SHIVAJI UNIVERSITY, KOLHAPUR.

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CHOICE BASED CREDIT SYSTEM

Syllabus For

M. Sc. Part – II Computer Science

SEMESTER – III & IV

(Syllabus to be implemented from June, 2020 onwards)

Revised Syllabus For

M.Sc. Computer Science Part-II

(Subject to modifications to be made time to time)
Syllabus to be implemented from June 2020

M.Sc. Part II - Semester III

Course Code	Title of the Course	Credits	Teaching Scheme (h/w)		Evaluation Scheme (Marks)		
			L	P	CIE	SE	Total
SWM -301	Artificial Intelligence	4	4	-	20	80	100
CC-302	Advanced Web Technology	4	4	-	20	80	100
CC-303	PHP	4	4	-	20	80	100
CE-304	Elective-II: CE-304.1: Software Quality Assurance CE-304.2: Advanced Data Science CE-304.3: Network Security Analyst CE-304.4: Internet of Things	4	4	-	20	80	100
CCPR-305	Advanced Web Technology Lab	4	-	6	20	80	100
CCPR-306	PHP Lab	4	-	6	20	80	100
CCPR-307	Project	4	-	6	20	80	100
Total		28	16	18	140	560	700

M.Sc. Part II - Semester IV

Course Code	Title of the Course	Credits	Teaching Scheme (h/w)		Evaluation Scheme (Marks)		
			L	P	CIE	SE	Total
CCPR - 401	Research Seminar	4	-	8	100	-	100
CCPR-402	Industrial / Research Project	8	-	4	50	150	200
Total		12	-	12	150	150	300

Student Contact hours per week : **16 Hours** (Min)	Total Marks for M.Sc-II : **1000**
Theory Lectures : 60 Minutes Each	Total Credits for M.Sc -II (Semester III & IV) : **40**
CC-Core Course	
CE – Core Elective (Within department) : Core elective papers shall be minimum 2 or more	
OE – Open Elective	
SWM –SWAYAM UGC Online courses	
CCPR – Core Course Practical.	**Total Credits for M.Sc. Course : 96**
Separate passing is mandatory for Theory, Internal, practical and Project	**Total Marks for M.Sc. Course : 2400**

MSc-II Semester-III (Computer Science)
SWM-301::**Artificial Intelligence**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Apply problem solving by intelligent search approach.
2. Represent knowledge using AI knowledge representation techniques.
3. Design Machine Learning solution to real life problems.
4. Derive solutions for problems with uncertainty using Fuzzy theory.
5. Define a NLP problem and find a suitable solution to it.
6. To develop a good understanding of all aspects of Natural Language Processing (NLP) and Genetic algorithm

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UNIT-I **15hrs**

Introduction of AI and Problem Solving:
Artificial Intelligence, AI Problems, AI Techniques, The Level of the Model, Criteria For Success. Defining the Problem as a State Space Search, Problem Characteristics , **Search and Game Playing**: Breadth first search, depth first search, hill climbing, heuristic search, Best first search, A* algorithm, AO* algorithm, Minmax & game trees, refiningminmax, Alpha – Beta pruning, constraint satisfaction

UNIT-II **15hrs**

Knowledge Representation
Introduction, Propositional Logic, Syntax and Semantics, Interpretations, Properties, Predicate Calculus, WFF, Free and Bound Variables, Normal Forms, Inference Techniques, Resolution, Unification, Modes Pones, Frames, Frame Representation Language, Conceptual Dependency, CD Theory, Script, Semantic Net, Conceptual Graph, Rule Based Representation, Forward and Backward Reasoning

UNIT-III **15hrs**

Neural Networks: Introduction, Basic Concepts of Neural Networks, Model of an Artificial Neuron, Activation Functions, Feedforward Network, Recurrent Network, Learning Methods, deep learning and deep neural network.Fuzzy Set Theory, Fuzzy Membership, Fuzzy Operations, Fuzzy Logic Systems.

UNIT-IV **15hrs**

Natural Language Processing: Introduction, Syntactic Processing,Semantic Analysis, Discourse and Pragmatic Processing.

Genetic Algorithm: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, the Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm,

Reference Book

1. Elaine Rich and Kelvin Knight, **Artificial Intelligence**, Tata McGraw Hill, 2002.
2. Nils J Nilson, **Artificial Intelligence: A New Synthesis**, Morgan Kaufmann Publishers , Inc., San Francisco, California, 2000.
3. R. Akerkar, **Introduction to Artificial Intelligence**, Prentice-Hall of India, 2005
4. Winston P.H, "Artificial Intelligence", Addision Wesley (1993)
5. B. Yegnanarayana, **Artificial Neural Networks**, Prentice-Hall of India, 2006
6. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, S. Rajasekaran, G. A. VijayalakshmiPai, Prentice-Hall of India, 2003
7. Artificial Intelligence: A Modern Approach, 2nd edition, by Russell and Norvig, Prentice Hall

MSc-II Semester-III (Computer Science)
CC-302: **Advanced Web Technology**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Students will be able to develop application using MVC
2. Students will be able to understand Entity Framework
3. Students will be able to understand Web API
4. Students will be able to understand and use azure services
5. Students will be able to understand the use bootstrap

UNIT -I **(15hrs)**

Introduction to MVC, Benefits of using ASP.NET MVC, Role of Model, View, and Controller, ASP.NET MVC Works, Naming conventions, Creating views, Defining controllers, Defining a data model, Creating strongly-typed views, Creating strongly-typed views

Razor View Engine: Razor Basics, Razor design goals, Implementation of Razor view, Razor syntax, Accessing Model Data in Razor views

UNIT -II **(15 hrs)**

Using Entity Framework:Crud Operations, Crud Operation Using BO Class, Crud Operations Using Generic BO Class. **Authentication and Authorization:** Windows Authentication, Forms Authentication, Role Based Authentication,

Working with URLs and Routing:Understanding the Routing Mechanism,Adding a Route Entry, Using Parameters, Using Defaults, Using Constraints

UNIT -III **(15 hrs)**

ASP.NET Web API with MVC: Overview of the ASP.NET Web API, Building servers and clients,Content negotiation, Validation, Dependency Injection

MVC State Management: Using hidden fields, Session and Application State, Custom model bindings

Azure Services: Cloud Computing, Cloud Characteristics, Cloud Computing Service Models, Introduction to Azure, Benefits of Azure, Azure Hosting Models, Azure Services, Azure Portals

UNIT -IV **(15 hrs)**

Introduction to Bootstrap: History of Bootstrap, Advantages of Bootstrap Framework,Responsive webpage,Bootstrap Grid,Container, Offset Column, Reordering Columns, Bootstrap Typography, Bootstrap Tables, Bootstrap Form Layout, Bootstrap Components, Glyphicons Component

Reference Books:

1. Professional ASP.NET MVC 5, by Jon Galloway, Brad Wilson, K. Scott Allen, David Matson
2. ASP.NET MVC 4 and the Web API: Building a REST Service from Start to Finish by Jamie Kurtz
3. Mastering Bootstrap 4 by Benjamin Jakobus and Jason Marah
4. Mastering Microsoft Azure Infrastructure Services by John Savill

MSc-II Semester-III (Computer Science)

CC-303: **PHP**

To be implemented from the academic year 2020-2021

External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Understand how server-side programming works on the web.
2. PHP Basic syntax for variable types and calculations.
3. Creating conditional structures
4. Storing data in arrays
5. Using PHP built-in functions and creating custom functions
6. Write PHP scripts to handle HTML forms.
7. Understanding POST and GET in form submission.
8. How to receive and process form submission data.
9. Reading and writing cookies.
10. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
11. Analyze and solve common Web application tasks by writing PHP programs.
12. Prepares the students to undertake PHP projects independently

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UNIT-I **15hrs**

Introduction of PHP, Structure of PHP Program, Pre-Defined Constants, Magic Constants and Super Globals in PHP , Data Types in PHP , I/O Statements , Variable Declaration Issues in PHP, Scope and Lifetime of Variables, Defining Constants , Type Casting , Testing the Value of a Variable , Operators in PHP, Precedence and Associativity of Operators, Including External File in PHP Script, Control and Looping Statements , Control Structures , Conditional Structures , Iterative Structures

UNIT-II **15hrs**

Arrays in PHP , Types of arrays , Indexed arrays , Associative arrays , Nested arrays , Multi-dimensional arrays , Sorting arrays , Displaying contents of an array in HTML table, Array functions in PHP

Functions in PHP : Defining a function , Conditional Functions , Functions with parameters , Functions with return values , Assigning Default Values to Function Parameters , Functions with static variables , Passing Array to a Function ,Function with Variable No. of Arguments , Function Returning Multiple Values , Passing Array to a Function and Returning List , Nested Functions ,Recursive Functions , Anonymous Functions , Dynamic Function Calls , Callback Functions

UNIT-III **15hrs**

File Handling in PHP : File I/O Operations , Checking File Permissions , Local File System Manipulation , Working with CSV Files, PHP Directory Operations, Exception Handling , Error Handling , Definition of Exception , Standard Keywords in Exception Handling , General Structure of Exception Handling Block , Difference Between Exception and Error , Uncaught Exceptions , Rules Governing Exception Handling , Pre-defined Exceptions , Methods of Exception class , Catching Multiple Exceptions , Nesting try blocks

UNIT-IV **15hrs**

Web Development and Session Management in PHP: Static and Dynamic Web Pages , Communication Between HTML and PHP , Difference Between Get and Post Requests , htmlspecialchars() Function , Guidelines in Designing a Form , Form Validation , Handling Multi-Valued Form Fields , Uploading a File in PHP , Accessing Information of Uploaded File 8.8.2 Uploading Multiple Files , Specifying Allowed File Formats , Restricting File Upload Sizes and File Extension , Session Management in PHP , Session Management Using Cookies , Sending Cookies in HTTP header , Creating a Cookie in PHP , Retrieving a Cookie in PHP , Deleting a Cookie in PHP , PHP Session , Location of Session Data , Starting a Session , Storing Data in the session , Displaying Session Variables , Destroying a Session

Reference :

1. Dr. Poornima G. Naik, Dr. Kavita S. Oza, PHP Concepts Unleashed For Novice – Vol I & II, Evincepub Publishing. 2018
2. Matt Doyle, Beginning PHP 5.3,Wiley India Edition,2012 .
3. PHP6 and MySQL, Steve Suehring, Tim Converse and Joyce Park, Wiley India 2010, SecondEdition
4. VikramVaswani, PHP: A Beginners guide,TataMcgraw Hill,2009.
5. Core PHP Programming" by Atkinson Leon, SuraskiZeev, Pearson Publication
6. Larry Ullman, PHP 6 and MySQL 5,Pearson Education,2008.

MSc-II Semester-III (Computer Science)
Elective-II: CE-304.1: **Software Quality Assurance**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Understand the basic tenets of software quality and quality factors.
2. Be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components.
3. Understand of how the SQA components can be integrated into the project life cycle.

Unit-I **(15 Hours)**

Software Quality and SQA architecture.

The software, Software errors, faults and failures, Classification of causes of software errors, Software quality-definition, Need, Software quality factors- McCall's quality model , Software Quality Assurance (SQA)- definition and objectives., SQA system and architecture , Software Project life cycle Components- Reviews, Expert opinions, Software testing, Software maintenance components, Assurance of the quality of the external participant's work

Unit-II **(15 Hours)**

SQA components in the project life cycle.

SQA components in the project life cycle- Formal design reviews, Peer reviews, Expert opinions, Software testing**. Integrating quality activities in the project life cycle** : classic and other software development methodologies, Factors affecting intensity of quality assurance activities in the development process, verification, validation and qualification.

Unit-III **(15 Hours)**

Review- Objectives-Direct, indirect, Reviewing Methods-**Formal design reviews**- The participants in a DR, Preparations for a DR, The DR session , Post-review activities, **Peer reviews** (inspections and walkthroughs)- Participants of peer reviews, Preparations for a peer review session, The peer review session, Post-peer review activities, The efficiency of peer reviews, Peer review coverage, **Expert opinions**

Unit-IV **(15 Hours)**

Software testing strategies and SQA maintenance components.

Testing-Definition and objectives-direct, indirect, Software testing strategies, Software test classifications- according to testing concept and requirements, White box testing, black box testing, The testing process, Test case design, Automated testing, Alpha and beta site testing.
SQA maintenance- components-Corrective maintenance, Adaptive maintenance, Functionality improvement maintenance, Software maintenance QA activities: objectives, The foundations of high quality-foundation 1 and 2, Pre-maintenance software quality components- Maintenance contract review and plan, Maintenance software quality assurance tools

Text book:

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.

Reference Books:

1. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
2. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997.

MSc-II Semester-III (Computer Science)

Elective-II: CE-304.2: **Advanced Data Science**

To be implemented from the academic year 2020-2021

External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
2. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
3. Implement deep learning algorithms and solve real-world problems.

Unit-I **15hrs**

Numerical Computation: Overflow and Underflow, Poor Conditioning, Gradient-Based Optimization, Constrained Optimization, Stochastic Gradient Descent **Deep Networks**: Challenges Motivating Deep Learning, Deep Feedforward Networks, Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

Unit-II **15hrs**

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness , Semi-Supervised Learning , Multi-Task Learning , Early Stopping, Parameter Tying and Parameter Sharing , Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training , Tangent Distance, Tangent Prop, and Manifold Tangent Classifier

Unit-III **15hrs**

Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms

Unit-IV **15hrs**

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function,

Structured Outputs , Data Types, Efficient Convolution Algorithms , Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.

References:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville , " Deep Learning" , www.deeplearningbook.org
2. Adam Gibson and Josh Patterson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, Inc.
3. SantanuPattanayak, "Pro Deep Learning with TensorFlow: A Mathematical Approach", Apress.
4. Daniel Slater, GianmarioSpacagna, and Peter Roelants, " Python Deep Learning", Packt>
5. John D. Kelleher , Brendan Tierney , " Data Science" (MIT Press Essential Knowledge series),

MSc-II Semester-III (Computer Science)
Elective-II: CE-304.3: **Network Security Analyst**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of network security.
2. Apply different verification techniques to achieve authentication and create secure applications
3. Apply network security basics, analyze different attacks on networks
4. Get introduced to port scanning, Sniffing , identity attacks etc.
5. Apply the knowledge of cryptographic utilities and authentication mechanisms to designsecure applications
6. Understand different Kerberos versions and working of firewalls

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Unit I: **15hrs**

Introduction: Security Attacks, Security Services, Integrity check, Secret Key Cryptography: Block Encryption, DES rounds, S-Boxes.
IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES. Hash Functions and Message Digests

Unit II: **15hrs**

Authentication: Password Based, Address Based, Cryptographic Authentication. Passwords in distributed systems, on-line vs offline guessing, storing.
Cryptographic Authentication:passwords as keys, protocols, KDC's Certification Revocation, Inter domain, groups, delegation.
Authentication of People: Verification techniques, passwords, length of passwords, password

distribution, smart cards, biometrics. Security Policies and Security Handshake Pitfalls: Protocol problems, assumptions, Shared secret protocols, public key protocols, mutual authentication, reflection attacks, use of timestamps, nonce and sequence numbers, session keys, one-and two way public key based authentication.

UNIT-III **15hrs**

Network Security: IANA, Allotment of IP Address, IPv4 and IPv6, IP Address – Basic, Detecting, Ping and Ping Sweep, Ping Sweeping tools, Nmap - common commands, Trace Router, Detecting Victim's OS, Detecting Firewall, Countermeasures.

Port-Scanning: Type of Ports, Virtual Port numbers, Detecting Open Ports, Tools to carry out Port Scanning, Anti-Port scanning tools, Port Manager, Countermeasures. Overview of Wireshark.

Sniffing: Introduction, Basic Sniffing, Man-in-the-middle Attack.

Identity Attacks: Introduction, Staying Anonymous, Web Proxy, IP Proxy, Proxy Bouncing, Tor browser, Add-ons, Steganography and Steganalysis, Steganography tools.

Unit IV **15 hrs**

Kerberos: purpose, authentication, serer and ticket granting server, keys and tickets, use of AS and TGS, replicated servers. Kerberos V4: names, inter-realm authentication, Key version numbers. Kerberos V5: names, realms, delegation, forwarding and proxies, ticket lifetimes, revoking tickets, multiple Realms. Firewalls, Intrusion Detection

References:

1. AtulKahate, Cryptography and Network Security, McGraw Hill.
2. Joseph MiggaKizza, Guide to Computer Network Security, Springer International Publishing AG 2017
3. Kaufman, c., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall PTR., 2002.
4. Stallings, W.,.Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR.,2003.
5. Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.
6. Information Security Intelligence Cryptographic Principles and App. Calabrese Thomson.

MSc-II Semester-III (Computer Science)

Elective-II: CE-304.4: **Internet of Things**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Theory-04 hrs. /week

Course outcomes:

1. Apply the concepts of IoT.
2. Identify the different technologies.
3. Apply IoT to different applications.

4. Analysis& evaluate protocols used in IoT.
5. Design smart city in IoT.
6. Analysis data received through sensors in IoT.

Unit-I **15hrs**

Basics of IoT: Characterization of IoT, Physical design, IoTprotocols,Functional blocks, Communication model,Communication APIs,Enabling technologies, Wireless sensornetworks, Big data analytics, Communication Protocols,Embedded Systems, M2M,Difference between IoT and M2M. IoTSmart-X applications: Home Automation, Cities, Environment,Energy, Logistics, Agriculture, Industry, Health & Lifestyle.

Unit- II **15hrs**

Architecture for IoT: Domain model specification, InformationModel Specification, Service specification, IoT Level specification,Functional view, Operational view, Device and ComponentIntegration, User centered design, Open source development, Enduser programming, Tools for IoT.

Unit − III **15hrs**

Towards web of things: Platform design methodologies,Servicing through uniform interface, Syndicating things, Webenabling, Constrained devices, Future Web of things. IoT physicaldevices and End points: IoT devices,Raspberry Pl interfaces,Arduino interfaces, programming Raspberry Pi with Python,OtherIoT devices.

Unit − IV **15hrs**

IoT Analytics- Business Process in IoT, Creative ThinkingTechniques, Modification,Combination Scenarios, Decentralizedand Inter operable ,Approaches, Object − InformationDistribution,Architecture, Object Naming Service (ONS),ServiceOriented Architecture, Network of Information.

MSc-II Semester-III (Computer Science)
CCPR-305: **Advanced Web Technology Lab**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Practical-06 hrs. /week

Lab assignments based on Advanced Web Technology Course.

MSc-II Semester-III (Computer Science)
CCPR-306: **PHP Lab**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Practical-06 hrs. /week

Lab assignments based on PHPCourse.

MSc-II Semester-III (Computer Science)
CCPR-307: **Project**
To be implemented from the academic year 2020-2021
External Marks-80 Internal Marks -20 Practical-06 hrs. /week

Course outcomes:

1) Gain skills as they apply knowledge effectively in diverse contexts.
2) Analyse and model requirements and constraints for the purpose of designing and implementing software artefacts and IT systems
3) Design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification
4) Present a clear, coherent and independent exposition of software applications, alternative IT solutions, and decision recommendations to both IT and non-IT personnel via technical reports of professional standard and technical presentations.
5) Team work: Work effectively in different roles, to form, manage, and successfully produce outcomes from teams, whose members may have diverse cultural backgrounds and life circumstances, and differing levels of technical expertise.

MSc-II Semester-IV (Computer Science)
CCPR-401: **Research Seminar**
To be implemented from the academic year 2020-2021
Internal Marks -100 Practical-08 hrs. /week

At the end of fourth semester 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.

MSc-II Semester-IV (Computer Science)
CCPR-402: **Industrial / Research Project**
To be implemented from the academic year 2020-2021
External Marks-150 Internal Marks -50 Practical-04 hrs. /week

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 50 marks for internal assessment and 150 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 markability, business plan and cash flow will be part of the Evaluation criteria.