal,Mobile Computing, TMH, 2005
3. Anthony T. Velte, “Cloud Computing- A Practical Approach”, Tata McGraw Hill Education Private Limited, 1st Edition (2013).

REFERENCE BOOKS:

1. Alexis Leon ,Mathews Leon,Fundamentals of Information Technology, ITL Limited
2. KumkumGarg,Mobile Computing, Pearson Education, 2010.
3. Michael Miller, Cloud Computing, Pearson Education, New Delhi, First Edition, 2013.

WEB REFERENCES

1. https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0529_CloudComputing_Notes-converted.pdf
2. https://mjginfologs.com/mobile-computing-architecture/
3. https://www.guru99.com/dbms-architecture.html
4. https://www.tutorialspoint.com/data_communication_computer_network/index.htmL

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:XIX (OPEN ELECTIVE)	24CAUOE1	MACHINE LEARNING	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE :

To provide an in-depth knowledge about machine learning concepts, techniques, models, and algorithms.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Remember the Machine Learning Fundamentals	K1
CO2	Understanding the Machine Learning Concepts	K2
CO3	Summarize the Impact of Machine Learning Applications	K3
CO4	Analyze Machine Learning Support to Business Goals	K4
CO5	Evaluate the Knowledge of Machine Skills	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	3	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	3	1
CO5	3	3	3	1	1	3	1
Total Contribution of COs to Pos	**33**	**33**	**27**	**17**	**11**	**13**	**5**
Weighted Percentage of COs Contribution to Pos	**1.77**	**1.56**	**1.33**	**0.94**	**0.58**	**0.43**	**0.44**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I Overview of Machine learning (9 Hours)

Understanding Machine Learning- What Is Machine Learning?- Defining Big Data- Big Data in Context with Machine Learning- The Need to Understand and Trust your Data- The Importance of the Hybrid Cloud- Leveraging the Power of Machine Learning- The Roles of Statistics and Data Mining with machine learning- Putting Machine Learning in Context- Approaches to Machine Learning.

UNIT- II Machine Learning Techniques (10 Hours)

Getting Started with a Strategy- Understanding Machine Learning Techniques- Tying Machine Learning Methods to Outcomes- Applying Machine Learning to Business Needs.

UNIT- III Machine Learning On Applications (9 Hours)

Looking Inside Machine Learning- The Impact of Machine Learning on Applications- Data Preparation- The Machine Learning Cycle.

UNIT- IV Getting Started with Machine Learning (10 Hours)

Getting Started with Machine Learning- Understanding How Machine Learning Can Help- Focus on the Business Problem- Machine Learning Requires Collaboration- Executing a Pilot Project- Determining the Best Learning Model.

UNIT- V Learning Machine Skills (10 Hours)

Learning Machine Skills- Defining the Skills That You Need- Getting Educated- Using Machine Learning to Provide Solutions to Business Problems- Applying Machine Learning to Patient Health- Leveraging IoT to Create More Predictable Outcomes- Proactively Responding to IT Issues- Protecting Against Fraud- Ten Predictions on the Future of Machine Learning.

TEXT BOOK:

1. Judith Hurwitz and Daniel Kirsch, Machine Learning for dummies, IBM Limited Edition,2018

REFERENCE BOOK:

1. EthemAlpaydin, Introduction to Machine Learning, Second Edition, The MIT Press Cambridge, Massachusetts London, England

WEB REFERENCES:

1. https://www.sciencedirect.com/topics/computer-science/machine-learning#:~:text=Machine%20learning%20(ML)%20refers%20to,being%20programmed%20with%20that%20knowledge.
2. https://www.javatpoint.com/machine-learning-techniques
3. **https://www.simplilearn.com/tutorials/machine-learning-tutorial/machine-learning-applications**

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:XIX (OPEN ELECTIVE)	24AMUOE1	ADVANCED EXCEL - PRACTICAL	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	40	60	100

PREAMBLE:

To provide skills and knowledge which will allow the attendee to Learn MS Excel tools and techniques.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Use a range of lookup and reference functions.	K1,K2,K3,K4,K5
CO2	Modify Excel options.	
CO3	Customise the formatting of charts in Excel.	
CO4	Create and use labels and names in a workbook.	
CO5	Group cells and use outlines to manipulate the worksheet	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	3	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	3	1
CO5	3	3	3	1	1	3	1
Total Contribution of COs to Pos	**33**	**33**	**27**	**17**	**11**	**13**	**5**
Weighted Percentage of COs Contribution to Pos	**1.77**	**1.56**	**1.33**	**0.94**	**0.58**	**0.43**	**0.44**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

Microsoft Excel

1.Find out the Total, minimum , maximum and average values using the formula in thegiven table

First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Virginia	Bernard	16	25.90	414.40	82.88	331.52	33.15
Catherine	Harvest	24	16.40	393.60	78.72	314.88	31.49
Steve	Jones	40	28.50	1,140.00	228.00	912.00	91.20
Sam	McGregor	40	25.70	1,028.00	205.60	822.40	82.24
Sandra	O'Shea	35	29.60	1,036.00	207.20	828.80	82.88
Eddie	Smith	40	28.50	1,140.00	228.00	912.00	91.20

2. Prepare a bar chart using the below table

2	**Sales**				
3		**Week 1**	**Week 2**	**Week 3**	**Week 4**
4					
5	**Monday**	296,114	565,042	429,746	123,445
6	**Tuesday**	70,500	78,967	85,889	117,015
7	**Wednesday**	520,830	360,389	244,488	110,585
8	**Thursday**	83,296	520,242	82,467	112,728
9	**Friday**	520,140	83,333	87,611	119,158
10		**1,490,880**	**1,607,973**	**930,201**	**582,931**

3.Write down the formula to concatenate the data in two different cells into a single cell

Example:

4. Enter the student details as Reg.No, Name, Age, Marks for 3 subject and display thecount of the students whose avg>=60

5. Find out the week No and day of the given table using date function

Current Date	Week No	Day of the year
5/3/2018		
5/23/2021		
2/23/2022		
5/23/2010		
5/23/2008		
12/27/2021		

6. Create a workbook with the following details

Emp. No	Name	Basic Salary	House Rent	Conv. Allowance	Medical Allowance	Gross	Tax	Net
1	ABC	8000						
2	XYZ	3500						
3	KLM	8900						
4	WXY	4500						
5	MNO	6500						
6	PQR	4000						
7	STU	7800						

Total Salary

Find out the following details

i) Calculate House Rent (if Basic Salary is greater than 5000 then 45% otherwise 30%)
ii) Calculate Conv. Allowance (if Basic Salary is greater than 5000 then 30% otherwise 20%)
iii) Calculate Medical Allowance (if Basic Salary is greater than 5000 then 60% otherwise 45%)
iv) Calculate Gross Pay, Net Pay

7. From the above given table find
i) Calculate Tax (if Gross is greater than 15000 then 10% otherwise 0)
ii) Calculate total salary of those employees whose salary is less than 5000
iii) Count no. of employees who are not giving tax

8. Create a workbook with the following details

Reg. ID	Name	Quizes (10)	Mid-Terms		Mids (Total) (30)	Assignment (10)	Project + Pres (10)	Final (40)	Total (100)	Grade
			M1	M2						
101	ABC	10	13	8		9	10	35		
201	XYZ	9	12	12		8	9	32		
301	KLM	7	15	15		7	8	28		
401	WXY	8	13	13		9	7	31		
501	MNO	9	10	12		10	5	36		
601	PQR	8	7	2		9	9	30		
701	STU	6	2	12		8	7	21		

No. of D's No. of F's

Find out the following

i) Calculate Mid-Total, Total
ii) Calculate Grade using If condition
iii) Calculate no. of D (below 60 and above 40) and F (below 40) grades

9. Find out the following details from the given table
i) Find out the city, departure time and terminal of Flight No. LH 5842 using vlookup formula
ii) Find out the no. of flights coming on terminal 2 using formula.

flight-Nr	city	departure	terminal	gate
EW 730	Bremen	14:50	T1	164
6E 235	Dortmund	16:00	T1	170
KL 1874	Amsterdam	16:00	T2	146
AF 2009	Paris	16:15	T1	114
LH 299	Berlin	16:20	T2	162
LH 5860	Madrid	16:25	T1	164
LH 5842	Barcelona	16:30	T1	166
LH 1369	München	17:00	T2	131
LH 5966	London	17:10	T1	161

10. Create a google sheet with the following details
i) Subtract both A and B series, then find the ABSOLUTE value in the next column.
ii) Share the sheet with your friend

Series A	Series B
10	8
6	8
7	9
5	8

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART: III	CORE: XX ELECTIVE: I	24CAU19A	MULTIMEDIA USING CANVA LEVEL-I	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE :

To understand the basic concepts of Multimedia.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recognize the basic concepts of multimedia	K1
CO2	Demonstrate different multimedia content	K2
CO3	Discover various effect in Images	K3
CO4	Analyze multimedia Audio files	K4
CO5	Determine multimedia requirements for designing using Canva	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	9	9	9	9	9	9	3
CO 2	9	9	9	9	9	9	3
CO 3	9	9	9	9	9	9	3
CO 4	9	9	9	9	9	9	3
CO 5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT- I **Multimedia an overview** **(12 Hours)**

Introduction-Multimedia Presentation and Production-Characteristics of a Multimedia Presentation-Hardware and Software Requirements.

UNIT- II **Text** **(12 Hours)**

Uses of Multimedia - Analog and Digital Representations –Digitization.- Text: Introduction -Types of Text -Unicode Standard -Font -Insertion of Text.

UNIT- III **Image** **(12 Hours)**

Image: Introduction-Image Data Representation-Image Acquisition-Image Processing

UNIT- IV **Audio** **(12 Hours)**

Audio: Introduction-Acoustics-Sound Waves-Types and Properties of Sounds-Psycho-Acoustics-Components of Audio Systems.

UNIT- V **Canva an Overview** **(12 Hours)**

What is Canva?-Templates-Blank Canvas Templates-Canva -Open and Edit your Design-Using Canva Editor-Search Tab-Elements-Grids-Text-Edit Text-Background-Upload Tab-Delete Uploaded Image-Save and Download your Design-Share your Design-Advice.

TEXT BOOKS :

1.Ranjan Parekh, Principles of Multimedia, TMH, 2007.
2.https://www.tyfucymru.co.uk/media/1947/200402-vm-v1-canva-user-guide-150201.pdf

REFERENCE BOOKS:

1. William M. Neuman, Robert R. Sprout, Principles of interactive Computer Graphics, McGraw Hill International Edition
2. Ashok Banerji, Ananda Mohan Ghosh, Multimedia Technologies, McGraw Hill Publication.

WEB REFERENCES:

1. https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm
2. https://littlevision.files.wordpress.com/2013/12/multimedia-technology.pdf
3. https://www.studocu.com/in/document/bharathiar-university/bsc-computer-science/gm-full-notes-of-cs-in-graphics-and-multimedia-unit-2-bharathiyar-university/28544356
4.https://www.canva.com/learn/how-to-canva-beginners-guide/

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XX ELECTIVE: I	24CAU19B	BIG DATA ANALYTICS USING TABLEAU LEVEL-I	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

To enable the students to learn the concepts of Big Data Analytics and its tools in Industry 4.0

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the definitions in Big Data and Data Analytics	K1
CO2	Explain Big Data Adoption	K2
CO3	Planning and Apply Data Analytics	K3
CO4	Analyze Big Data Challenges, link analysis and Recommendation systems towards Industry 4.0	K4
CO5	Evaluate Data with Tebleau	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I Understanding Big Data Analytics (12 Hours)

Understanding Big Data-Concepts and Terminology-Datasets-Data Analysis-Data Analytics-Descriptive Analytics-Diagnostic Analytics-Predictive Analytics-Prescriptive Analytics-Business Intelligence (BI)- Key Performance Indicators (KPI)- Big Data Characteristics-Different Types of Data-Case Study Background.

UNIT- II Business Motivations and Drivers for Big Data (12 Hours)

Business Motivations and Drivers for Big Data Adoption- Marketplace Dynamics-Business Architecture-Business Process Management-Information and Communications Technology-Internet of Everything (IoE).

UNIT- III Big Data Adoption & Planning (12 Hours)

Big Data Adoption and Planning Considerations- Organization Prerequisites-Data Procurement-Privacy Security-Provenance- Limited Real-time Support-Distinct Performance Challenges-Distinct Governance –Requirements-Distinct Methodology-Clouds-Big Data Analytics Lifecycle.

UNIT -IV Enterprise Technologies and Big Data Business Intelligence (12 Hours)

Enterprise Technologies and Big Data Business Intelligence- Online Transaction Processing (OLTP)-Online Analytical Processing (OLAP)- Extract Transform Load (ETL)- Data Warehouses-Data Marts-Traditional BI-Big Data BI.

UNIT- V Tableau an Overview (12 Hours)

Tableau an Overview -The Tableau Environment-How Does Tableau Fit with Cognos?-What you need to know about - Tableau and how we use it at Princeton -The Tableau Reporting Tool - Application Terminology -Icons and Visual Cues for Fields -Getting Started in Tableau Desktop-Helpful Hints - Data Sources -Security Considerations -Data -Report Access and Security in Tableau-Tableau Server-Collecting and Assembling Data -Understanding Tableau Data Sources - Tableau Data Format-Connect to an Excel Data Source -Connecting to an Excel File with Multiple Tabs - Connecting to More than One Separate File -Data Blending -Cross Database Joins -When to Blend and When to Join -Connecting to a Server Data Source -Editing and Saving a Data Source -Modifying Data Attributes -Saving Your Data Source -Understanding Changes to Data .

TEXT BOOKS:

1. Thomas Erl,Wajid Khattak,and Paul Buhler “Big Data Fundamentals Concepts, Drivers Techniques”, The Prentice Hall Service Technology Series from Thomas ERL.
2. Princeton University ,”Tableau An Introduction”

REFERENCE BOOKS:

1. Radha Shankarmani and M.Vijayalakshmi, “Big Data Analytics”, 2nd Edition, Wiley.
2. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, PACKT publishing open source community experience distilled, Mumbai. 2013.

WEB REFERENCES:

1. https://www.techtarget.com/searchdatamanagement/definition/big-data
2. https://www.techtarget.com/searchdatamanagement/definition/NoSQL-Not-Only-SQL
3. https://www.youtube.com/watch?v=nbBJ27XhEyM
4. https://www.youtube.com/watch?v=fL41WSVDunM
5. https://www.youtube.com/watch?v=a3It88zzbiA

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XX ELECTIVE: I	24CAU19C	INTERNET OF THINGS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

This course gives an overview of the basic concepts of building an IoT system and its application in Industry 4.0

COURSE OUTCOME:

On successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the general concepts of Internet of Things (IoT).	K1
CO2	Illustrate various IoT sensors and applications	K2
CO3	Apply design concepts to IoT solutions for Industry 4.0	K3
CO4	Compare various IoT architectures	K4
CO5	Evaluate Design issues in IoT applications	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I Fundamentals of IoT (12 Hours)

Introduction – Characteristics - Physical Design - Protocols – Logical Design – Enabling Technologies – IoT Levels and deployment Templates

UNIT- II IoT Communication and Network Protocols (12 Hours)

M2M -IoT Vs M2M – Software Defined Network and Network Function Virtualization - IoT Systems Management – Simple Network Management Protocol - NETCONF-YANG

UNIT- III IoT Design Methodology (12 Hours)

IoT Design Methodology – Case study on IoT System for Home Automation –Weather Monitoring – Python in IoT

UNIT- IV Physical Devices and Endpoints (12 Hours)

Basic Building blocks – Raspberry Pi- Interfaces – Programming with Raspberry Pi- IoT with Arduino-Connecting -Testing Sensors using Arduino sketch

UNIT- V IoT Cloud offerings and Case Studies (12 Hours)

Cloud Storage Models and Communication APIs –WAMP- Xively Cloud- Amazon Web Services for IoT- Various Real Time Applications of IoT. Industrial IoT

TEXT BOOKS :

1.Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 2015.

REFERENCE BOOKS:

1.Marco Schwartz, Internet of Things with the Arduino Yun,,Packt Publishing, 2014.
2.Adrian McEwen, Hakim Cassimally,Designing the Internet of Things, ISBN: 978-1-118-43062-0,Wiley,November 2013

WEB REFERENCES:

1. **https://www.oracle.com/in/internet-of-things/what-is-iot/**
2. **https://www.youtube.com/watch?v=uLbtexcw39Y**
3. **https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/**
4. **https://www.youtube.com/watch?v=h0gWfVCSGQQ**
5. **https://youtu.be/PNsWWhllOJM**
6. **https://www.techtarget.com/iotagenda/definition/Industrial-Internet-of-Things-IIoT**

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XX ELECTIVE: I	24CAU19D	DATA COMMUNICATIONS AND NETWORKS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

This course gives an overview of the basic concepts of building an IoT system and its application in Industry 4.0

COURSE OUTCOME:

On successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Ability to understand basics of Data communication and transmission process	K1
CO2	Understand basic concepts of Transmission Media, Switching and Routing Techniques	K2
CO3	Acquire knowledge of Network types	K3
CO4	Analyze Communication protocols	K4
CO5	Evaluate different networking	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I Introduction to Data Communications and Networking (12 Hours)

Introduction to Data Communications and Networking – Information Encoding – Analog and Digital Transmission Methods – Modes of Data Transmission and Multiplexing.

UNIT- II Transmission Media & Algorithms (12 Hours)

Transmission Errors: Detection and Correction- Transmission Media : Guided Media, Unguided Media – Network Topologies – Network Protocols and OSI Model.

UNIT- III Types of Networks (12 Hours)

Local Area Networks (LAN), Metropolitan Area Networks (MAN) and Wide Area Networks (WAN) – Integrated Services Digital Network (ISDN) – X.25 Protocol – Frame Relay.

UNIT -IV Internetworking Concepts (12 Hours)

Internetworking Concepts, Devices, Internet Basics, History and Architecture – Ways of Accessing the Internet – An Introduction to Transmission Control Protocol/ Internet Protocol (TCP/IP),Internet Protocol (IP), AddressResolutionProtocol (ARP), Reverse Address Resolution Protocol (RARP), Internet Control Message Protocol (ICMP).

UNIT- V Protocols (12 Hours)

TCP: Features of TCP, Relationship between TCP and IP, Ports and Sockets, TCP connections, What makes TCP Reliable? TCP Packet Format – User Datagram Protocol (UDP): UDP Packet, Difference between UDP and TCP – Domain Name System (DNS) – Electronic Mail (Email) – File Transfer Protocol (FTP) – Web Browser Architecture.

TEXT BOOK:

1.Achyut S.Godbole, “Data Communications and Networks”, Tata McGraw-Hill Publishing Company Limited, Ninth reprint, 2007.

REFERENCE BOOKS:

1.Behrouz A. Forouzan, “Data Communications and Networking – Second Edition Update “ Tata McGraw-Hill Publishing Company Limited, Nineteenth reprint, 2007.
2.Andrew S. Tanenbaum, “Computer Networks”, III Edition, Prentice Hall of India, 2000.

WEB REFERENCES:

1.https://www.tutorialspoint.com/data_communication_computer_network/index.htm
2.https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/
3.https://www.academia.edu/8910678/Data_communication_and_computer_networks_Introduction

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	SKILL ENHANCEMENT : II	24SECAU02	WEB PROGRAMMING - PRACTICAL	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	50	-	50

PREAMBLE:

To learn the basic components of HTML and PHP

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Remember the basics syntax of HTML & PHP	K1,K2,K3,K4,K5
CO2	Demonstrate the concepts of HTML & PHP	
CO3	Utilize the syntax of HTML& PHP	
CO4	Analyze an insight on forms	
CO5	Assess an insight on MYSQL Database	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

PRACTICAL LIST

HTML Program

1. Design a page having suitable background color and text color using all the attributes of the Font tag.
2. Write HTML code to create a Web Page that contains an Image at its centre.
3. Create a HTML document containing a nested list.
4. Develop a website to publish your family and the details of each member using HTML.
5. Develop a HTML document to display a Registration Form for an inter-collegiate function
6. Create a web page using Embedded CSS

PHP Program

1. Create a PHP Program for finding factorial number
2. Write a PHP program to find maximum value
3. Design a PHP program to display Multiplication table
4. Create a PHP Program to draw Human face
5. Design a PHP program that demonstrates simple web page in PHP
6. Create an Authentication web page in PHP with MySql to check username and password

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-V	PROFICIENCY ENHANCEMENT:	24PECAU01	BUSINESS COMMUNICATIONS (Self Study)	-	2

Contact hours per week: -

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	-	100	100

PREAMBLE:

To enable the students to communicate in business environment

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Understand need for Communication	K1
CO2	Explain the Process of Communication	K2
CO3	Planning and Apply Process of Communication	K3
CO4	Analyze Reports Writing Methods	K4
CO5	Evaluate Methods for Public Speaking and Presentation	K5

K1 – Remember; K2 – Understand;K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	1	1	9	3	9
CO2	9	9	1	1	9	3	9
CO3	9	9	1	1	9	3	9
CO4	9	9	1	1	9	3	9
CO5	9	9	1	1	9	3	9
Total Contribution of COs to POs	**45**	**45**	**5**	**5**	**45**	**15**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**0.25**	**0.28**	**2.61**	**0.92**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT:

UNIT- I Introduction to Communication

Introduction - The Concept of Communication - Significance of Communication – Introduction and Objective of Business Communication-Effective Communications Skills.

UNIT- II Process of Communication

Introduction - How to Understand Communication Process - A Common Misconception - The Communication Environment. - A Well Designed Communication Process.

UNIT- III Barriers and Gateways in Communication

Barriers in Communication- Gateways to Communication Barriers - Making Communication Effective - Do's and Don't of Commercial Letter.

UNIT -IV Business Reports Writing

Introduction - Types of Business Reports - Characteristics of A Good Report - Structures of Business Reports – Introduction to Oral and Non-verbal Communication - Oral and Non-verbal Communication

UNIT- V Public Speaking and Presentation

Introduction - Encoding and Translating - Understanding Your Audience - Targeting Your Audience - Designing a Presentation - Preparing the Venue and Seating Arrangement - Final Point and Getting Start - Phases of a Negotiation - Characteristics of a Negotiation - Opening Negotiations - Legal Aspects of Communication

TEXT BOOK:

1.Dr. Karam Pal "Business Communication"

REFERENCE BOOKS:

1. Business Communication *by* K. K. Sinha. Galgotia Publishing Company., New Delhi.
2. Business Communication *by* C. C. Pattensheti. R. Chand and Company Publishers., New Delhi.
3. Essentials of Business Communication *by* Rajindra Pal and J. S. Korlahalli. Sultan Chand and Sons., New Delhi.
4. Effective Business Communication *by* Herta A. Murphy and Charrles E. Peck. Tata McGraw Hill Publishing Company Limited., New Delhi.
5. Essentials of Business Communication *by* Pettett and Lesikar. Tata McGraw Hill Publishing Company Limited., New Delhi.
6. Business Communication *by* Pettett and Lesikar. Tata McGraw Hill Publishing Company Limited., New Delhi.

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1.https://dcomm.org/wp-content/uploads/2019/05/Business-Communication-PDFDrive.com-.pdf
2.https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/1/UG_B.A._Public%20Administration_106%2013_Business%20Communication.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE : XXI	24CAU20	PROGRAMMING IN PYTHON	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE :

The course offers the understanding of basic principles in python and skills to create computer programs for small scale usage.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall syntax and semantics of various programming constructs.	K1
CO2	Illustrate the process of structuring data using lists, tuples, and dictionaries	K2
CO3	Identify appropriate programming structure for a real time applications	K3
CO4	Apply file concepts in various aspects	K4
CO5	Infer the object oriented concepts in python	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**27**
Weighted Percentage of COs Contribution to Pos	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**2.39**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT- I Basics and Functions (12 Hours)

The way of the program: What is a program? - Running Python. - The first program.- Arithmetic operators - Values and types - Variables, expressions and statements: Assignment statements - Variable names - Expressions and statements - Script mode - Order of operations - String operations Comments – Debugging. Functions: Function calls - Math functions - Composition – Adding new functions – Definition and uses - Flow of execution - Parameters and arguments- Variables and parameters are local - Fruitful functions and void functions - Why functions?

UNIT -II Conditionals, Recursion, Iteration, Strings (15 Hours)

Conditionals and Recursion: Floor division and modulus - Boolean expressions - Logical operators - Conditional execution - Alternative execution - Chained conditionals - Nested conditionals Recursion - Infinite recursion – Keyboard input. Fruitful functions: Return values Incremental development- Composition - Boolean functions. Iteration: Reassignment - Updating variables - The while statement - break - Square roots - Strings: String is a sequence - Traversal with a for loop - String slices - Strings are immutable - Searching - Looping and counting - String methods - The in operator - String comparison.

UNIT- III Lists, Dictionaries, Tuples (15 Hours)

Lists: A list is a sequence - Lists are mutable - Traversing a list - List operations - List slices - List methods - Map, filter and reduce Deleting elements - Lists and strings Objects and values - Aliasing - List arguments - Dictionaries: A dictionary is a mapping Dictionary as a collection of counters - Looping and dictionaries - Reverse lookup Dictionaries and lists - Memos - Global variables. Tuples: Tuples are immutable - Tuple assignment - Tuples as return values - Variable length argument tuples - Lists and tuples- Dictionaries and tuples.

UNIT- IV Files, Classes and Objects (15 Hours)

Files: Persistence - Reading and writing - Format operator - Filenames and paths - Catching exceptions - Databases - Pickling - Pipes - Writing modules – Classes and objects: Programmer -defined types . Attributes - Rectangles - Instances as return values - Objects are mutable Copying - Classes and Functions: Time - Pure functions - Modifiers - Prototyping versus planning.

UNIT- V Classes and Methods (15 Hours)

Classes and methods: Object-oriented features - Printing objects - Another example - A more complicated example - The init method- The_str_method - Operator overloading - Type-based dispatch - Polymorphism - Interface and implementation - Inheritance: Card objects - Class attributes Comparing cards -Decks Printing the deck, add, remove, shuffle and sort - Inheritance - Class diagrams - Data encapsulation.

TEXT BOOK

1. Allen B. Downey,"Think Python: How to Think Like a Computer Scientist", 2nd Edition 2012, O'Reilly.

REFERENCE BOOKS :

1. Kenneth A. Lambert, "Fundamentals of Python First Programs", Second Edition
2. Rashi Gupta, "Making Use of Python", Willey publishing Inc

WEB REFERENCES:

1. https://www.w3schools.com/python/python_intro.asp
2. https://www.geeksforgeeks.org/python-programming-language/
3. https://www.programiz.com/python-programming

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE : XXII PRACTICAL : VII	24CAU21	PROGRAMMING IN PYTHON - PRACTICAL	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	40	60	100

PREAMBLE:

The course offers the understanding of basic principles in python and skills to create computer programs for small scale usage.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Demonstrate the various programming constructs.	K1,K2,K3,K4,K5
CO2	Illustrate the process of structuring data using lists, tuples, and dictionaries	
CO3	Identify appropriate programming structure for a real time applications	
CO4	Apply file concepts in various aspects	
CO5	Infer the object oriented concepts in python	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to Pos	**45**	**45**	**45**	**45**	**45**	**45**	**27**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**2.39**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

PRACTICAL LIST

1. Write a program to find prime numbers between 1 to n.

2. Construct a program to print the decimal equivalents of 1/2, 1/3, 1/4,.....1/n code.

3. Design a program to check given number is Armstrong or not.

4. Simulate a basic calculator using various arithmetic operators.

5. Compute GCD and LCM of two numbers using functions.

6. Develop a program to accept a line of text and find the number of characters, number of vowels and number of blank spaces in it.

7. Demonstrate various List operations.

8. Write a program to create a List and split it into two lists for odd and even numbers.

9. Design a program to create a tuple and perform various slicing operations.

10. Build a program to display the file contents and copy the file contents from one file to another.

11. Develop a program to create a dictionary, add a key-value pair, change and retrieve the values based on the key.

12. Develop a program to implement class and object concepts.

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XXIII	24CAU22	MOBILE COMPUTING	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To learn about different technologies available in the mobile computing.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Outline the emergence of Mobile technology and its architecture	K1
CO2	Identify the features of various technologies	K2
CO3	Apply the knowledge on mobile computing through telephony	K3
CO4	Examine the different Mobile networks	K4
CO5	Determine data services in mobility	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	3	3	9	9	9
CO2	9	9	3	3	9	9	9
CO3	9	9	3	3	9	9	9
CO4	9	9	3	3	9	9	9
CO5	9	9	3	3	9	9	9
Total Contribution of COs to POs	**45**	**45**	**15**	**15**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**0.74**	**0.83**	**2.61**	**2.75**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I Introduction to Mobile Computing and its Architecture (15 Hours)

Mobile Computing –Dialogue Control –Networks –Middleware and Gateways –Application and Services-Developing Mobile Computer Applications –Security in Mobile Computing –Mobile Computing Architecture: History of Computers and Internet –Architecture for Mobile Computing – Three-tier Architecture –Design Considerations for Mobile Computing –Mobile Computing through Internet –Making Existing Applications Mobile Enabled.

UNIT- II Mobile Computing through Telephony (15 Hours)

Evolution of Telephony – Multiple Access Procedures – Mobile Computing through Telephone – IVR Application – Voice XML – TAPI.

UNIT -III Emerging Technologies (15 Hours)

Blue Tooth – RFID – WiMAX – Mobile IP – IPv6 –Java Card. GSM : Global System for Mobile Communications – GSM Architecture – GSM Entities – Call routing in GSM .

UNIT- IV GPRS (15 Hours)

GPRS – GPRS and Packet Data Network –GPRS Network Architecture –GPRS Network Operations – Data Services in GPRS –Application for GPRS-Limitations –Billing and Charging.

UNIT -V Wireless LAN (12 Hours)

Wireless LAN: Introduction-Wireless LAN Advantages-Wireless LAN Architecture-Mobility in Wireless LAN –Deploying Wireless LAN-Mobile AdhocNetworks and Sensor network- Wireless LAN security.

TEXT BOOK:

1. Mobile Computing, Asoke K Talukder , Roopa R Yavagal, TMH, 2010

REFERENCE BOOK:

1. Mobile Computing, KumkumGarg, Pearson Education, 2010.

WEB REFERENCES:

1. https://www.slideshare.net/rnpatel/ch1-13878057

2. https://slideplayer.com/slide/4646453/

3. https://www.motherteresawomenuniv.ac.in/dde/SLM/MOBILE%20COMPUTING.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART: III	CORE: XXIV ELECTIVE: II	24CAU23A	MULTIMEDIA USING CANVA LEVEL-II	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To understand the basic concepts of Multimedia.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recognize the basic concepts of multimedia	K1
CO2	Demonstrate different multimedia content	K2
CO3	Discover various effect in Images	K3
CO4	Analyze multimedia Audio files	K4
CO5	Determine multimedia requirements for designing using Canva	K5

K1 – Remember;K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	9	9	9	9	9	9	3
CO 2	9	9	9	9	9	9	3
CO 3	9	9	9	9	9	9	3
CO 4	9	9	9	9	9	9	3
CO 5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT- I **Video** **(12 Hours)**

Video: Introduction-Motion Video-Analog Video Camera-Analog Video Signal Representation-Television Systems-Video Color Spaces-Digital Video.

UNIT- II **Animation** **(12 Hours)**

Introduction-Historical Background -Uses of Animation -Traditional Animation -Principles of Animation -Computer-based Animation -Animation on the Web -3D Animation -Rendering Algorithms -Animation File Formats -Animation Software.

UNIT -III **Compression and Virtual Reality** **(12 Hours)**

Compression: Introduction-Basic Concepts-Lossless Compression Techniques-Lossy Compression Techniques.

UNIT- IV **Create video animations using Canva** **(12 Hours)**

Create exciting video animations using Canva-animations and combinations-Edit like a pro with Lottie stickers and animation variations-What is brand management?-What is a brand management process?-Types of brand management-5 core tenets of brand management-Examples of brand management-Brand management vs. brand marketing-Brand management in Canva.

UNIT- V **Create Flyer using Canva** **(12 Hours)**

Why flyers are still just as useful today as they were in the 90s-The elements of an impactful flyer design-Tips to maximize your flyer design-Flyer dimensions.

TEXT BOOK :

1. Ranjan Parekh, Principles of Multimedia, TMH, 2007.
2. https://www.canva.com/create/animated-videos/
3. https://www.canva.com/learn/brand-management/
4. https://www.canva.com/learn/the-ultimate-guide-to-flyer-design/

REFERENCE BOOKS:

1. William M. Neuman, Robert R. Sprout, Principles of interactive Computer Graphics, McGraw Hill International Edition
2. Ashok Banerji, Ananda Mohan Ghosh, Multimedia Technologies, McGraw Hill Publication.

WEB REFERENCES:

1. https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm
2. https://littlevision.files.wordpress.com/2013/12/multimedia-technology.pdf
3. https://www.studocu.com/in/document/bharathiar-university/bsc-computer-science/gm-full-notes-of-cs-in-graphics-and-multimedia-unit-2-bharathiyar-university/28544356

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE:XXIV ELECTIVE: II	24CAU23B	BIG DATA ANALYTICS USING TABLEAU LEVEL-II	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To enable the students to learn the concepts of Big Data Analytics and its tools in Industry 4.0.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the definitions in Big Data and Data Analytics	K1
CO2	Explain Big Data Adoption	K2
CO3	Planning and Apply Data Analytics	K3
CO4	Analyze Big Data Challenges, link analysis and Recommendation systems towards Industry 4.0	K4
CO5	Evaluate Enterprise Technologies & BI	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to Pos	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I **Big Data Storage Concepts** **(12 Hours)**

Clusters-File Systems and Distributed File Systems-NoSQL-Sharding-Replication-Sharding and Replication-CAP Theorem-ACID-BASE.

UNIT- II **Big Data Processing Concepts** **(12 Hours)**

Parallel Data Processing-Distributed Data Processing-Hadoop-Processing –Workloads-Cluster-Processing in Batch Mode-Processing in Realtime Mode.

UNIT- III **Big Data Storage Technology** **(12 Hours)**

On-Disk Storage Devices- Distributed File Systems- RDBMS Databases- NoSQL Databases- NewSQL Databases- In-Memory Storage Devices- In-Memory Data Grids- In-Memory Databases.

UNIT- IV **Big Data Analysis Techniques** **(12 Hours)**

Quantitative Analysis-Qualitative Analysis-Data Mining-Statistical Analysis-Machine Learning-Semantic Analysis-Visual Analysis.

UNIT- VMechanics of Tableau Desktop to Create Visualizations **(12 Hours)**

Filtering- Groups- Hierarchies- Sets- Dates in Tableau- Crosstabs- Bar Charts- Heat Maps- Donut Charts- Dashboards – Connecting Your Worksheets to One Another.

TEXT BOOKS:

1. Thomas Erl,Wajid Khattak,and Paul Buhler “Big Data Fundamentals Concepts, Drivers & Techniques”, The Prentice Hall Service Technology Series from Thomas ERL.
2. Princeton University ,”Tableau An Introduction”

REFERENCE BOOKS:

1. Radha Shankarmani and M.Vijayalakshmi, “Big Data Analytics”, 2nd Edition, Wiley.
2. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, PACKT publishing open source community experience distilled, Mumbai. 2013.

WEB REFERENCES:

1. https://www.techtarget.com/searchdatamanagement/definition/big-data
2. https://www.techtarget.com/searchdatamanagement/definition/NoSQL-Not-Only-SQL
3. https://www.youtube.com/watch?v=nbBJ27XhEyM
4. https://www.youtube.com/watch?v=fL41WSVDunM
5. https://www.youtube.com/watch?v=a3It88zzbiA

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XXIV ELECTIVE: II	24CAU23C	INTRODUCTION TO COMPILER DESIGN	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To understand the principles of compiler design.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the basics of compilers and lexical analysis	K1
CO2	Infer the concepts of syntactic specification of programming languages and parsing techniques	K2
CO3	Apply the syntax and symbol tables in complier design	K3
CO4	Analyze runtime storage and error recovery	K4
CO5	Interpret General introduction on code optimization	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to Pos	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I **Introduction to Compilers** **(12 Hours)**

Compliers and Translator – Need of Translator – The Structure of a Complier – Lexical analysis – Syntax analysis – Intermediate code generation – optimization – code generation. Finite automata and lexical Analysis:The role of the lexical analysis - Regular expressions to finite automata – Minimizing the number of states of a DFA.

UNIT-II **The Syntactic specification of programming languages** **(12 Hours)**

Context free grammars – derivations and parse trees – capabilities of context free grammars. Basic parsing techniques:Parsers –top down parsing – predictive parsers.

UNIT- III **Syntax – directed translation** **(12 Hours)**

Syntax-directed translation schemes – implementation of syntax-directed translators – intermediate code – postfix notation – parse trees and syntax trees – 3 address code – quadruples and triples– Boolean expressions – statements that alter the flow of control. Symbol tables: the contents of a symbol table – data structures for symbol table – representing scope information.

UNIT- IV **Run time storage administration** **(12 Hours)**

Implementation of a simple stack allocation scheme – Implementation of block-structured languages – storage allocation in block structured languages**.** Error deduction and recovery: errors – lexical phase errors – syntactic phase errors – semantic errors.

UNIT- V **Introduction of code optimization** **(12 Hours)**

The principle sources of optimization – loop optimization – the DAG representation of basic blocks – value numbers and algebraic laws. Code generation: Object programs – problems in code generation – a machine model– register allocation and assignment – code generation from DAG's – peepholes optimization.

TEXT BOOK:

1. V.Aho, Jeffrey D.Ullman, Principles of Complier Design by Alfred, Narosa Publishing House.

REFERENCE BOOK:

1. Alfred V. Aho, Ravi Sethi,Jeffry D. Ullman,Compliers, Principles. Techniques, and tools.

WEB REFERENCES:

1. https://www.askbooks.net/2022/02/pdf-compiler-principles-techniques-and.html
2. https://www.guru99.com/compiler-design-tutorial.html
3. http://hjemmesider.diku.dk/~torbenm/Basics/basics_lulu2.pdf
4. https://easyexamnotes.com/p/introduction-to-compiler.html
5. http://160592857366.free.fr/joe/ebooks/ShareData/Modern%20Compiler%20Design%202e.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XXIV ELECTIVE:II	24CAU23D	GREEN COMPUTING	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment, skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Label the problems concerning with e-waste and its consequences on environment	K1
CO2	Describe the components involved and how effectively we can achieve cost saving without harming environment	K2
CO3	Inspect the procedural aspects towards going green.	K3
CO4	Categorize the means of green compliance	K4
CO5	Specify the certifications necessary for hardware devices	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	9	9	3
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**15**
Weighted Percentage of COs Contribution to Pos	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**1.33**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I **Green Computing Essentials** **(12 Hours)**

Overview and Issues: Introduction - green Computing - Problems – Your Company's Carbon Footprint – Cost Savings. **Initiatives and Standards**: Global Initiatives – Comparative study on green initiatives of other countries.

UNIT- II **Green Computing Tribulations and Optimizations** **(12 Hours)**

Minimizing Power Usage: Power problems - Monitoring power Usage – Reducing Power Usage – Low power Computers – Components. **Cooling:** Cooling Costs – Reducing Cooling Costs – Optimizing air Flow – Adding Cooling – Datacenter Design.

UNIT- III **Green Enterprise Transforming** **(12 Hours)**

Changing the Way of Work: Old Behaviour – Steps – Teleworkers and Outsourcing. **Going Paperless:** Paper Problems – Paper and Office – Going Paperless – Intranets – Electronic Data Interchange (EDI).

UNIT- IV **Green Computing** **(12 Hours)**

Recycling: Problems – Means of Disposal – Life Cycle – Recycling Companies – Hard Drive Recycling. **Hardware Considerations**: Certification Programs – Energy Star – Servers – Hardware Considerations – Remote Desktop.

UNIT- V **Green Accomplishment** **(12 Hours)**

Greening Your Information Systems: Initial Improvement Calculations – Change Business Process – Improve Technology Infrastructure. **Staying Green:** Organizational Check-ups – Equipment Check-ups – Certifications – Helpful Organizations.

TEXT BOOK:

1. Tushar Sambare , Sonali Sambare: Green Computing, Himalaya Publishing House, First Edition 2008.

REFERENCE BOOKS:

1. Carl Speshocky, Empowering Green Initiatives with IT, John Wiley & Sons, 2010.
2. Jason Harris, Green Computing and Green IT- Best Practices on regulations & Industry, Lulu.com, 2008.

WEB REFERENCES:

1. https://www.himpub.com/documents/Chapter1765.pdf
2. https://www.wiley.com/en-us/Empowering+Green+Initiatives+with+IT+%3A+A+Strategy+and+Implementation+Guide-p-x000528886
3. https://www.wiley.com/en-be/exportProduct/pdf/9780470550151
4. http://docplayer.net/102991987-Green-home-computing-learn-to-woody-leonhard-katherine-murray-making-everything-easier-use-your-computer-to-green-your-lifestyle.html

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XXV ELECTIVE:III	24CAU24A	GIS FOR LAND RESOURCE MANAGEMENT	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To enable the students to learn the concepts of Big Data Analytics and its tools in Industry 4.0.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Understand GIS	K1
CO2	Explain Remote Sensing Technology	K2
CO3	Planning and Apply Crop Management	K3
CO4	Analyze Land Resource Management	K4
CO5	Evaluate Government Programmes for Land Resource Management	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; k5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	9
CO2	9	9	9	3	3	3	9
CO3	9	9	9	3	3	3	9
CO4	9	9	9	3	3	3	9
CO5	9	9	9	3	3	3	9
Total Contribution of COs to POs	**45**	**45**	**45**	**15**	**15**	**15**	**45**
Weighted Percentage of COs Contribution to Pos	**2.04**	**2.13**	**2.22**	**0.83**	**0.87**	**0.92**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT:

UNIT- I Overview of GIS (12 Hours)

Introduction- Overview of GIS- History of GIS development- Components of GIS- Functions of GIS- Technology used in GIS- Spatial Analysis with GIS- GIS software-The future of GIS-List of GIS software.

UNIT- II Remote Sensing Technology (12 Hours)

Introduction to Remote Sensing Technology- Overview of Remote Sensing Technology- History of Remote Sensing- Data acquisition techniques- Types of Resolution- Converting Remote Sensing Data into Geospatial Data- Visual Image Interpretation- Automated Classification- Mapping Spatial Variables- Creating Elevation Data from Remote Sensing Data- Remote Sensing Software- Applications of Remote Sensing and GIS.

UNIT- III Crop Management (12 Hours)

Crop Production Databases- Crop Growth and Yield Determination- Crop Monitoring-Mapping Soil Resources With Remote Sensing Data- Spectral Reflectance of Soils- Soil Mapping- Land Degradation.

UNIT- IV Land Resource Management (12 Hours)

Department of Land Resources -Rain fed Agriculture: Key to Poverty Reduction-Watershed Management Approach -Background of Watershed Development in India- Assessments of Outcomes of Pre-IWMP Projects -Integrated Watershed Management Programme –Objectives- Salient Features -Targets -Year-wise and State-wise Progress -Institutional Arrangements -Technology Development Extension Training (TDET) -Neeranchal: A Technical Assistance Project with a Difference -New Initiatives of DoLR in Watershed Management -Monitoring and Evaluation Conventional System- Use of MIS for M&E -PFMS for M&E and Financial Management -Use of Mobile Apps for M&E -Third party evaluation -Use of Remote Sensing and GIS Technology -Use of Bhuvan Geo Portal of IWMP –Convergence-Benchmarking-Workshop on Desilting of Water -Harvesting structures -Best Practices in implementation of – IWMP-Way Forward - Rejuvenation and De-silting of Water Harvesting Structures: A Sustainability Project -Regional Agencies for M&E -Setting Standards for Outcome Measurement -Watershed Development through Inter-agency- Coordination-Transparency & accountability -Adoption of State of the Art Technology -Public-Private-Peoples' Partnership in IWMP .

UNIT- V Government Programmes for Land Resource Management (12 Hours)

Epilogue-National Land Records Modernization Programme (NLRMP) -Objectives of NLRMP -Citizen Centric Services -Components/Activities of NLRMP -Guidelines -Project Sanctioning and Monitoring Committee (PSMC) -Core Technical Advisory Group (CTAG)- NLRMP Cell -Project Management Unit (PMU) -Achievements-Training and Capacity Building.

TEXT BOOKS :

1. https://www.manage.gov.in/studymaterial/GIS.pdf
2. Department of Land Resources E-Book on Activities- https://dolr.gov.in/sites/default/files/DoLR%20Activities%20version-2%2017-Mar-2016.pdf

REFERENCE BOOKS:

1. Otto Huisman and Rolf A. de "Principles of Geographic Information Systems -An introductory textbook

2. Suraj Kumar Singh (Editor), Shruti Kanga (Editor), Gowhar Meraj (Editor), Majid Farooq (Editor), Sudhanshu Sudhanshu (Editor) "Geographic Information Science for Land Resource Management"

WEB REFERENCES:

1. https://www.uou.ac.in/sites/default/files/slm/DGIS-503.pdf
2. https://kanchiuniv.ac.in/coursematerials/REMOTE_SENSING_GIS.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE: XXV ELECTIVE:III	24CAU24B	ARTIFICIAL INTELLIGENCE	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE :

To learn about the concepts of Artificial Intelligence (AI) and its applicability in Industry 4.0.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Outline the basic AI problems, techniques and knowledge representation issues	K1
CO2	Explain the AI problem designs and issues, heuristic techniques and knowledge representation methods	K2
CO3	Apply AI techniques in Industry 4.0	K3
CO4	Analyze AI problems using various search techniques	K4
CO5	Assess procedural and declarative knowledge representation methods	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	9
CO2	9	9	9	3	3	3	9
CO3	9	9	9	3	3	3	9
CO4	9	9	9	3	3	3	9
CO5	9	9	9	3	3	3	9
Total Contribution of COs to Pos	**45**	**45**	**45**	**15**	**15**	**15**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**0.83**	**0.87**	**0.92**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT- I **Introduction – Problems and Search** **(12 Hours)**

What is Artificial Intelligence? The AI Problems – The Underlying Assumption – What is an AI Technique? – The Level of the Model – Criteria for Success. Problems, Problems Space and Search – Defining the Problem as a State Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the Design of Search Programs.

UNIT- II **Heuristic Search Techniques** **(12 Hours)**

Heuristic Search Techniques: Generate and Test – Hill Climbing – Best First Search. Problem Reduction – Constraint Satisfaction – Means – Ends Analysis.

UNIT- III **Knowledge Representation** **(12 Hours)**

Knowledge Representation Issues: Representations and Mappings – Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem. Using Predicate Logic: Representing Simple Facts in Logic – Representing Instance and Isa Relationships – Computable Functions and Predicates – Resolution.

UNIT- IV **Representing Knowledge Using Rules** **(12 Hours)**

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge - Logic Programming – Forward versus Backward Reasoning – Matching – Control Knowledge

UNIT- V **Statistical Reasoning** **(12 Hours)**

Statistical Reasoning: Probability and Bayes Theorem – Certainty Factors and Rule Based Systems – Bayesian Networks – Dempster-Shafer Theory – Fuzzy Logic-Robotics

TEXT BOOK:

1. Elain Rich & Kevin Knight, Artificial Intelligence - Tata McGraw Hill – Second Edition, 1991.

REFERENCE BOOKS:

1.Stuart Russel, Peter Norvig, Artificial Intelligence: A Modern Approach,3rd Edition
2.David W. Rolston, Principles of Artificial Intelligence & Expert Systems Development – McGraw Hill.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://www.youtube.com/watch?v=oV74Najm6Nc

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE :XXV ELECTIVE : III	24CAU24C	ETHICAL HACKING	60	4

Contact hours per week:-5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To introduce the concepts of security and different kinds of attacks, system hacking andpenetration testing

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Explain the importance of security and various types of attacks	K1
CO2	Understand the concepts of scanning and system hacking	K2
CO3	Explain about penetration testing and its methodology	K3
CO4	To study the ethical hacking techniques	K4
CO5	Identify the various programming languages used by security professional	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	9
CO2	9	9	9	3	3	3	9
CO3	9	9	9	3	3	3	9
CO4	9	9	9	3	3	3	9
CO5	9	9	9	3	3	3	9
Total Contribution of COs to POs	**45**	**45**	**45**	**15**	**15**	**15**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**0.83**	**0.87**	**0.92**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT:

UNIT- I **Introduction to Hacking** **(12 Hours)**

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – InformationGatheringMethodology–FootprintingTools–WHOISTools–DNS Information Tools– Locating the Network Range–Meta Search Engines.

UNIT- II **Scanning and Enumeration** **(12 Hours)**

Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration–Enumeration Techniques –Enumeration Procedure–Tools.

UNIT- III **System Hacking** **(12 Hours)**

Introduction–Cracking Passwords– Password Cracking Websites– Password Guessing– Password Cracking Tools– Password Cracking Counter measures– Escalating Privileges– Executing Applications– Key loggers and Spyware.

UNIT- IV **Programming for Security Professionals** **(12 Hours)**

Programming Fundamentals– C language–HTML– Perl– Windows OS Vulnerabilities–Toolsfor Identifying Vulnerabilities– Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities– Countermeasures.

UNIT- V **Penetration Testing** **(12 Hours)**

Introduction–Security Assessments–Types of Penetration Testing-Phases of Penetration Testing– Tools–Choosing Different Types of Pen-Test Tools–Penetration Testing Tools.

TEXT BOOKS:

1. EC-Council, ‑Ethical Hacking and Countermeasures: Attack Phases‖, Cengage Learning, 2010.
2. Jon Erickson,―Hacking,2nd Edition: The Art of Exploitation‖, No Starch Press Inc., 2008.
3. Michael T. Simpson, Kent Back man, James E. Corley,―Hands-On Ethical Hacking And Network Defense‖,Cengage Learning,2013.

REFERENCE BOOK(S):

1. PatrickEngebretson,‑TheBasicsof HackingandPenetration Testing –Ethical Hacking and PenetrationTesting MadeEasy‖,SecondEdition,Elsevier,2013.
2. RafayBoloch, ‑Ethical Hackingand Penetration TestingGuide‖, CRC Press,2014

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE :XXV ELECTIVE : III	24CAU24D	ANDROID APP DEVELOPMENT	60	4

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To learn application development in Android

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Explain the basic concepts of Android Application Development	K1
CO2	Understand the concepts of Application Design	K2
CO3	Explain about Application Creation and Deploy	K3
CO4	Analyze the common API	K4
CO5	Identify the various structure for application	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	9
CO2	9	9	9	3	3	3	9
CO3	9	9	9	3	3	3	9
CO4	9	9	9	3	3	3	9
CO5	9	9	9	3	3	3	9
Total Contribution of COs to Pos	**45**	**45**	**45**	**15**	**15**	**15**	**45**
Weighted Percentage of COs Contribution to Pos	**2.04**	**2.13**	**2.22**	**0.83**	**0.87**	**0.92**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT- I Introduction to Android (12 Hours)

Why Develop for Android?-Android Development Basics-Hardware Tools-Software Tools-Developing the Android Developer Inside You-Assembling Your Toolkit-Tuning Up Your Hardware-Installing and Configuring Your Support Tools-Installing Android Studio-Installing Java 7-Adding SDK Packages-Navigating the Android SDK-Specifying Android Platforms-Using SDK Tools for Everyday Development

UNIT- II Android Application Design Essentials (12 Hours)

Starting a New Project in Android Studio-Responding to errors- Setting Up an Emulator-Running the Hello Android App-Understanding Project Structure-Creating the Silent Mode Toggle Application-Laying Out the Application-Adding an Image to Your Application- Creating a Launcher Icon for the Application-Previewing the Application in the Visual Designer

UNIT- III Android User Interface Design Essentials (12 Hours)

Understanding Activities and the Activity Life cycle -Creating Your First Activity-Working with the Android Frame work Classes- Installing Your Application-Material Design-Uh Oh!(Responding to Errors)-Thinking Beyond the Application Boundaries-Understanding Resources -Working with Resources-Different Strokes for Different Folks :Using Resource Qualifier Directories

UNIT- IV Testing Android applications (12 Hours)

Working with App Widgets in Android -Working with Intents and Pending Intents- Creating the App Widget-Placing Your Widget on the Home Screen-Creating a Distributable File-Creating a Google Play Developer Profile -Pricing Your Application-Getting Screen Shots for Your Application -Uploading Your Application to the Google Play Store -Watching the Number of Installs Soar

UNIT- V Using Common Android APIs (12 Hours)

Reviewing the Basic Requirements-Creating the Application's Screens-Creating the TaskEditActivity-Creating the TaskEditActivity-Linking the List View to the Edit View-Creating the TaskEditFragment-You Put the Fragment in the Activity and Shake It All Up-Updating the Styles-A Special Bonus-Understanding Options and Context Menus-Creating Your First Menu-Creating a Long Press Action-Creating the User Input Interface-Getting Choosy with Dates and Times-Creating an Alert Dialog-Validating Input

TEXT BOOK:

1. Michael Burton, "Android Application Development for Dummies", 3rd Edition

REFERENCE BOOKS:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

WEB REFERENCES:

1. https://www.geeksforgeeks.org/android-tutorial/
2. https://www.javatpoint.com/android-tutorial
3. https://www.tutorialspoint.com/android/index.htm
4. https://www.tutlane.com/tutorial/android

5. https://www.youtube.com/watch?v=FjrKMcnKahY

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-IV	SKILL ENHANCEMENT: III	24SECAU03	GOOGLE COLAB - PRACTICAL	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	50	-	50

PREAMBLE:

To enable the students to learn the working environment of Google Colab

COURSE CONTENT:

On the successful completion of the course, students will be able to

COs	CO Statement	KnowledgeLevel
CO1	Learn the Google colab	K1,K2,K3,K4,K5
CO2	Understand colab environment	
CO3	Apply various colab functions	
CO4	Explore colab functions	
CO5	Evaluate various colab features	

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.04**	**2.13**	**2.22**	**2.48**	**2.61**	**2.75**	**3.98**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

PRACTICAL LIST

1. DataScience: The code cell uses **numpy** to generate some random data and uses **matplotlib** to visualize it
2. ML: import an image dataset, train an image classifier on it and evaluate the model
3. Program using Text cells
4. Exception formatting
5. Generate rich chart
6. Integrate with drive
7. Commenting on a cell
8. Factorial of a number
9. A program using forms
10. Interactive Using Jupyter Widgets sliders