SU/BOS/Science/497   **Date: 10/07/2023**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

Sir/Madam,

      With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

M.Sc.Part-II (Sem. III & IV) as per NEP-2020			
1.	Microbiology (HM)	8.	Food Science & Nutrition
2.	Pharmaceutical Microbiology (HM)	9.	Food Science & Technology
3.	Microbiology	10.	Biochemistry
4.	Computer Science	11.	Biotechnology
5.	Computer Science (Online Mode)	12.	Medical Information Management
6.	Data Science	13.	Environmental Science
7.	Information Technology (Entire)	14.	Physics

      This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

      The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

      You are, therefore, requested to bring this to the notice of all students and teachers concerned.

      Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR

NAAC "A++" Grade with CGPA 3.52

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus for

Master of Science
In
Information Technology
(Under Faculty of Science and Technology)

PART II SEMESTER III & IV

(Syllabus to be implemented from Academic year 2023-24)

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)
M.Sc. Program Structure
M.Sc. Part – II (Level-9)

	Sr. No.	CourseCode	Teaching Scheme			Examination Scheme					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
CGPA	1	CC-301 Artificial Intelligence	4		4	80	32	3	20	8	1
	2	CC-302 Image Processing	4		4	80	32	3	20	8	1
	3	CC -303 Advanced Python Programming	4		4	80	32	3	20	8	1
	4	CC-304 Elective i) R Programming ii) Micro services Architecture iii) Cyber Security	4		4	80	32	3	20	8	1
	5	CCPR-305 Artificial Intelligence Lab		2	2	50	20	3	--	--	*
	6	CCPR-306 Image Processing Lab		2	2	50	20	3	--	--	*
	7	CCPR-307 Advanced Python Programming Lab		2	2	50	20	3	--	--	*
	8	CCPR-308 Elective Lab III		2	2	50	20	3	--	--	*
		Total (C)	**16**	**8**	**24**	**520**	**208**	**--**	**80**	**--**	

SEMESTER-III (Duration- Six Month)

Non-CGPA	**1**	AEC-309: Communicative English-II	2	2	2	--	--	--	50	20	2
	2	EC(SWMMOOC)-310:	Number of Lectures and credit shall be specified on SWAYAM MOOC								
		SEMESTER-IV (Duration- Six Month)									
CGPA	1	CCPR-401:Research Seminar	--	1	4	--	--	--	100	40	*
	6	CCPR-402: Research /Industrial Project	--	--	16	300	120	--	100	40	*
	Total (D)		--	1	20	300	120	--	200	--	--
Total (C+D)					44	820	328	--	280	--	--

• Student contact hours per week : **34** Hours (Min.)	• Total Marks for MSc.-II : **1100**
• Theory and Practical Lectures : **60** Minutes Each	• Total Credits for MSc.-II (Semester III & IV) : **44**
• CC-Core Course • CCS- Core Course Specialization • CCPR-Core Course Practical and Project • DSE-Discipline Specific Elective • AEC-Mandatory Non-CGPA compulsory Ability Enhancement Course • SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course • EC (SWM MOOC) - Non-CGPA Elective Course • GE- Multidisciplinary Generic Elective	• **Practical Examination is Semester wise after theory examination.** Examination for CCPR-305, CCPR-306, CCPR-307 and CCPR-308 shall be based on Semester III Practical. • Examination for CCPR-401 and CCPR-402 shall be based on Semester IV Practical. • * Duration of Practical Examination as per respective BOS guidelines • *Separate passing is mandatory for Theory, Internal and Practical Examination*
• **Requirement for Entry at Level 9:** **Completed all requirements of the relevant Post Graduate Diploma in Information Technology (Level 8)**	
• **Exit at Level 9:** Students will exit after Level 9 with **Master's Degree in Information Technology** if he/she completes the courses equivalent to minimum of 96 credits.	

Course structure

M.Sc. Part II (Information Technology)

Semester-III		
Course Code	**Course Title**	**Credits**
CC-301	Artificial Intelligence	4
CC-302	Image Processing	4
CC-303	Advanced Python Programming	4
CC-304 Elective	i) R Programming ii) Microservices Architecture iii) Cyber Security	4
CCPR-305	Artificial Intelligence Lab	2
CCPR-306	Image Processing Lab	2
CCPR-307	Advanced Python Programming Lab	2
CCPR-308	Elective Lab-III	2
AEC-309	Communicative English-II	
EC-310	(SWMMOOC)	
	Total Credits	**24**
Semester –IV		
Course Code	**Course Title**	**Credits**
CCPR-401	Research Seminar	4
CCPR-402	Research /Industrial Project	16
	Total Credits	**20**

Theory Lectures : 60 Minutes Each	**Total Credits for M.Sc. -II (Semester III & IV) :44**
CC:-Core Course	
OE: – Open Elective	
CCPR:-Core Course Practical	
SWM:- SWAYAM UGC online Courses	
CE :- Core Elective (Within department) : Core elective papers shall be minimum 2 or more	
Practical Examination is Semester wise.	
Separate passing is mandatory for Theory, Internal, Practical and Project	

Master of Science
In
Information Technology
(Under Faculty of Science and Technology)

PART II (SEMESTER III)

M.Sc.(Information Technology)		Semester –III	
Course Name: Artificial Intelligence		**Course Code:CC301**	
Periods per week (1 Period is 60 minutes)		**4**	
Credits		**4**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	3	80
	Internal	--	20

Course Objectives:-
- To explore the applied branches of artificial intelligence
- To enable the learner to understand applications of artificial intelligence
- To enable the student to solve the problem aligned with derived branches of artificial intelligence.

Unit	Details	Lectures
I	**Review of AI:** History, foundation and Applications **Expert System and Applications:** Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems, Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools	12
II	**Probability Theory:** joint probability, conditional probability, Bayes's theorem, probabilities in rules and facts of rule based system, cumulative probabilities, rule based system and Bayesian method **Fuzzy Sets and Fuzzy Logic:** Fuzzy Sets, Fuzzy set operations, Types of Membership Functions, Multivalued Logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems, possibility theory and other enhancement to Logic	12
III	**Machine Learning Paradigms:** Machine Learning systems, supervised and un-supervised learning, inductive learning, deductive learning, clustering, support vector machines, cased based reasoning and learning. **Artificial Neural Networks:** Artificial Neural Networks, Single-Layer feed forward networks, multi-layer feed-forward networks, radial basis function networks, design issues of artificial neural network sand recurrent networks	12
IV	**Intelligent Agents:** Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications	12

V	**Advanced Knowledge Representation Techniques:** Conceptual dependency theory, script structures, CYC theory, script structure, CYC theory, case grammars, and semantic web. **Natural Language Processing:** Sentence Analysis phases, grammars and parsers, types of parsers, semantic analysis, universal networking language, dictionary	12

Books and References:

Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	Artificial Intelligence	Saroj Kaushik	Cengage	1st	2019
2.	Artificial Intelligence: A ModernApproach	A.Russel,Peter Norvig		1st	
3.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shiva shankar B.Nair	TataMc-Grawhill	3rd	

M. Sc (Information Technology)		Semester – III	
Course Name: Image Processing		**Course Code: CC302**	
Periods per week **1 Period is 60 minutes**	**Lectures**	4	
	Credits	4	
		Hours	**Marks**
Evaluation System	**Theory Examination**	3	80
	Theory Internal	--	20

Objectives:-	● Review the fundamental concepts of a digital image processing system. ☐ ● Analyze images in the frequency domain using various transforms. ● Evaluate the techniques for image enhancement and image restoration. ● Categorize various compression techniques. ● Interpret Image compression standards. ☐ ● Interpret image segmentation and representation techniques

Pre requisites	To learn image processing, it is recommended to have a understanding basic concept of computer graphics.

Unit	Details	Lectures
I	**Introduction:** Digital Image Processing, Origins of Digital Image Processing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Basic Mathematical Tools Used in Digital Image Processing, Intensity Transformations and Spatial Filtering: Basics, Basic Intensity Transformation Functions, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering.	12
II	**Filtering in the Frequency Domain:** Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of the 2-D DFT and IDFT, Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, Fast Fourier Transform Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-----Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections	12
III	**Wavelet and Other Image Transforms:** Preliminaries, Matrix-based Transforms, Correlation, Basis Functions in the Time-Frequency Plane, Basis Images, Fourier-Related Transforms, Walsh-Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image	12

		Segmentation, Noise in Color Images, Color Image Compression. Image Compression and Watermarking: Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-length Coding, Symbol-based Coding, 8 Bit-plane Coding, Block Transform Coding, Predictive Coding, Wavelet Coding, Digital Image Watermarking	
IV		**Morphological Image Processing:** Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transform, Morphological Algorithms, Morphological Reconstruction, Morphological Operations on Binary Images, Grayscale Morphology Image Segmentation I: Edge Detection, Thresholding, and Region Detection: Fundamentals, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Region Segmentation Using Clustering and Super pixels, Region Segmentation Using Graph Cuts.	**12**
V		**Image Segmentation II:** Active Contours: Snakes and Level Sets: Background, Image Segmentation Using Snakes, Segmentation Using Level Sets. Feature Extraction: Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features, Scale-Invariant Feature Transform (SIFT).	**12**

Books and References:-
1. Digital Image Processing and Computer Vision, Sonka, Hlavac, Boyle-Cengage learning.
2. Digital Image Processing, William Pratt- John Wiley.
3. The Image Processing HndBook J.C.Russ CRC fifth edition 2010

M. Sc (Information Technology)		Semester – III	
Course Name: Advanced Python Programming		Course Code: CC 303	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	4	
		Hours	Marks
Evaluation System	Theory Examination	3	80
	Theory Internal	--	20

Objectives:-	● The programming skills in advanced Python. ● The Object-oriented programming skills in Python. ● The skill of to design graphical-user interfaces (GUI) in Python. ●

Pre requisites	To learn Advanced Python Program, it is recommended to have a understanding basic concept of python.

Unit	Details	Lectures
I	**Object Oriented Python :-** Topics Assertion , Decorators, Generators , Iterators . Creation, Execution of threads using threading module	12
II	**Database programming using Python:-** Connecting to a database (sqlite) using Python , Sending DML and DDL queries and processing the result from a Python Program .	12
III	**GUI in Python:-** Introduction to GUI building libraries, Widgets , Button ,Canvas , Checkbutton , Entry , Frame , Label , Listbox , Menu button , Menu , Message ,Radio button , Scale , Scrollbar ,Text , Top level , Spinbox , PanedWindow , LabelFrame	12
IV	**Basic image processing using Python** Introduction to digital image processing , Basic operations on an imge ,Crop , Scale , Rotate , Flip , Changing contrast, brightness and color , Edge detection, blur, sharpening. Basic data visualization using: - Introduction to Matplotlib, Scatter plot ,Line plot , Bar chart , Histogram Box plot.	12
V	**Basic numerical processing using Python:-** Introduction to numpy, Creation of vectors and matrices , Matrix manipulation . Basing data analysis using Python:- Introduction to Pandas, Pandas data structures – Series and DataFrame , Data wrangling using pandas, Loading a dataset into a dataframe , Selecting Columns from a dataframe ,Selecting Rows from a dataframe , Adding new data in a dataframe, Deleting data from a dataframe	12

Books and References:-
1. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition , 2018
2. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
3. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python, BPB publication, 1st Edition, 2019.
4. Ashok Kamthane, Amit Kamthane, "Programming and Problem solving with Python", McGraw Hill Education (India) Private Limited, 2018.
5. Taneja Sheetal, Kumar Naveen, "Python Programming – A Modular Approach", Pearson, 2017

M. Sc (Information Technology)		Semester – III	
Course Name: R Programming		**Course Code: CC304** **Elective I**	
Periods per week **1 Period is 60 minutes**	**Lectures**	4	
	Credits	4	
		Hours	**Marks**
Evaluation System	**Theory Examination**	3	80
	Theory Internal	--	20

Objectives:-	• Master the use of the R and RStudio interactive environment.
	• Expand R by installing R packages.
	• Explore and understand how to use the R documentation.
	• Read Structured Data into R from various sources.
	• Understand the different data types in R.
	• Understand the different data structures in R.
	• Use data visualization tools.

Pre requisites	To learn R programming, it is recommended to have a basic understanding of any programming language, statistics, and mathematics.

Unit	Details	Lectures
I	**Introduction to R:-** Installation of R & RStudio, Features of R, Variables, Constants, Operators in R, Datatypes and R Objects, Accepting Input, Important Built-in functions, Creating Vectors, Accessing elements of a Vector, Operations on Vectors, Vector Arithmetic.	12
II	**R Data Types:-** Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat	12

	loop, while loop, for loop - Loop control statement: break statement, next statement.	
III	**Control statements and functions:-** Control statements: if…else, if else() function, switch() function, repeat loop, while loop, for loop, break statement, next statement, Formal and Actual arguments, Named arguments, Global and local variables, Argument and lazy evaluation of functions, Recursive functions. Creating strings, paste(), Formatting numbers and string using format(), String manipulation	**12**
IV	**Matrices, Arrays and Data frames:-** Creating matrices, Accessing elements of a Matrix, Operations on Matrices, Matrix transpose, Creating arrays, Accessing array elements, Calculations across array elements, Introduction to data frames and basic operations on data frames.	**12**
V	**Introduction to Data Visualization:-** Data visualization basics, Installing and loading packages, importing data, Working with missing data, Extracting a subset of a data frame, Scatter Plot, Box Plot, Bar plot, Plotting categorical data, Stacked bar plot, Histogram, plot() function and line plot, pie chart / 3D pie chart.	**12**

Books and References:-

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	R Programming for Data Science	Peng, R.D.	Bookdown: New York		2020
2.	An Introduction to Statistical Learning	Gareth James	Springer		2017
3.	R for Data Science	Garrett Grolemund and Hadley Wickham	O'Reilly Media, Inc.		2017
4.	R Fundamentals by Sosulski, K.	Sosulski, K.	Bookdown: New York		2018

M.Sc.(Information Technology)		Semester –III	
Course Name: Micro services Architecture		**Course Code:CC304 Elective II**	
Periods per week(1 Period is 60 minutes)		4	
Credits		4	
		Hours	**Marks**
Evaluation System	**Theory Examination**	3	80
	Internal	--	20

Objectives:-	● ● Gain a thorough understanding of the philosophy and architecture of Web applications using ASP.NET Core MVC. ● ● Gain a practical understanding of.NET Core.	

Unit	Details	Lectures
I	**Understanding Micro services**: - Understanding Micro services, Adopting Micro services, The Micro services Way. Micro services Value Proposition: Deriving Business Value, defining a Goal-Oriented, Layered Approach, Applying the Goal-Oriented, Layered Approach. Designing Micro service Systems: The Systems Approach to Micro services, A Micro services Design Process, Establishing a Foundation: Goals and Principles, Platforms, Culture.	12
II	**Service Design:** Micro service Boundaries, API design for Micro services, Data and Micro services, Distributed Transactions and Sagas, Asynchronous Message-Passing and Micro services, dealing with Dependencies. **System Design and Operations:** Independent Deployability, More Servers, Docker and Micro services, Role of Service Discovery, Need for an API Gateway, Monitoring and Alerting.	12
III	**Building Micro services with ASP.NET Core:** Introduction, Installing .NET Core, Building a Console App, Building ASP.NET Core App. Delivering Continuously: Introduction to Docker, Continuous integration with Wercker, Continuous Integration with Circle CI, Deploying to Dicker Hub. **Building Micro service withASP.NET Core:** Micro service, Team Service, API First Development, Test First Controller, Creating a CI pipeline, Integration Testing, Running the team service Docker Image. **Backing Services:** Micro services Ecosystems, Building the location Service, Enhancing Team Service.	12
IV	**Creating Data Service:** Choosing a Data Store, Building a Postgres Repository, Databases are Backing Services, Integration Testing Real Repositories, Exercise the Data Service. Event Sourcing and CQRS: Event Sourcing, CQRS pattern, Event Sourcing and CQRS, Running the samples.	12
V	**Creating Data Service and Configuring Micro service Ecosystems:** Configuring Micro service Ecosystems: Using Environment Variables with Docker, Using Spring Cloud Config Server and Configuring Micro services with etcd. **Securing Applications and Micro services:** Security in the Cloud, Securing ASP.NET Core Web Apps and Securing ASP.NET Core Micro services.	12

Books and References:-

Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	Micro service Architecture	O'Reilly Edition		1st	2016
2.	Building Micro services with ASP.NET Core	Kevin Hoffman			2017

M.Sc. (Information Technology)		Semester–III	
Course Name: Cyber Security		Course Code: CC-304 Elective III	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	4	
		Hours	Marks
Evaluation System	Theory Examination	3	80
	Theory Internal	--	20

Objectives:-	• Fundamentals of cyber security and related safeguards. • Cyber threats and vulnerabilities. • Securing web applications. • Cyber Laws, Cyber Forensics and IPR.

Unit	Details	Lectures
I	**Introduction to Cyber Security:** Overview of Cyber Security, Internet Governance –Challenges and Constraints Cyber Threats: Cyber Squatting, Cyber Warfare, Cyber terrorism, Cybercrime, Cyber Offenses Cybercrime-Mobile and Wireless Devices: Proliferation of Mobile and Wireless Devices, Authentication Service Security, Attacks on Mobile Phones, Security Implications for Organizations, Measures for Handling Mobile Devices Cyber Offenses: Categories, Attacks, Social Engineering, Cyber stalking, Botnets, Cloud Computing Classification of Cybercrimes: Email spoofing, Spamming, Cyber defamation, Internet Time Theft, Data Diddling, Espionage, Hacking, Online Frauds, Computer Sabotage, Email Bombing, Computer Network Intrusion, Password Sniffing, Credit Card Frauds, Identify Theft.	**12**
II	**Cybercrime and Cyber Security:** The Legal Perspective: Introduction, Cyber Security Regulations, Legal Landscape around the World, The Indian IT Act and Amendments, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment	**12**
III	**Cyber Security Vulnerabilities and Cyber Security Safeguards:** Cyber Security Vulnerabilities-Overview, vulnerabilities in software, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attack on wireless Networks, Identity Theft (ID Theft)	**12**
IV	**Securing Web Application, Services:** Introduction, Basic security for HTTP Applications, Email Security, Back up Issues, Identity Management and Web	**12**

	Services, Authorization Patterns, Firewall, Intrusion Detection and Prevention System: Intrusion, Physical Theft, Abuse of Privileges, Access Management, Access management Models (DAC, OAC, RBAC), Unauthorized Access by Outsider, 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, Security Information Management, Network Session Analysis, System Integrity Validation	
V	**Understanding Computer Forensics:** Cyber forensics and digital Evidences. Digital Forensics Life cycle, Network Forensics, Relevance of the OSI 7 layer model to Computer Forensics, Forensics and Social Networking Sites, Challenges in Computer Forensics, Forensics Auditing, Anti forensics Intellectual Property in the Cyber Space: Copyrights, Jurisdiction Issues and Copyright Infringement, Multimedia and Copyright issues, WIPO, Intellectual Property Rights, Understanding Patents, Understanding Trademarks, Trademarks inInternet, Trade Secrets, Trade Name, Domain name registration, Software Piracy, Legal Issues in Cyber Contracts, Authorship, Document Forgery	**12**

Books and References:
- Mark Rhodes- Ousley, "Information Security-The Complete Reference", McGraw Hill Education , 2nd Edition, 2012.
- Nina Godbole, "Information Systems Security–Security Management, Metrics, Frameworks and Best Practices", Wiley, 2nd Edition, 2017.
- Mark Merkow, James Breithaupt, "Information Security: Principles and Practices", Pearson Education, 1st Edition, 2007. RB4. Matt Bishop, "Computer Security Art and Science", Pearson Education, 2nd Edition, 2018.

M. Sc (Information Technology)		Semester – III	
Course Name: Artificial Intelligence Lab		**Course Code: CCPR 305**	
Periods per week **1 Period is 60 minutes**	**Lectures**	**4**	
	Credits	**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2**	**50**

List of Practical's:-
- At least 10 practical covering the entire syllabus must be performed.

M. Sc (Information Technology)		Semester – III	
Course Name: Image Processing Lab		Course Code: CCPR 306	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	2	
		Hours	Marks
Evaluation System	Practical Examination	2	50

Course Outcomes:-	At the end of the Course the student shall be able to: ● Understand the relevant aspects of digital image representation and their practical implications. ● ☐ Have the ability to design pointwise intensity transformations to meet stated specifications. ☐

Sr.No.	Title of Practicals
1	Point Processing techniques (At least 4 experiments).
2	Spatial domain Filtering.
3	Histogram Processing (Histogram Stretching and Equalisation).
4	Frequency Domain Filtering (Plotting 2D-DFT, Low pass and High Pass- Ideal, Butterworth and Gaussian Filters).
5	Segmentation-Gradient operators.
6	Transforms-DCT.
7	Morphology-Dilation Erosion.

M. Sc (Information Technology)		Semester – III	
Course Name: Advanced Python Programming Lab		Course Code: CCPR 307	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	2	
		Hours	Marks
Evaluation System	Practical Examination	2	50

Course Outcomes:-	At the end of the Course the student shall be able to: ● Apply exception handling and user defined exception ● Develop Module(s) and Package(s) in python ● Make use of Pandas and Numpy Libraries ● Implement Object Oriented concepts in programming ● Apply Collection modules for the data types

Sr.No.	Title of Practicals
1	Create a class ATM and define ATM operations to create account, deposit, check balance, withdraw and delete account. Use constructor to initialize members.
2	Make a class Employee with a name and salary. Make a class Manager inherit from Employee. Add an instance variable, named department. Write a method that prints manager's name, department and salary. Make a class Executive inherit from Manager. Write a method that prints the string "Executive" followed by the information stored in the Manager super class object.
3	A hospital wants to create a database regarding its indoor patients. The information to store include a) Name of the patient b) Date of admission c) Disease d) Date of discharge. Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).
4	Write a python program to create two threads to keep a count of number of even numbers entered by the user.
5	Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds.
6	Write a test-case to check the function even_numbers which return True on passing a list of all even numbers.
7	Write a test-case to check the function reverse_string which returns the reversed string
8	Numpy Library a) Create a numpy array from list, tuple with float type b) Python program to demonstrate slicing, integer and boolean array indexing c) Write a python program to find min, max, sum, cumulative sum of array. d) Write a python program to demonstrate use of ndim, shape, size, dtype. e) Write a python program to find rank, determinant, and trace of an array. f) Write a python program to find eigenvalues of matrices g) Write a python program to find matrix and vector products (dot, inner, outer, product), matrix exponentiation. h) Write a python program to solve a linear matrix equation, or system of linear scalar equations.
9	Pandas Library a) Write a python program to implement Pandas Series with labels. b) Create a Pandas Series from a dictionary.

c) Creating a Pandas DataFrame.
d) Write a program which make use of following Pandas methods i) describe() ii) head() iii) tail()
e) Write a program that converts Pandas DataFrame and Series into numpy.array.
f) Write a program that demonstrates the column selection, column addition, and column deletion.
g) Write a program that demonstrates the row selection, row addition, and row deletion.
h) Write a program which use pandas inbuilt visualization to plot following graphs: i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots

M. Sc (Information Technology)		Semester – III	
Course Name: **R Programming Lab**		Course Code: CCPR-308 Elective I	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	2	
		Hours	Marks
Evaluation System	Practical Examination	2	50

Practical No	Details
1 - 15	Apply syntax of R through practice exercises.
16-19	Implement the control statements, functions, data visualization. in R.

Basics of R Programs:-	
Sr.No.	**Title of Practicals**
1	Find the factorial of a number
2	Check whether a number is prime or not
3	Find Sum, Mean and Product of Vector
4	Generate Random Number from Standard Distributions
5	Find Minimum and Maximum
6	Check Armstrong Number
7	Sum of Natural Numbers Using Recursion
8	Print the Fibonacci Sequence
9	Check for Leap Year
10	Check whether number is Odd or Even
11	Check if a Number is Positive, Negative or Zero
12	Find the Sum of Natural Numbers
13	Convert Decimal into Binary using Recursion in R
14	Find the Factorial of a Number Using Recursion
15	. R Program to Find H.C.F. or G.C.D.
Data Visualization basic practical's:-	
Download mtcars dataset in R. (also available on GitHub) and create the following	

graphics	
16	Create a pie chart showing the proportion of cars from the mtcars data set that have different cylinder (cyl) values.
17	Create a bar graph, that shows the number of each carb type in mtcars.
18	Show a stacked bar graph of the number of each gear type and how they are further divided out by cyl.
19	Draw a scatter plot showing the relationship between wt and mpg.

M. Sc (Information Technology)		Semester – III	
Course Name: Micro services Architecture Lab		Course Code: CCPR-308 Elective II	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	2	
		Hours	Marks
Evaluation System	Practical Examination	2	50

List of Practicals:-	
Micro services Architecture Lab	
Sr. No.	Title of Practical's
1	Building APT.NET Core MVC Application
2	Building ASP.NET Core REST API.
3	Working with Docker, Docker Commands, Docker Images and Containers
4	Installing software packages on Docker, Working with Docker Volumes and Networks.
5	Working with Docker Swarm
6	Working with Circle CI for continuous integration.
7	Creating Micro service with ASP.NET Core.
8	Working with Kubernetes
9	Creating Backing Service with ASP.NET Core.
10	Building real-time Microvservice with ASP.NET Core

M. Sc (Information Technology)		Semester – III	
Course Name: Cyber Security Lab		Course Code: CCPR 308 Elective III	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	2	
		Hours	Marks
Evaluation System	Practical Examination	2	50

M. Sc (Information Technology)		Semester – III	
Course Name: Communicative English-II		**Course Code: AEC 309**	
Periods per week **1 Period is 60 minutes**	**Lectures**	**2**	
	Credits	**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2**	**50**

M. Sc (Information Technology) (NEP)
SEM-III AEC-II Communicative English-II
INTERVIEW AND PRESENTATION SKILLS

Unit: -1.	Interview Skills.
Unit: -2.	Presentation Skills. (Presenting your point of view.)

Nature of Question Paper Pattern
M.Sc. II(Information Technology) Ability Enhancement Compulsory Course- II

Time Allotted: 2 hrs   **Total Marks:** 50
Instructions:-
- All the questions are compulsory.
- Figures on the right indicate full marks allotted to each question.

Q. 1 Rewrite the following questions choosing the correct alternative.   8 Marks
Q. 2 Answer the following questions in one word/ phrase/ sentence   7 Marks
Q. 3 Answer the following questions. (Theory questions) (3/5)   15 Marks
Q. 4 Questions based on the given advertisement   . 10 Marks
Q. 5 Preparation of Oral or PowerPoint Presentation.   10 Marks

Master of Science
In
Information Technology
(Under Faculty of Science and Technology)

PART II (SEMESTER IV)

M. Sc (Information Technology)		Semester – IV	
Course Name: Research Seminar		Course Code: CCPR-401	
Periods per week 1 Period is 60 minutes	Lectures	01	
	Credits	4	
		Hours	Marks
Evaluation System	Practical Examination		100

- Student shall deliver seminar on one of the advanced topic chosen in consultation with the guide after compiling the information from the latest literature and also internet.
- The concepts must be clearly understood and presented by student.
- Prior to presentation, he/she shall carry out the detailed literature survey from standard references such as International & National journals and periodicals recently published reference books etc.
- A hard copy of the report (A4 size, 12 fonts, Times New Roman, Single spacing both side printed) should be submitted to the Department before delivering the seminar.
- This seminar will be evaluated internally for 100 marks by the respective guides.

M. Sc (Information Technology)		Semester – IV	
Course Name: **Research/Industrial Project**		Course Code: CCPR-402	
Periods per week 1 Period is 60 minutes	Lectures	--	
	Credits	16	
		Hours	Marks
Evaluation System	Practical Examination	3	400

External Marks-300
Internal Marks -100

1. Fourth semester Project work can be carried out as industrial training of four months in the Industry or in the Institute as Research project with prior permission of the Institute.
2. Project viva-voce by the University panel will be conducted at the end of semester.
3. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation.
4. Project work may be done individually or in groups in case of bigger projects.
5. The major project work carry 100 marks for internal assessment and 300 marks for External viva. The external viva shall be conducted by a panel of external examiners.

OR
1. The student will be allowed to formulate a proposal for start-up and the same will be rated equivalent to an industrial project. A detailed problem statement showing innovation along with mark ability, business plan and cash flow will be part of the Evaluation criteria.

Guidelines for Major Project Work: -
Number of Copies: The student should submit two Hard-bound copies of the Project Report.
Acceptance/Rejection of Project Report: The student must submit an outline of the project report to the college for approval. The college holds the right to accept the project or suggest modifications for resubmission. Only on acceptance of draft project report, the student should make the final copies.
Format of the Project Report: The student must adhere strictly to the following format for the submission of the Project Report.
a. Paper: The Report shall be typed on white paper, A4 size, for the final submission.
The Report to be submitted to the must be original and subsequent copies may be photocopied on any paper.
b. Typing: The typing shall be of standard letter size, 1.5 spaced and on one side of the paper only. (Normal text should have Arial Font size 11 or 12. Headings can have bigger size).
c. Margins: The typing must be done in the following margins: Left -----1.5 inch, Right ----- 1 inch Top ----- 1 inch, Bottom ----- 1 inch
d. Front Cover: The front cover should contain the following details: TOP : The title in block capitals of 6mm to 15mm letters. CENTRE: Full name in block capitals of 6mm to 10mm letters. BOTTOM: Name of the University, Course, Year of submission -all in block capitals of 6mm to 10mm letters on separate lines with proper spacing and centering.
e. Blank Sheets: At the beginning and end of the report, two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

Appendix – 2:-
• Input Design
• Report Design
• Implementation
• Testing
Standard Project Report Documentation Format:-

a) Covering Page
b) Institute/College certificate
c) Guide Certificate
d) Student declaration
e) Acknowledgement
f) Index (Chapter Scheme)
g) Chapter Scheme (Index)
1) Introduction to Project -Introduction -Existing System -Need and scope of System - Organization Profile
2) Proposed System -Objectives -Requirement Engineering. • Requirement Gathering. • SRS
3) System Diagrams • DFD • ERD • UML(if applicable) System Requirements • Hardware • Software
4) System Design • Database Design • Input Design • Output Design
5) User Guideline - Installation process
6) Source Code
8) Outputs Input screens and Reports (with valid Data)
9) Conclusion and Suggestions

• Conclusion and suggestions
• Future enhancement Bibliography
<u>Note: -</u> Minimum 5 reports are essential as outputs of the project work done by the student..