DEPARTMENT OF COMPUTER SCIENCE

PREAMBLE

UG   **:** Course Profile and Syllabi of courses offered in III & IV semesters along with evaluation components III & IV (With effect from 2018-2021 batch onwards) and

PG   **:** Course Profile and Syllabi of courses offered in III & IV semesters along with evaluation components III & IV (With effect from 2018-2020 batch onwards) are presented in this booklet.

PROGRAMME PROFILE B.Sc. (Computer Science)

PSO1: Ability to understand, analyze, design, develop and optimize solutions related to computer programming languages.

PSO2: Application of concepts in core areas related to computer programming for efficient design of computer-based systems of varying complexity.

PSO3: Ability to test the technical issues in Software Engineering and deliver a quality product for business success.

PSO4: Ability to innovate and develop new technologies.

Semester	Part	Category	Course Code	Course Title	Contact Hrs/Week	Credit Min	Credit Max
I	I	Language	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil-I/ Advanced Tamil-I/ Hindi-I/ French-I	4	2	3
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	5	3	4
	III	Core I	UCSM106/ UCAM107	Programming in C	6	5	5
	III	Core II	UCSM107/ UCAM108	Fundamental of Computer Science	5	4	4
	III	Core II	UCSM108/ UCAM109	Advanced Computer Science			
	III	Core III	UCSR109/ UCAR105	Programming in C - Practical	3	2	2
	III	Allied I	UMAA113	Statistical Methods	5	4	4
	IV	Value Education			2	1	1
Total					**30**	**21**	**23**
II	I	Language	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil-II/ Advanced Tamil-II/ Hindi-II/ French-II	4	2	3

	II	English	UENL207/ UENL208	General English-II/ Advanced English-II	5	3	4
	III	Core IV	UCSM206/ UCAM205	Data Structures	6	6	6
	III	Core V	UCSR206/ UCAR204	Data Structures - Practical	4	3	3
	III	Allied II	UMAA210	Mathematics for Computer Science	5	4	4
	IV	Non Major Elective			4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme / Physical Education/NCC			-	1	2
Total					**30**	**22**	**25**
III	I	Language	UTAL305/ UTAL306	Basic Tamil-III / Advanced Tamil–III	4	2	3
			UHIL301/ UFRL301	Hindi-III / French-III			
	II	English	UENL307/ UENL308	General English-III/ Advanced English-III	5	3	4
	III	Core VI	UCSM305/ UCAM310	Java Programming	5	5	5
	III	Core VII	UCSM306	Microprocessor and its Applications	4	4	4
	III	Core VIII	UCSR308/ UCAR304	Java Programming – Practical	4	3	3
	III	Allied III	UPHA304	Digital Electronics	3	3	3
	III	Allied IV	UPHR304	Digital Electronics – Practical	3	2	2
	IV	Value Education			2	1	1
Total					**30**	**23**	**25**
IV	I	Language	UTAL405/ UTAL406/	Basic Tamil-IV / Advanced Tamil–IV	4	2	3
			UHIL401/ UFRL401	Hindi-IV / French-IV			
	II	English	UENL407/ UENL408	General English-IV / Advanced English-IV	5	3	4
	III	Core IX	UCSM408	Graphics & Multimedia	6	6	6
	III	Core X	UCSM409/ UCSM609	Operating System	5	5	5
	III	Core XI	UCSR411	Operating System & Graphics Lab	5	3	3
	IV	Online courses		NPTEL/SPOKEN TUTORIAL/SWAYAM	3	1	2
		Soft skill			2	1	1
	V	Extension Programme / Physical Education			-	-	2
Total					**30**	**21**	**26**

	III	Core XII	UCSM506	Middleware Technologies	5	5	5
	III	Core XIII	UCSM509	Database Management System	5	4	4
	III	Core XIV	UCSM510	Computer Networks	5	5	5
V	III	Core XV	UCSM511	Software Engineering	5	4	4
	III	Core XVI	UCSR509	Middleware Technologies – Practical	4	3	3
	III	Core XVII	UCSR511	Database Management System-Practical	4	3	3
	IV	Value Education			2	1	1
Total					**30**	**25**	**25**
	III	Core XVIII	UCSM612	Cloud Computing	5	5	5
	III	Core XIX	UCSM613	Open Source Technology	5	5	5
	III	Core XX	UCSM610	Big Data Tools	4	4	4
	III	Core XXI	UCSR607	Open Source Technology-Practical	4	3	3
	III	Core XXII	UCSP601	Project	5	5	5
VI	III	Major-Elective	UCSO606/ UCSO607/ (UCSO608/U CSM507)	Network Security / Mobile Computing / System Analysis and Design	5	4	4
	III	Viva – Voce	UCSM611	Comprehensive Viva Voce	-	1	1
	IV	Soft skill			2	1	1
	V	Extension Programme / Physical Education/N CC			-	-	2
Total					**30**	**28**	**30**
Grand Total					**180**	**140**	**154**

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

Class & Major	Semester	Category	Course Code	New Course Title	Contact Hrs/ Week	Credit
B.Com with Computer Applications	I	Allied	UCSA104	C Programming	3	3
	I	Allied Practical	UCSR110	C Programming Lab	3	2
	II	Allied	UCSA204	Object Oriented Programming	3	3
	II	Allied Practical	UCSR207	Object Oriented Programming – Lab	3	2
	III	Allied	UCSA305	Fundamentals of Blockchain Technology	3	3
	III	Allied Practical	UCSR309	Blockchain Technology Using Solidity – Lab	3	2
	IV	Allied	UCSA406	Digital Marketing Analytics	3	3
	IV	Allied Practical	UCSR412	Web Design - Lab	3	2
	V	Allied	UCSA509	Business Analytics and Intelligence.	3	3

	V	Allied Practical	UCSR512	Business Analytics and Intelligence using SAS - Lab	3	2
BBA, B.Com and Economics	IV	Allied	UCSA407	Cyber Security in Finance	3	3
	IV	Allied Practical	UCSR413	Cyber Security Lab	3	2
Tamil	V	Allied	UCSA505	Tamil Kanini	3T + 2P	5
Maths	III	Allied	UCSA304	Mathematical Programming using C	3	3
	III	Allied Practical	UCSR307	Mathematical Programming using C – Lab	3	2
	V	Allied	UCSA507	Object Oriented Programming using Java	3	3
	V	Allied Practical	UCSR508	Object Oriented Programming using Java - Lab	3	2
Physics	III	Allied	UCSA306	Computational Physics with Python	3	3
	III	Allied Practical	UCSR310	Computational Physics with Python – Lab	3	3

NON-MAJOR ELECTIVE

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit
II	IV	Non Major Elective	UCSE206	Tableau Programming	2T+2P	2
			UCSE207	Python Programming	4P	2
			UCSE208	R Programming	4P	2
			UCSE209	Arduino Programming	4P	2

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit Min	Credit Max
II	III	Core	UCSI201	Summer Internship / Working Model	-	-	1
IV	III	Core	UCSI401	Summer Internship	-	-	1
V	III	Self Study Paper	UCSS501	Python Programming	2	-	2
V	III	Self Study Paper	UCSS502/ UCAS502	Android Applications	2	-	2
VI	III	Self Study Paper	UCSS601/ UCAS601	Angular JS	2	-	2
VI	III	Self Study Paper	UCSS602/ UCAS602	Green Computing	2	-	2

UCSM305/ UCAM310 JAVA PROGRAMMING

Semester   : III   **Credit   : 5**
Category   : Core VI   **Hours/Week : 5**
Class & Major : II B.Sc. CS   **Total Hours : 65**

Objectives
To enable the students
- Understand the OOP Concepts, Exception and String Handling in Java
- Construct programs using Applets and JDBC concepts
- Execute Java and Applet Programs in various applications

UNIT -I INTRODUCTION   **10 Hrs**

Fundamentals of Object Oriented Programming: Java Evolution – Overview of Java Language – Data Types, variables, arrays – Operators – Control statements.

UNIT –II CLASSES AND METHODS   **15 Hrs**

Introduction to classes – class fundamentals – Declaring objects – Constructors – Methods and Classes – Overloading methods – static - final - Nested and Inner classes – Inheritance – Method Overriding – Abstract Classes – Packages – Interfaces.

UNIT – III EXCEPTION HANDLING AND FILES   **15 Hrs**

Exception handling – Types of Exception – try and catch – nested try – throw and throws – Multithreading Programming –I/O Streams – Reading and Writing files – Reading and writing Console I/O.

UNIT – IV STRING HANDLING AND APPLETS   **15 Hrs**

String Handling- String Operations: Comparison – Modifying String – String Buffer - Applet Class – Applet Architecture – The HTML Applet Tag – Passing parameters in Applets – Applet Context – Improving the Banner Applet – get() Method - JDBC Concepts.

UNIT – V AWT   **10 Hrs**

AWT classes – Window fundamentals – Working with Frame windows, Graphics – Controls – Layout Managers - Java Swing.

Text Books
- Herbert Schildt, *Java - The Complete Reference*, Tata McGraw Hill, 10th Edition, Nov 2017.

Reference Books
- E. Balagurusamy , *Programmingwith Java A Primer*, Tata McGraw Hill, Fourth Edition, 2010.

- Cay S. Horst Mann & Gary Cornell, *Core java*, Volume II (9th ed.), Sun Microsystems Press Java Series, 2012.

e-Resources
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk

UCSM306 MICROPROCESSOR AND ITS APPLICATIONS

Semester	: III	**Credit**	: 4
Category	: Core VII	**Hours/Week**	: 4
Class & Major	: II B.Sc CS	**Total Hours**	: 52

Objectives
To Enable the Students
- Understand the Architecture and Instruction set
- Develop simple programming Skills
- Gain hands-on experience in Interfacing Peripherals

UNIT - I INTRODUCTION TO 8085 MICROPROCESSOR   **12 Hrs**

Evolution of the Microprocessor – Intel 8085: Introduction – Register Architecture – 8085 Pins and Signals – Memory Addressing – 8085 Addressing Modes – 8085 Instruction Set – The 8085 Programming Model.

UNIT - II 8085 MICROPROCESSOR   **10 Hrs**

8085 Instruction Timing and Execution – Serial Port – Interfacing Input/Output Devices – 8085 Interrupts – Interrupt Controller – Direct Memory Access Transfer – Direct Memory Access Controller.

UNIT - III 8086 MICROPROCESSOR   **10 Hrs**

Introduction – 8086 Architecture – 8086 Addressing Modes – Accessing Immediate and Register Data – Accessing Data in Memory.

UNIT – IV 8086 INSTRUCTION SET   **10 Hrs**

8086 Instruction Set – Data Movement Instructions – Arithmetic and Logic Instructions – Program Control Instructions.

UNIT - V PERIPHERAL INTERFACING   **10 Hrs**

Keyboard Display Interface controller (8279) – Hex Key and Display Interface to 8085, 8279 Keyboard Display Controller Chip – Printer Interface – LR 7040 Printer Interface Using 8295 Printer Controller.

Text Books

- Mohamed Rafiquzzaman, *Introduction to Microprocessors and Microcomputer – Based System Design,* CRC Press, New York, 2010.
- S. Ramesh Gaonkar, *Microprocessor Architecture, Programming and Applications with the 8085*, Penram International Publishing, New Delhi, 2011.

References Books

- B. Barry Brey, *the INTEL Microprocessors 8086/8088, 80186, 80286, 80386 and 80486 Architecture -Programming and Interfacing*, Prentice Hall, New Delhi, 2011.
- Gilmore, *Microprocessors principles and applications*, Tata McGraw Hill, New Delhi, 2010.

e- Resource

- http://www.nptel.ac.in/courses/106108100

UCAR304/UCSR308 JAVA PROGRAMMING – PRACTICAL

Semester : III
Category : Core XIII
Class & Major : II B.Sc CS

Credit : 3
Hours/Week : 4
Total Hours : 52

Objectives
To enable the students

- Create programs using Inheritance, Exception and String Handling
- Build programs using Threads, Packages and Interfaces
- Design simple applet programs using Swing and JDBC

Lab Exercises

1. Classes and Objects
2. Constructors
3. Method Overloading
4. Implementing Single and Multiple Inheritance concepts.
5. Method Overriding
6. Implementing Package Concepts.
7. Implementing Interfaces Concepts.
8. Implementing Exception Handling.
9. Implementing Thread Synchronization
10. Implementing String manipulation using string and string buffer classes
11. Implementing Graphics using Applet.
12. Implementing Swing Concepts.
13. JDBC Connectivity

UCSM408GRAPHICS & MULTIMEDIA

Semester : IV   **Credit** : 6

Category : Core IX   **Hours/Week** : 6

Class & Major : II B.Sc CS   **Total Hours** : 78

Objectives

To enable the students

- To inculcate knowledge on Graphics & Multimedia concepts
- To deals with Graphics Concepts and Multimedia methodologies
- Mathematical Knowledge on Graphics and Technical background of Multimedia

UNIT-I GRAPHICS   **15 Hrs**

Output Primitives: Points and Lines – Line-Drawing algorithms – Loading frame Buffer – Line function – Circle-Generating algorithms – Ellipse-generating algorithms. Attributes of Output Primitives: Line Attributes – Curve attributes – Color and Grayscale Levels – Area-fill attributes – Character Attributes.

UNIT-II2D GEOMETRIC TRANSFORMATIONS   **15 Hrs**

2D Geometric Transformations: Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations. 2D Viewing: The Viewing Pipeline – Viewing Co-ordinate Reference Frame – Window-to-Viewport Co-ordinate Transformation- 2D Viewing Functions – Clipping Operations.

UNIT-III MULTIMEDIA   **16 Hrs**

Text: Types of Text – Unicode Standard – Font – Insertion of Text – Text compression – File formats. Image: Image Types – Seeing Color – Color Models –Basic Steps for Image Processing – Scanner – Digital Camera – Interface Standards –Specification of Digital Images – CMS – Device Independent Color Models – ImageProcessing software – File Formats – Image Output on Monitor and Printer.

UNIT-IV AUDIO   **16 Hrs**

Audio: Introduction – Acoustics – Nature of Sound Waves – FundamentalCharacteristics of Sound – Microphone – Amplifier – Loudspeaker – Audio Mixer – DigitalAudio – Synthesizers – MIDI – Basics of Staff Notation – Sound Card – AudioTransmission– Audio File formats and CODECs – Audio Recording Systems – Audio and Multimedia–Voice Recognition and Response - Audio ProcessingSoftware.

UNIT-V VIDEO   **16 Hrs**

Video: Analog Video Camera – Transmission of Video Signals – Video SignalFormats – Television Broadcasting Standards – PC Video – Video File Formats andCODECs – Video Editing – Video Editing Software. Animation: Types of Animation –Computer Assisted Animation – Creating Movement – Principles of Animation – SomeTechniques of Animation – Animation on the Web – Special Effects – RenderingAlgorithms. Compression: MPEG-1 Audio – MPEG-1 Video - MPEG-2Audio – MPEG-2Video.

Text Books
- Donald Hearn, M.Pauline Baker, *Computer Graphics,2nd Edition, PHI.*
- Ranjan Parekh,*Principles Of Multimedia, 2007, TMH.*

Reference Books
- Amarendra N Sinha, Arun D Udai,*Computer Graphics*, TMH.
- Making it Work – Tay Vaughan, *Multimedia,*7th edition, TMH.

UCSM409/UCSM609 OPERATING SYSTEM

Semester	: IV	**Credit**	:5
Category	: Core X	**Hours/week**	:5
Class & Major	: III B.Sc. CS	**Total Hours**	:65

Objectives
To enable the students
- Acquire knowledge on basics of operating systems
- Analyze the various scheduling algorithms in process and memory management
- Exposure to LINUX Operating System

UNIT – I OVERVIEW OF OPERATING SYSTEM   13 Hrs

Operating system – Types of Computer Systems Computer-system operation – I/O structure – System components – System calls – System programs – Process concept – Process scheduling – Operations on processes –Interprocess communication – Multithreading models – Threading issues.

UNIT – II PROCESS MANAGEMENT   13 Hrs

Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation – Process Scheduling Models - Synchronization hardware – Semaphores – Classic problems of synchronization – Deadlock characterization – Methods for handling deadlocks – Recovery from deadlock

UNIT – III MEMORY MANAGEMENT   13 Hrs

Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

UNIT – IV FILE CONCEPT   13 Hrs

Access methods – Directory structure – File-System Mounting – Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management.

UNIT – V LINUX SYSTEM   13 Hrs

History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Security

Text Books
- Silberschatz, Galvin and Gagne, *Operating System Concepts*, Sixth Edition, John Wiley & Sons Inc, New Delhi, 2012.
- Richard Fox, *Linux with Operating System Concepts*, Second Edition, Pearson Education, 2014.

Reference Books
- Andrew S. Tanenbaum , *Operating system Design and Implementation,* Fourth Edition, PHI, New Delhi, 2010.
- H M Deital, P J Deital and D R Choffnes, *Operating Systems*, Pearson Education, New Delhi, 2013.

e-Resources
- http://www.w3schools.com
- http://www.youtube.com

UCSR411OPERATING SYSTEM & GRAPHICS LAB

Semester	**: IV**	**Credit**	**: 3**
Category	**: Core XI**	**Hours/Week**	**: 5**
Class & Major	**: III B.Sc. CS**	**Total Hours**	**: 65**

Operating System
1. Simulation of FCFS process scheduling
2. Simulation of SJF process scheduling
3. Demonstration of process synchronization using signals
4. Deadlock avoidance using banker's algorithm
5. Implement Page replacement algorithm

Graphics
1. Write a program to rotate an image
2. Write a program to drop each word of a sentence one by one from the top
3. Write a program to drop a line using DDA Algorithm
4. Write a program to move a car with sound effect
5. Write a program to bounce a ball a move it with sound effect
6. Write a program to test whether a given pixel is inside or outside or on a polygon

Multimedia
1. Create Sun Flower using Photoshop
2. Animate Plane flying in the Clouds using Photoshop
3. Create Plastic Surgery for the Nose using Photoshop
4. Create See-through text using Photoshop
5. Create a Web Page using Photoshop
6. Convert Black and White Photo to Color Photo using Photoshop

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

UCSA305 FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

Semester   : III   **Credit   : 3**
Category   : Allied   **Hours/Week : 3**
Class &Major : II B.Com(CA)   **Total Hours   : 39**

Objectives
To enable the students
- Understand the concepts of Blockchain
- Prepare and take on new roles evolving in the market across various verticals
- Acquire knowledge on Bitcoin, Multichain, Hyperledger Fabric

UNIT – I Introduction to Blockchain – I (Basics)   **8 Hrs**
Blockchain – History of Blockchain 2.0 - Architecture : Block in a Block chain Transactions – How to create and connect to a Blockchain - Concepts and benefits of blockchain - Components in Blockchain design.

UNIT – II Blockchain – II (Basics)   **8 Hrs**
Conceptualization - Cryptographic Hash Function - Properties of a Hash Function - Wallets - Digital Signature - Public Key Cryptography - Blockchain-as-a-Service (BaaS) – Decentralized Autonomous Organization (DAO) - DAO Structure – Smart Contract.

UNIT – III Bitcoin Basics   **7 Hrs**
Creation of Coins - Bitcoin scripting - Bitcoin P2P Network - Transaction in Bitcoin Network - Block Mining -   Block propagation and block relay.

UNIT – IV Multichain   **8 Hrs**
Multichain - Compatibility & Differences with Bitcoin Core - Working with Multichain Streams - Multichain Explorer - Checking PoE in using Multichain.

UNIT – V Hyperledger Fabric   **8 Hrs**
Hyperledger Fabric - Comparison between Fabric & Other Technologies - Fabric Architecture - Components - Advantages - Goals of Hyperledger - Hyperledger Fabric Network Setup.

Case Study: Blockchain Applications
Blockchain in Healthcare ,Blockchain in Energy Markets,Blockchain in Media

Text Books
- AndreasAntonopoulos,*"Mastering Bitcoin: Unlocking Digital Cryptocurrencies",*Published December 27th 2014 by O'Reilly Media (first published July 1st 2014)
- Melanie Swan, *"Blockchain"*, O'Reilly media, February- 2015

Reference Books
- Andreas M. Antonopoulos, "*Mastering Bitcoin: Programming the Open Blockchain*", 2nd Edition, June, 2017.
- Alan T.Norman , "*Blockchain Technology Explained: The Ultimate Beginner's Guide*", Dec 12, 2017

E-Recourses
- https://www.amazon.com/Hands-Blockchain-Hyperledger-decentralized-applications/dp/1788994523
- https://github.com/HyperledgerHandsOn/trade-finance-logistics
- The Basics of Blockchain
- Hyperledger Fabric - https://www.hyperledger.org/projects/fabric

UCSR309 BLOCKCHAIN TECHNOLOGY USING SOLIDITY LAB

Semester	**: III**	**Credit**	**: 2**
Category	**: Allied**	**Hours/Week**	**: 3**
Class &Major	**: II B.Com(CA)**	**Total Hours**	**: 39**

Objectives
To enable the students

- Understand primary principles of Blockchain technology
- Apply the Blockchain concepts in real time
- Working with Ethereum Blockchain

Lab Exercises
1. Smart Contracts in Ethereum
2. Importing other Source Files
3. Value or Data Types
4. Strings & Operators
5. Arrays
6. Data Structures
7. Mappings
8. Control Structures
9. Functions
10. Inheritance

UCSA406 DIGITAL MARKETING ANALYTICS

Semester	**: IV**	**Credit**	**: 3**
Category	**: Allied**	**Hours/Week**	**: 3**
Class &Major	**: II B.Com(CA)**	**Total Hours**	**: 39**

Objectives
To enable the students

- Provide students with the knowledge about business advantages of the digital marketing and its importance for marketing success; and developing a digital marketing plan
- Integrate different digital media and create marketing content
- Optimizing a Website and SEO optimization; and to create Google AdWords campaigns; social media planning
- Acquire knowledge of Google Analytics for measuring effects of digital marketing and getting insight of future trends that will affect the future development of the digital marketing

UNIT – I Introduction to Digital Media   7 Hrs

Digital Marketing - Digital marketing vs traditional marketing - Digital Media Types - Paid Media -Owned Media - Determining Your Owned and Earned Social Metrics - Demystifying Web Data - Searching for the Right Metrics - The main steps of building your website - Choosing your domain name - Hosting – your website's home on the internet - How to choose a web designer/developer

UNIT – II Search Analytics   8 Hrs

SEO Optimization -Writing the SEO content - Google AdWords- creating accounts - Google AdWords- types. Introduction to CRM - CRM platform - CRM models. Web design: - Optimization of Web sites - MS Expression Web

UNIT – III Web Analytics   8 Hrs

Introduction to Web analytics - Web analytics – levels. Introduction of Social Media Marketing - Creating a Facebook page - Visual identity of a Facebook page - Facebook Ads - Creating Facebook Ads - Types of publications

UNIT – IV Web Analytics   8 Hrs

Business tools on LinkedIn - Creating campaigns on LinkedIn - Analyzing visitation on LinkedIn. Creating business accounts on YouTube - YouTube Advertising - YouTube Analytics. E-mail marketing: E-mail marketing plan - E-mail marketing campaign analysis - Keeping up with conversions. Digital Marketing Budgeting- resource planning- cost estimating- cost budgeting- cost control

UNIT – VDigital Marketing in IoT   8 Hrs

Levers of digital marketing- The digital advertising, a continuous disruption- The Personalization of Media- Data in Advertising- Predictive Models- Programmatic Advertising- IoT- IoT needs to work: Artificial Intelligence- Security in IoT- IoT shaping digital Marketing

Reference Books
- Ryan, D.,*Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation*, Kogan Page Limited 2014.
- The Beginner's Guide to Digital Marketing-Digital Marketer.2015
- Pulizzi,J.,*Epic Content Marketing*, Mcgraw Hill Education,2014

e-Resources
- https://www.pdfdrive.com/digital-marketing-how-internet-of-things-is-impacting-digital-market-e58837676.html

- https://www.webmarketingacademy.in/beginners-guide-to-digital-marketing-with-resources/

UCSR412 WEB DESIGN LAB

Semester	**: IV**	**Credit**	**: 2**
Category	**: Allied**	**Hours/Week**	**: 3**
Class &Major	**: II B.Com(CA)**	**Total Hours**	**: 39**

Objectives
To enable the students
- Develop skills in analyzing the usability of a web site
- Learn the language of the web: Ms Expression, HTML and CSS
- Develop skills in digital imaging and embed social media content into web pages

Lab Exercises

Ms Expression
1. Create a website for the web developer.
2. Create a Web design for Summer Beach
   a. Create Custom Interactive Buttons
   b. Using Behaviors to Change Content
   c. Centering the Webpage
3. Create a Web design for Car Show room
   a. Creating Borders and a Background
   b. Creating Page Layouts with Layers
   c. Styling Your Web Site Using CSS
   d. Adding Navigation Controls to Your Site
4. Creating an Advertisement for your online courses in the website
5. Create a website for online shopping – samples flipkart, amazon etc.,
6. Create a College Website
7. Creating an advertisement in social media in the website

e-Resources
- http://docplayer.net/28135492-Expression-web-4-advanced-lab-exercises.html

UCSA407 CYBER SECURITY IN FINANCE

Semester	**: IV**	**Credit**	**: 3**
Category	**: Allied**	**Hours/Week**	**: 3**
Class &Major	**: BBA/B.Com and Economics**	**Total Hours**	**: 39**

Objectives
To enable the students
- To plan and prepare for all stages of an investigation – Detection, initial response and management interaction

- To investigate web server attacks and router attacks and also can learn the importance of evidence handling and storage
- To understand the system level security

UNIT-IIntroduction to Cyber Security **7 Hrs**

Introduction to Cyber Security - Implementing Hardware Based Security - Software BasedFirewalls - Security Standards - Operating System Attacks - Application Attacks.

UNIT-IICyber Security Vulnerabilities **8 Hrs**

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness.

UNIT – III Cyber Security Safeguards **8 Hrs**

Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT-IV Cyber Security in Finance **8 Hrs**

Characterization of cyber-incidents – Types of cyber attacks in financial services – Need for convergence in incident reporting schemes – Optimizing information sharing – Different models of information sharing – Sharing of relevant information with different types of stakeholders – Complementary policies to strengthen responses in case of cyber attacks

UNIT- VIntrusion Detection and Prevention **8 Hrs**

Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems,

Text Books
- James Graham, Richard Howard, Ryan Olson, *Cyber Security Essentials*, CRC Press, Auerbach Publications, 2011.
- William Stallings *Cryptography and Network Security*, Sixth edition Prentice Hall 2013.

e- Resources
- http://ptgmedia.pearsoncmg.com/images/9780789748904/samplepages/0789748908.pdf
- https://www.ceps.eu/system/files/TFRCybersecurityFinance.pdf

UCSR413 CYBER SECURITY LAB

Semester : IV		**Credit** : 2
Category : Allied		**Hours/Week** : 3
Class &Major : BBA/B.Com/Economics		**Total Hours** : 39

Objectives

The student should be made to

- Understand the security and privacy features and operation of browsers.
- Know the security vulnerabilities of browsers.
- Explore, how browsers hacks are used for better security.

Lab Exercises

1. Study of different wireless network components and features of any one of the Mobile Security Apps.
2. Study of the features of firewall in providing network security and to set Firewall Security in windows.
3. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)
4. Study of different types of vulnerabilities for hacking a websites / Web Applications.
5. Analysis of Security Vulnerabilities of E-commerce services.
6. Analysis of security vulnerabilities of E-Mail Application

UCSA304   MATHEMATICAL PROGRAMMING USING C

Semester : III		**Credit** : 3
Category : Allied		**Hours/Week** : 3
Class & Major : II B.Sc. Maths		**Total Hours** : 39

Objectives
To enable the students

- Understand the concept of Structured Programming Language.
- Apply Control Statements in the C Program.
- Write C Programs using functions, pointers, structure and union for the real time problem.

UNIT - I   INTRODUCTION **7 Hrs**

     Basic Structure of C programs - Executing C program -C fundamentals: character set – Identifiers and keywords – data types – constants – variables – declaration – expression – statements.

UNIT - II   OPERATORS AND EXPRESSION **8 Hrs**

     Operators and Expression: arithmetic operators – unary operators – relational and logical operators – assignment operators – conditional operators. Data input and Output statements: getchar and putchar functions – scanf and printf function – more about scanf and printf functions.

UNIT - III CONTROL STATEMENTS & ARRAY   **8 Hrs**

Control statements: if-else, while, do-while, for-nested control structure – switch – break – continue- comma operator – goto statement. Arrays: definition of array – processing array- passing array to function – multidimensional arrays – arrays and strings.

UNIT - IV FUNCTIONS & POINTERS   **8 Hrs**

Functions: definition – accessing and function – function prototype –passing argument to a function – recursion. Pointers: Fundamentals – pointer declaration – passing pointer to a function – array of pointers.

UNIT - V STRUCTURE AND UNIONS   **8 Hrs**

Structure and Unions: Definition of structure – processing structure – user defined data types- Structure and pointers - passing structure to function – self referential structure- Unions - Bit wise operations. Data files: opening and Closing a data file – creating data file – processing a data file – unformatted data file.

Text Books
- Balagurusamy E., *Programming in ANSI C*, 6ᵗʰ Edition, TMH Publishers, New Delhi, 2004.
- Ashok N. Kamthane, *Programing in ANSI C and Turbo C, 3*ʳᵈ Edition, Pearson Education, New Delhi, 2006.

Reference books
- Byron S. Gottfried, *Theory and Problems of Programming with C*, 2ⁿᵈ Edition, Tata Mcgraw-Hill Ltd, New Delhi, 2008
- Pradip Dey and Ghosh Manas, *Programming in C,* Oxford University Press USA, 2009.

e-Resources
- http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/lecture-notes/
- http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures/2
- http://www.powershow.com/view/d7c5Y2Y2N/OBJECT_ORIENTED_PROGRAMMING_powerpoint_ppt_presentation

UCSR307 MATHEMATICAL PROGRAMMING USING C - LAB

Semester	**: III**	**Credit**	**: 2**
Category	**: Allied Practical**	**Hours/Week**	**: 3**
Class & Major	**: II B.Sc Maths**	**Total Hours**	**: 39**

Objectives
To enable the students
- Acquire knowledge on Structured Programming Language.
- Choose appropriate programming techniques to develop a program.
- Solve the real time problems using c programming.

I Arithmetic and Trigonometric Operations   **9 Hrs**
   1. Solve Quadratic Equations.
   2. Solve Taylor' Series for sin, cos and tan.

II   String Manipulation   6 Hrs
1. Counting the no. of vowels, consonants, words, white spaces in a line of text and array of lines.
2. Reverse a string & check for palindrome.

III   Recursion   9 Hrs
1. $^{n}P_{r}, ^{n}C_{r}$
2. GCD of two numbers
3. Fibonacci series

IV   Matrix Manipulation   9 Hrs
1. Addition & Subtraction
2. Multiplication
3. Transpose, of a matrix

V   Sorting and Searching   6 Hrs
1. Bubble Sort
2. Linear Search

UCSA306 COMPUTATIONAL PHYSICS WITH PYTHON

Semester : III	**Credit : 3**
Category : Allied	**Hours/Week : 3**
Class & Major : II B.Sc(Physics)	**Total Hours : 39**

Objectives
To enable the students
- Know the basics of algorithmic problem solving
- Develop Python programs with conditionals and loops
- Use Python data structures –- lists, tuples, dictionaries

UNIT- I ALGORITHMIC PROBLEM SOLVING   7 Hrs
Algorithms - Building blocks of algorithms(Statements, State, Control Flow, Functions). - Notation (pseudo code, Flow chart) - Algorithmic problem solving- Iteration, Recursion(Towers of Hanoi).

UNIT- II DATA,EXPRESSIONS,STATEMENTS   9 Hrs
Python interpreter and interactive mode: values and types: - int, float, Boolean, string, and list - variables - expressions - statements - tuple assignment - precedence of operators comments; modules and functions - function definition and use - flow of execution

UNIT- III CONTROL , FUNCTIONS   8 Hrs
Conditionals: Boolean values and operators - conditional (if) - alternative (if-else - chained conditional (if-elif-else) - Iteration: state, while, for, break, continue, pass.
Functions: return values - parameters - local and global scope - function composition

UNIT- IV-LEAST-SQUARES FITTING   **8 Hrs**

Least-Squares Fitting -Derivation --Non-linear fitting .- Python curve-fitting libraries-Euler's Method -Standard Method for Solving ODE's -Problems with Euler's Method -Euler-Cromer Method -Visual Python- VPython Coordinates -VPython Controls and Parameters

UNIT- VPARTIAL DIFFERENTIAL EQUATIONS   **7 Hrs**

Partial Differential Equations -Laplace's Equation -Wave Equation -Schrodinger's Equation-Monte Carlo Techniques - Random Numbers -Integration-Chaos - The Real Pendulum -Phase Space- Poincar´e Plots

Text Books
- Allen B. Downey, "*Think Python: How to Think Like a Computer Scientist*'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
- Guido van Rossum and Fred L. Drake Jr, *An Introduction to Python – Revised and updated for Python 3.2*, Network Theory Ltd., 2011.

Reference Books
- John V Guttag, *Introduction to Computation and Programming Using Python*'', Revised and expanded Edition, MIT Press , 2013
- Robert Sedgewick, Kevin Wayne, Robert Dondero, *Introduction to Programming in Python,* 2013

e-References
- http://greenteapress.com/wp/think- python
- http://www.fizika.unios.hr/rf/wp-content/uploads/sites

UCSR310 COMPUTATIONALPHYSICS WITH PYTHON LAB

Semester	**: III**	**Credit**	**: 2**
Category	**: Allied**	**Hours/Week**	**: 3**
Class & Major	**: II B.Sc(Physics)**	**Total Hours**	**: 39**

Objectives
- Designand conduct experiments as well as to analyze and interpret data
- Develop creative software applications
- Understand a complex real world problem and develop an efficient practical solution

Lab Exercises

1. Compute the Towers of Hanoi.

2. Find the square root of a number (Newton's method)

3. To define an integer, floating point number, Strings are defined either with a single quote or double quotes and Assignments can be done on more than one variable "simultaneously".

4. Find the maximum of a list of numbers.

5. Find the semester marks using Elif condition.
6. Find the Global and Local variable program using function.
7. Programs that take command line arguments (word count).
8. Find the most frequent words in a text read from a file.
9. Selection sort, Merge sort.
10. Simulate bouncing ball using TRINKET.

III and IV Evaluation Components of CIA

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
III	III	Core VI	UCSM305/ UCAM310	Java Programming	Assignment	Problem Solving
	III	Core VII	UCSM306	Microprocessor and its Applications	Assignment	Simple Program Writing
	III	Core VIII	UCSR308/ UCAR304	Java Programming - Practical	DPA	Viva-voce
IV	III	Core IX	UCSM408	Graphics & Multimedia	Assignment	Seminar
	III	Core X	UCSM409 /UCSM609	Operating System	Assignment	Seminar
	III	Core XI	UCSR411	Operating System & Graphics lab	DPA	Viva-voce

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
III	III	Allied	UCSA305	Fundamentals of Blockchain Technology	Assignment	Problem Solving
	III	Allied Practical	UCSR309	Blockchain Technology Using Solidity – Lab	DPA	Viva-voce
	III	Allied	UCSA304	Mathematical Programming using C	Assignment	Problem Solving
	III	Allied Practical	UCSR307	Mathematical Programming using C – Lab	DPA	Viva Voce
	III	Allied	UCSA306	Computational Physics with Python	Assignment	Problem Solving

	III	Allied Practical	UCSR310	Computational Physics with Python – Lab (Vpython)	DPA	Viva Voce
IV	IV	Allied	UCSA406	Digital Marketing Analytics	Assignment	Seminar
	IV	Allied Practical	UCSR412	Web Design Lab	DPA	Viva Voce
	IV	Allied	UCSA407	Cyber Security in Finance	Assignment	Seminar
	IV	Allied Practical	UCSR413	Cyber Security Lab	DPA	Viva-voce

PROGRAMME PROFILE M.Sc. (Computer Science)

PSO1: Demonstration of the knowledge of advanced programming skills and distributed environmental need for sustainable development.

PSO2: Ability to design and develop hardware and software in emerging technology environments.

PSO3: Ability to solve problems using the techniques of data analytics like pattern recognition and knowledge discovery.

PSO4: Ability to work out effective and efficient real time solutions using acquired knowledge in various domains.

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Min	Max
I	Core I	PCSM111/ PCSM403	Internet of Things	5	4	4
	Core II	PCSM112	Object Oriented Software Engineering	4	4	4
	Core III	PCSM113	Data Mining	5	4	4
	Core IV	PCSM114/ PCSM210	Design and Analysis of Algorithm	4	3	3
	Core V	PCSM115	Virtual Reality	4	4	4
	Core VI	PCSR106	UML - Practical	3	2	2
	Core VII	PCSR107	Data Mining using WekaTool -Practical	4	3	3
			Library	1	-	-
Total				**30**	**24**	**24**
II	Core VIII	PCSM212	Multimedia and its Applications	4	3	3
	Core IX	PCSM211	Software Testing	4	3	3
	Core X	PCSM213/ PCSM309	TCP / IP Networks	4	3	3
	Core XI	PCSM214	Biometrics	4	4	4
	Core XII	PCSR206/ PCSM304	Networking – Practical	4	3	3

	Core XIII	PCSR207	Biometrics Using Mat lab- Practical	4	3	3
	Non Major Elective	PALE201/ PALE301		5	4	4
	Service Learning	PCSX201		-	1	1
			Library	1	-	-
			Total	**30**	**24**	**24**
	Core XIV	PCSM311	Cloud Computing	4	4	4
	Core XV	PCSM315	Big Data Analytics	5	4	4
	Core XVI	PCSM313	Research Methodology	4	4	4
	Core XVII	PCSM314	Cyber Security	5	4	4
III	Core XVIII	PCSI301	Fuzzy Set and Systems	5	4	4
	Core XIX	PCSR306	Big Data Analytics - Practical	4	3	3
	Core XXI	PCSR302	Mini Project	2	2	2
			Library	1	-	-
Total				**30**	**25**	**25**
	Core XXII	PCSM404	Digital Image Processing	5	4	4
IV	Core XXIII	PCSM406	Artificial Intelligence and Robotics	5	4	4
	Core XIV	PCSP402	Major Project	19	9	9
			Library	1	-	-
			Total	**30**	**17**	**17**
			Grand Total	**120**	**90**	**90**

NON-MAJOR ELECTIVE

Semester	Category	Course Code	Course Title	Contact Hrs/week	Credit
I	Non Major Elective	PCSE205	Programming in J2EE	3T+2P	4
		PCSE206	Mobile Computing Lab	5P	4

PCSM311 CLOUD COMPUTING

Semester : III   **Credit** : 4
Category : Core XI   **Hours/Week** : 5
Class &Major : II M.Sc Computer Science   **Total Hours** : 65

Objectives
To enable the students
- Understand the Cloud computing concepts
- Gain substantial knowledge in application of cloud computing
- Identify the cloud services

UNIT - I INTRODUCTION   **13 Hrs**

Introduction – Cloud computing basics – overview – Applications – Intranets and the cloud – First Movers in the Cloud- Organization and cloud computing- Benefits – Limitations – Security Concerns.

UNIT - II BUSINESS CASE FOR CLOUD COMPUTING   **13 Hrs**

Business case for going to the cloud. – Cloud Computing Services – applications in Business – Deleting your datacenter – Hardware and Infrastructure – Clients –Security – Network –services – Standards.

UNIT -III ACCESSING THE CLOUD   **13 Hrs**

Accessing the Cloud-Platforms – Web Applications –web APIs – web Browers - Cloud Storage – overview – Cloud storage providers-standards– Software as a service - software plus Services – Developing application.

UNIT - IV CLOUD COMPUTING AT WORK   **13 Hrs**

Cloud computing at work : Driving forces – Company offerings –Industries -software plus Services – overview - Developing application – Google – Microsoft –Development – troubleshooting – Application Management.

UNIT -V BEST PRACTICES FOR CLOUD COMPUTING   **13 Hrs**

Local clouds and Thin Clients –Server Solution – Thin Clients –Migrating to the cloud – Cloud Services for Individuals-Enterprise class cloud offerings –Migration –Cloud Computing evaluation.

Text Book
- Anthony T.Velte, Toby J.Velte Robert elsenpeter, *Cloud Computing –A Practical approach,*Tata McGraw Hill Publications, 2010.

Reference Books
- Barrie sosinsky, *Cloud Computing Bible*, Wiley publishing Inc., 2011.
- BorkoFurht, Armando Escalante, *Handbook of Cloud Computing*, Springer, 2010.

PCSM315 BIG DATA ANALYTICS

Semester : III	**Credit**	: 4
Category : Core XV	**Hours / Week**	: 5
Class & Major: II M. Sc Computer Science	**Total Hours**	: 65

Objectives
To enable the students

- Understand the concepts in Big Data and apply Hadoop ecosystem components.
- Get introduced to tools like Pig, Hive, HBase, Elastic MapReduce etc.
- Realize the Hadoop architecture and implementation of MapReduce Application.
- Acquire knowledge on variety of NoSQL databases

UNIT – I   BIG DATA & HDFS   13Hrs

Big Data Definition and Taxonomy – Challenges for processing big data - Technologies support big data - Big Data value for the enterprise – Setting up the environment – First step with the Hadoop ecosystem. HDFS Architecture – HDFS Concepts – Blocks – NameNode – Secondary NameNode – DataNode – HDFS Federation – Basic File System Operations – Data Flow – Anatomy of File Read – Anatomy of File Write.

UNIT – II HADOOP   13Hrs

Introduction to Hadoop – History of Hadoop – Hadoop Architecture Concepts- Components of Hadoop – Applications of Hadoop – Advantages/Disadvantages of Hadoop - Compression – Security – Enterprise integration in hadoop. Use cases of Hadoop – RDBMS vs Hadoop – Ecosystem tour – Vendor comparison.

UNIT – III   PIG   13Hrs

Introduction to Apache Pig – Map Reduce Vs. Apache Pig – SQL vs. Apache Pig – Different data types in Pig – Modes of Execution in Pig – Execution Mechanism- Local Mode-Map Reduce or Distributed Mode   – Grunt shell – Loading data – Exploring Pig – Latin commands - Embedded - Transformations in Pig - How to write a simple pig script - How to develop the Complex Pig Script - Bags, Tuples and fields in PIG - UDFs in Pig - Need of using UDFs in PIG.

UNIT – IV HIVE AND HBASE   13 Hrs

Hive introduction – Hive architecture – Hive vs RDBMS – HiveQL and the shell - Managing tables (external vs managed) – Data types and schemas – Partitions and buckets. HBASE: Architecture and schema design - HBase vs. RDBMS- HMaster and Region Servers-Column Families and Regions- Write pipeline- Read pipeline- HBase commands.

UNIT – V FRAMEWORKS AND APPLICATIONS   13Hrs

IBM for Big Data – Map Reduce Framework – Algorithms using map reduce - Map Reduce Types and Formats- Map Reduce Features-   Sharding – NoSQL Databases - S3– Hbase – Impala – Analyzing big data with twitter – Big data for E-Commerce – Big data for blogs.

Text Books
- Michael Berthold, David J. Hand, *Intelligent Data Analysis*, Springer, 2007.
- AnandRajaraman and Jeffrey David Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2012.
- Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, McGraw Hill, 2012.

Reference Books
- Jay Liebowitz, *Big DAata and Business Analytics,* Auerbach Publications, CRC press (2013).
- EMC Education Services, *Data Science and Big Data Analytics: Discovering, Analyzing,*

Visualizing and Presenting Data, I edition, 2015.
- ArvindSathi, *BigDataAnalytics: Disruptive Technologies for Changing the Game*, MC Press, 2012.

e-Resources
- http://postscapes.com
- http://www.bigdataanalysis.eu/what-is-bigdata

PCSM313 RESEARCH METHODOLOGY

Semester	: III	**Credit**	: 4
Category	: Core XVI	**Hours/Week**	: 4
Class & Major : II M.Sc Computer Science		**Total Hours**	: 52

Objectives
To enable the students
- Understand the concepts of Research Methodology
- Acquired knowledge on Report Writing, and LaTeX
- Gain Practical Knowledge in Python, and R Programming

UNIT –I INTRODUCTION TO RESEARCH   **10 Hrs**

Meaning of Research - Objectives of Research - Motivation of Research - Types of Research - Research Approaches - Significance of Research - Research Methods versus Methodology - Research and Scientific Methods - Research Process - Criteria of Good Research - Problems encountered by Researchers in India. Defining the Research Problem Methodology: What is a Research Problem? Selecting the problem-Necessary of defining the Problem-Techniques involved in defining a problem-an Illustration conclusion.

UNIT - II REPORT WRITING   **10 Hrs**

Scientific Writing: Significance of report writing - Structure and Components of Research Report. Types of Report: research papers - thesis - Research Project Reports - Precautions for writing research reports - Pictures and Graphs - Citation Styles - Oral presentation - Creating reports and articles.

UNIT –III LaTeX   **11 Hrs**

Introduction to LaTeX- Text - Text environment - Inline Formulas and Displayed Formulas - Documents -Customizing LaTeX - Presentation.

UNIT - IV PYTHON   **10 Hrs**

Introduction to python - Installing python - Basic Python Syntax: String operations - The format method - String Slices - String operators - Numeric Data types - Conversions -

Simple Input and Output - Functions - Control flow and syntax - Loops - Collections - Lists - Tuples - Sets - Dictionaries – Class & Objects – Regular Expressions.

UNIT –V R Programming   **11 Hrs**

Overview of R programming - Evolution of R - Applications of R programming - Basic syntax Basic Concepts of R: Reserved Words - Variables & Constants. Data structures in R: Vectors – Matrix. Control flow: If...else - If else() Function. Functions: R Functions - Function Return Value. Strings: String construction rules. R Data Reshaping: Joining Columns and Rows in a Data Frame. Working with files: Read and writing into different types of files. Data visualization in R and Data Management: Bar Chart - Dot Plot

Text Books
- Kothari. C.R - Gaurav Garg - *Research methodology -Methods & Techniques* - 3rd Edition - New Age International Publishers - 2014.
- Misra R.P - Research Methodology – A Hand Book - Concept publishing Company - New Delhi
- George Gratzer - *Practical LaTeX* - Springer International Publishing Switzerland 2014.
- Kindle Edition - Python Programming -Publisher: Guru99 (19 July 2016)
- Norman Matloff - *The Art of R Programming-a tour of statistical software design* - 2011.

Reference Books
- Ryhan Ebad - *Research Methodology In Computer Science Hardcover* - Centrum Press 2014.
- Paul Teetor - *R Cookbook: Proven Recipes for Data Analysis - Statistics - and Graphics* (O'Reilly Cookbooks) - 2011
- Rob Kabacoff - *R in Action : Data Analysis and Graphics with R* – 2011
- Nina Zumel - John Mount - Jim Porzak, *Practical Data Science with R* - 2014
- Richard Cotton, *Learning R: A Step-by-Step Function Guide to Data Analysis*, 2013

e-Resources
- http://extras.springer.com

PCSM314 CYBER SECURITY

Semester	**: III**	**Credits**	**: 4**
Category	**: Core XVII**	**Hours/weeks**	**: 5**
Class & Major: II M.Sc Computer Science		**Total Hours**	**: 65**

Objectives
- Understand the difference between threat, risk, attack, and vulnerability
- Find information about threats, vulnerabilities, and attacks
- Understand threats, attacks and exploits and the motivations behind them

UNIT - I INTRODUCTION TO CYBER SECURITY   **13 Hrs**

Introduction -Computer Security - Threats -Harm - Vulnerabilities – Controls.Authentication - Access Control - Cryptography. Web - User Side: Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks.

UNIT - II SECURITY IN OPERATING SYSTEM & NETWORKS   **13 Hrs**

Security in Operating Systems - Security in the Design of Operating Systems –Rootkit. Network security attack: Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT - III DEFENCES: SECURITY COUNTERMEASURES   **13 Hrs**

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

UNIT - IV PRIVACY IN CYBERSPACE   **13 Hrs**

Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.

UNIT - V MANAGEMENT AND INCIDENTS   **13 Hrs**

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster.Emerging Technologies: The Internet of Things - Economics - Electronic Voting - Cyber Warfare.

Text Book
- Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies - *Security in Computing* - 5th Edition - Pearson Education - 2015.

Reference Books
- George K.Kostopoulous - Cyber Space and Cyber Security - CRC Press - 2013.
- Martti Lehto - Pekka Neittaanmäki - Cyber Security: Analytics - Technology and Automation edited - Springer International Publishing Switzerland 2015.
- Nelson Phillips and Enfinger Steuart - Computer Forensics and Investigations - Cengage Learning - New Delhi - 2009.

PCSI301 FUZZY SET AND SYSTEMS

Semester	**: III**	**Credit**	**: 4**
Category	**: Core XVIII**	**Hours/Week**	**: 5**
Class &Major : II M.Sc Computer Science		**Total Hours**	**: 65**

Objectives
To enable the students
- Understand the concepts of fuzzy set theory and fuzzy logic;

- Construct fuzzy rules and perform fuzzy reasoning on them.
- Illustrate the organization, design and operation of some common fuzzy systems

UNIT –I INTRODUCTION   **13 Hrs**

Introduction – Background – Uncertainty and Imprecision – Statistics and Random Processes – Uncertainly and Information – Fuzzy Sets and Membership – Chance versus Ambiguity - Sets as Points in Hypercubes – Classical Sets and Fuzzy Sets: Classical Sets – Fuzzy Sets.

UNIT -II CLASSICAL RELATIONS AND FUZZY RELATIONS   **13 Hrs**

Cartesian product – Crisp Relations – Fuzzy Relations – Tolerance and Equivalence Relations – Fuzzy Tolerance and Equivalence Relations – Value Assignments.

UNIT -III MEMBERSHIP FUNCTIONS   **13 Hrs**

Features of the Membership Functions – Standard Forms and Boundaries – Fuzzification – Lambda(λ) Cut for Fuzzy Relations – Defuzzification to scalars - Membership Value Assignments – Fuzzy to Crisp Conversions.

UNIT- IV FUZZY ARITHMETIC AND EXTENSION PRINCIPLE   **13 Hrs**

Fuzzy Arithmetic - Numbers - Vectors and the Extension Principle – Extension Principle – Fuzzy Numbers – Interval Analysis in Arithmetic – Approximate Methods of Extension.Classical Logic and Fuzzy logic: Fuzzy Tautologies - contradictions - Equivalence - and Logical Proofs - Classical Predicate Logic – Fuzzy Logic – Approximate Reasoning — other Forms of the Implication Operation – Other Forms of the Composition Operation.

UNIT V FUZZY SYSTEMS AND CLASSIFICATION   **13 Hrs**

Fuzzy Rule Based systems: Natural Language – Linguistic Hedges – Rules Based Systems – Graphical Techniques of Inference. Fuzzy Classification: Classification by Equivalence Relations – Cluster Analysis – cluster Validity – c-Means Clustering – Classification Metric – Hardening the Fuzzy c-Partition – Similarity Relations from Clustering.

Text Books
- Timothy J Ross - "*Fuzzy Logic with Engineering Applications*" - McGraw – Hill - Inc - 4th Edition - 2016.
- Timothy J. Ross, *Fuzzy Logic with Engineering Applications*, Wiley India, II Edition, 2010 reprint. Chapters 1,2,3,4,5,6,Chapter 11 (Part I only), 12

Reference Books
- John Yen, Reza Langari, *Fuzzy Logic- Intelligence, Control, and information*, Pearson Education, 2004.
- George J.Klir , Bo Yuan, *Fuzzy Sets and Fuzzy Logic-Theory and Applications*, Prentice Hall of India, 2000.

PCSR306 BIG DATA ANALYTICS – PRACTICAL

Semester	**: III**	**Credits**	**: 3**
Category	**: Core XIX**	**Hours/Week**	**: 4**
Class & Major	**: II M.Sc Computer Science**	**Total/Hours**	**: 52**

Objectives

To enable the students

- Understand Analytical concepts using PIG
- Gain knowledge on higher level of abstraction
- Develop programming skills using HIVE commands.

Lab Exercise

1. I/O operations
2. Split and union
3. Filters
4. Joins
5. Flattening
6. Sample and Parallel
7. Advanced Relational Operations
8. Perform Basic DDL - DML Operations using Hive Commands.
9. Perform Group by Operations using Hive Command.
10. Perform Order by vs. Sort by Operations using Hive Commands.
11. Demonstrate Join Operations using Hive Commands.
     (i) Left Outer Join (ii) Right Outer Join   (iii) Full Outer Join
12. Calling out external program to perform Map and Reduce operations.

PCSM404   DIGITAL IMAGE PROCESSING

Semester	**: IV**	**Credits**	**: 3**
Category	**: Core XIII**	**Hours/week**	**: 5**
Class & Major	**: II M. Sc Computer Science**	**Total Hours**	**: 65**

Objectives
To enable the students

- To study the image enhancement techniques
- To study image restoration procedures
- To study the image compression procedures
- To study the image segmentation and representation techniques

UNIT - I   DIGITAL IMAGE FUNDAMENTALS   11 Hrs

Elements of digital image processing systems, Vidicon and DigitalCamera working princ iple,Elements of visual perception, brightness,contrast, hue, saturation, mach band effect, Color i mage fundamentals -RGB, HSI models, Image sampling, Quantization, dither.

UNIT - II   IMAGE ENHANCEMENT   15 Hrs

Histogram equalization and specification techniques, Noise distributions,Spatial averagin g, Directional Smoothing, Median, Geometric mean,Harmonic mean, Contraharmonic mean filte rs, Homomorphic filtering,Color image enhancement.

UNIT - III   IMAGE RESTORATION   **13 Hrs**

Image Restoration - degradation model, Unconstrained restoration –
Lagrangemultiplierand Constrained restoration, Inverse filtering-
removalof blurcaused byuniform linear motion, Wiener filtering, Geometric transformations.

UNIT - IV   IMAGE SEGMENTATION   **13 Hrs**

Edge detection, Edge linking via Hough transform – Thresholding -Region based
segmentation – Region growing   – Region splitting and   merging –Segmentation   by morpho
logical watershed – basic concepts –   Dam   construction algorithm.

UNIT - V   IMAGE COMPRESSION   **13 Hrs**

Need for data compression, Huffman, Run Length Encoding, Shiftcodes, Arithmetic
coding, Vector Quantization, Transform coding, JPEGstandard, MPEG.

Textbooks
- Rafael C. Gonzalez, Richard E. Woods, *Digital Image   Processing*,Pearson, 2ndEdition, 2004.
- Anil K. Jain, Fundamentals *of Digital Image Processing*, Pearson 2002.

References
- Kenneth R. Castle man, *Digital Image Processing*, Pearson, 2006.
- Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,*DigitalImage Processing using MA TLAB*, Pearson Education, Inc., 2004.
- D,. Dudgeon and RM. Mersereau, *Multidimensional DigitalSignal Processing*, Prentice H all   Professional   Technical Reference, 1990.
- William K. Pratt, *Digital Image Processing* , John Wiley,New York, 2002
- Milan Sonka et aI, *Image Processing, Analysis Andmachine Vision*, Brookes/Cole, Vikas Publishing House, 2ndedition, 1999.

PCSM406 ARTIFICIAL INTELLIGENCE & ROBOTICS

Semester   : IV   **Credits   : 4**
Category   : CoreXXII   **Hours/weeks   : 5**
Class & Major: II M.Sc Computer Science   **Total Hours   : 65**

Objectives
To enable the students
- Understand the Basics of Artificial Intelligence
- Analyze and develop AI Algorithms
- Develop simple robots

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE   **13 Hrs**

Introduction: Intelligent Agents-Search Strategies-Solving Problems by Searching –
Breadth - First Depth-First- Depth-Limited -Iterative Deepening –Bidirectional- Informed Search
Methods -A* -AO* -Games as Search Problems -Alpha-Beta Pruning.

UNIT II REPRESENTATION   **13Hrs**
        Representation: Propositional Logic – First - Order Logic - Frame Systems and Semantic Networks.

UNIT III REASONING   **13Hrs**
        Reasoning: Inference in First-Order Logic - Forward and Backward Chaining - Resolution Unification-Logical Reasoning Systems.

UNIT IV PLANNING   **13Hrs**
        Planning: Simple Planning Agent - From Problem Solving to Planning - Basic Representations for Planning - Practical Planners - Hierarchical Decomposition - Resource Constraints - Uncertainty - Probabilistic Reasoning Systems.

UNIT V LEARNING & ROBOTICS   **13Hrs**
        Learning: General Model of Learning Agents - Inductive Learning - Computational Learning Theory - Learning in Neural and Belief Networks - Reinforcement Learning - Types of Communicating Agents - Robotics: Tasks - Parts - Configurations Spaces - Navigation and Motion Planning.

Text Book

- StuartJ.Russell and Peter Norvig - *Artificial Intelligence* - Tata Mc Graw Hill Publisher 3rd Edition 2017.

Reference Books

- Elaine Rich and Kevin Knight - *Artificial Intelligence* - Tata Mc Graw Hill Publisher - 3rdEdition 2017.
- Dan W.Patterson - *Introduction to Artificial Intelligence and Expert Systems* - Prentice Hall of India -2009.

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
III	Core XIV	PCSM311	Cloud Computing	Assignment	Seminar
	Core XV	PCSM315	Big Data Analytics	Assignment	Seminar
	Core XVI	PCSM313	Research Methodology	Case study	Seminar
	Core XVII	PCSM314	Cyber Security	Assignment	Seminar
	Core XVIII	PCSI301	Fuzzy Set and Systems	Assignment	Seminar
	Core XIX	PCSR306	Big Data Analytics - Practical	DPA	Viva Voce
IV	Core XXII	PCSM404	Digital Image Processing	Problem Solving	Seminar
	Core XXIII	PCSM406	Artificial Intelligence and Robotics	Assignment	Seminar