PROPOSED

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: Post Graduate Diploma in Computer Applications(P.G.D.C.A.)

Programme Specific Outcome(PSO)

PSO1. Acquire conceptual skills in Computer Fundamentals as well as in Computer applications.
PSO2. Gain knowledge of database systems, operating systems, web technologies and relevant modern issues.
PSO3. Understand, analyze and develop computer programs in the areas related to application development, web design and networking for efficient design of computer-based systems of varying complexity.
PSO4. Acquire skills and apply standard practices and strategies in software project development using open source programming environments.
PSO5. Learn to design and make systems, components or processes to meet desired needs within realistic constraints.
PSO6. Communicate, develop, maintain and implement software systems.
PSO7. Implement and maintain network hardware and operating systems.
PSO8. Employ advanced computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.
PSO9. Exposure to application development through project.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mathematics**	**Academic Year**	**2021-22**

Post Graduate Diploma in Computer Applications(P.G.D.C.A.): Regular Programme

Year	**I**	**Core / ~~Elective / Foundation~~** Principles of System Management and Databases	**Credits / Hours per week**	**05**
Semester	**I**	Year of Introduction: 2014 Year of Syllabus Revision: 2024	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO)
CO1 Describe the fundamental elements of relational database management systems
CO2 Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3 Design ER-models to represent simple database application scenarios
CO4 Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
CO5 Improve the database design by normalization.
CO6 Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.
CO7 Attain a good practical understanding of SQL.
CO8 Develop SQL queries to create, read, update, and delete relational database objects.
CO9 Identify various types of information systems concepts and terminologies.
CO10 Discuss the initial phases of the System Development Life Cycle

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**DBMS Theory**	10	16.66	1,2,4,5,6	CO1 CO2	PSO2	EMP SD	G	PE

	Introduction: Data, Data models, Database languages, Data base users, Database administration. Entity-Relationship modeling: E-R diagrams, mapping constraints, Keys, E-R Database scheme and its reduction to tables.				CO3 CO4				
2.	Relational model: Structure of relational databases, The relational algebra, Relational calculus, Views. Relational database design: Decomposition, functional, multivalued and join dependencies, Normal forms.	10	16.66	1,2,3,5,6	CO5 CO6 CO7	PSO3			
3.	Integrity constraints: Domain constraints, Referential integrity, Assertions, triggers, functional dependencies. Indexing and Hashing: Ordered indices, B^+ and B^- tree indices, Static & Dynamic hashing.	04	6.67	1,2,3,5,6	CO7 CO8	PSO3 PSO5			
4	**System Analysis and Design** Components and users of systems, Role of system analyst, Categorization of Information Systems, Designing approaches (linear life cycle, evolutionary, prototyping), Dataflow diagrams, function decomposition diagram	16	26.67	1,2,3,4,5,6	CO9 CO10	PSO3 PSO6			
6	**PostgreSQL / MySQL** Basic SQL commands - Creating, adding, viewing, selecting, removing, modifying Constraints – NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY Custom Queries-Using NULL, column labels, AND/OR usage, LIKE comparison, CASE clause	20	33.34	1,2,3,4,5,6	CO7 CO8	PSO2 PSO8 PSO9			

	SQL Aggregates -Aggregates, using GROUP BY, using HAVING Joining tables, Combining SELECT, Transactions and locks, procedural concepts								

Reference Books

1. A. Silberschatz, Korth, Sudarshan, Data base system concepts, The McGraw-HillComp. Inc., 3rd edition 1997.

2. A. K. Majmudar, P. Bhattacharya, Database Management Systems, Tata McGraw Hill, 1996.

3. C. J. Date, An introduction to Database Systems, VolumeI, Addison Wesley 5th edition, 1994

4. J. D. Ullman, Principles of Database and knowledge base system, Volume-II, Computer science press, Rockville, MD, 1988.

5. Hawryszkiewycz, Introduction to System Analysis and Design, Prentice-Hall of India, 2nd edition

6. Priti Srinivas Sajja, Essence of System Analysis and Design, Springer

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

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PSO9. Exposure to application development through project

	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Applied Mathematics	**Academic Year**	**2021-22**

Post Graduate Diploma in Computer Applications: Regular Programme

Year	**I**	**Core / ~~Elective / Foundation~~ AMT****: Data Communications and Cloud Computing**	**Credits / Hours per week**	**05**
Semester	**II**	Year of Introduction: 2014 Year of Syllabus Revision: 2021	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) AMT2313

- CO1 Have knowledge of LAN, WAN and MAN.
- CO2 Have knowledge of different networking devices and networking topology.
- CO3 Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Layers 1-3
- CO4 Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- CO5 Have an understanding of the issues surrounding Mobile and Wireless Networks.
- CO6 Have a working knowledge of datagram and internet socket programming.
- CO7 Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
- CO8 Choose the appropriate technologies, algorithms, and approaches for the related issues.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Types of networks- LAN, MAN and WAN-their features and connectivity. Transmission	5	8.33	1,2,3	CO1	PSO1 PSO6	SD	G	PE

	media (Guided-twisted pair cables, coaxial cables, Fiber optics, Unguided-Terrestrial microwave, Satellite communication), Routers, Bridges, Hubs, Switches, Gateway.								
2	Bus,Tree, Star, Ring, Hybrid, Protocols, ISO OSI Model of networks; Seven layers and their working, TCP/IP model; its four layers and their working	10	16.67	1,3,4	CO2 CO3	PSO1 PSO6 PSO7			
3	IP Address, classes of IP address, classless IP address, subnetworks, Address Resolution Protocol. IP Datagrams and Datagram Forwarding, IP Encapsulation, Fragmentation and Reassembly, IPv6, Error Reporting Mechanism (ICMP), TCP and UDP, routing and routed protocols.	10	16.67	1,2,3,6	CO4 CO5	PSO1 PSO6 PSO7			
4	The Socket Inteface, Algorithms in Client Software Design, TCP Client for echo server, UDP Client for echo server, Iterative connectionless servers, Iterative connection oriented servers.	10	16.67	3,4,5,6	CO3 CO6	PSO1 PSO6 PSO7			
5	Introduction to Different Computing Paradigms such as Stand-alone, Parallel, Grid, Distributed and Cloud Computing, Cloud Computing overview, cloud components, Cloud service models (IaaS, PaaS, SaaS) and deployment models (Public, Private, Hybrid), Storage, Database Services Hypervisor applications. First Movers in the Cloud. Benefits and limitations of cloud computing.	10	16.66	1,2	CO7	PSO1 PSO6 PSO7			
6	Google App Engine, Google Web Toolkit. EMC: Technologies, Vmware Acquisition. Amazon Elastic Compute Cloud, Amazon SimpleDB, Amazon Simple Storage Service. Accessing the Cloud: Platforms, Web Applications, Web API's, Web Browsers. Cloud Storage: Overview, Cloud Storage Providers, Standards: Application, Client, Infrastructure, Service.	15	25	1,2,3	CO8	PSO1 PSO6 PSO7			

Reference Books	
1.	Martin R. Arick: The TCP / IP companion a guide for common user, Publications & Pvt. Ltd.B'bay, 1993.
2.	E. D. Taylor: Demystifying TCP / IP, BPB, 1993
3.	Douglas E. Comer: Computer Networks and Internets, Pearson, 2018.
4.	Andrew S.Tanenbaum: Computer Networks, Prentice Hall, 2013.
5.	David Vaskevitch:Client/Server Strategies, John Wiley & Sons Inc., 1995
6.	Doubles E. Comer, David L. Stevens : Internetworking with TCP/IP Volume-III, Pearson Education, Asia, 2000.
7.	Toby Velte, Anthony Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, The McGraw-Hill Companies, 2009.
8.	Kant Hiran, Kamal, Ruchi Doshi et. Al: Cloud Computing: Master the Concepts, Architechture and Applications with Real-world examples and Case Studies, BPB Publisher, 2019.

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Syllabus of Courses

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Post Graduate Diploma in Computer Applications(P.G.D.C.A.): Regular Programme				
Year	**I**	**Core / ~~Elective / Foundation~~** **Fundamentals of Web application development**	**Credits / Hours per week**	**05**
Semester	**I**	Year of Introduction: 2021 Year of Syllabus Revision: -	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO)

CO1 Understand C# language constructs, syntax and semantics and write basic C# programs.
CO2 Understand and implement methods and structures in C#.
CO3 Understand object-oriented programming concepts and able to Construct classes, methods, and assessors, and instantiate objects.
CO4 Apply the concepts of exception handling and object-oriented methodology in the application.
CO5 create web applications, web services, and dynamic websites using ASP.NET

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Introduction to C#:**								

	Object Oriented Concepts, C# Program – Execution, Sample Programs, Command Line Arguments, Programming Examples, Multiple Main Methods. **Literals, Variables and Data Types**: Keywords, Identifiers, Literals, Variables, Data Types, Boxing and Unboxing. **Operators and Expressions:** Operator Precedence and Associativity, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Type Conversions. **Branching and Looping Structure:** Decision Making Statements, The Switch Statement, The ? operator, Decision Making and Looping, Jumps in Loops, Labeled Jumps. **Arrays and Strings:** Single Dimensional Arrays, Multidimensional Arrays,Jagged Arrays, System. Array Class, ArrayList Class, Strings, Regular Expressions.	15	25	1,2,3,4	CO1	PS08	EMP SD	G	PE
2	**Methods in C#:** Declaring Methods, Main Method, Invoking Methods, Nesting of Methods, Method Parameters. **Structures and Enumerations**: Structures-Defining a Structure, Assigning	05	8.3	2,3,4,6	CO2	PSO3 PSO8			

	Values to Members , Copying Structures , Structures with Methods , Nested Structures , Classes Vs Structures, Guidelines to use Structures; Enumerations- Enumerator Initialization, Enumerator Base Types, Enumerator Type Conversion.								
3	**Classes and Objects:** Classes, Constructors & Destructors, Member Initialization, 'this' Reference Variable, Nesting of Classes, Members, Properties. **Inheritance and Polymorphism:** Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Subclass Constructor, Method Overriding, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes, Sealed Methods, Polymorphism.	10	16.67	2,4,6	CO3	PSO3 PSO8			
4	**Exception Handling:** Exceptions – An Overview, Exception Handling Syntax, Multiple Catch Statements, The Exception Hierarchy, General Catch Handler, Using 'Finally', Nested Try Blocks, User Defined Exceptions, Operators – Checked and Unchecked. **Interfaces, Delegates and Events:** Defining Interfaces, Extending Interfaces, Implementing Interfaces, Explicit Interface Implementation,	10	16.67	2, 3,4,5,6	CO4	PSO3 PSO8			

	Abstract Classes and Interfaces, Delegates, Multicast Delegates, Events								
5	**Web Application Development (ASP.NET)** **Introduction to ASP.NET :** Working with Web and HTML Controls, Using Rich Server Controls, Login controls, Overview of ASP.NET Validation Controls, Using the Simple Validations, Using the Complex Validators Using the Complex Validators	10	16.67	2,3,4,5,6	CO5	PSO2 PSO3 PSO8 PSO9			
6	**ASP.NET Working With Data :** Data Binding, State Management, Validation, Caching, Introduction to ASP.NET Model View Controller(MVC) and Windows Presentation Foundation (WPF)	10	16.7	2,3,4,5,6	CO5	PSO2 PSO3 PSO8 PSO9			

Reference Books

1.	Andrew Troelsen, Philip Japikse: Pro C# 7: With .NET and .NET Core, Apress, 2018
2.	Joseph Albahari and Ben Albahari, : C# 7.0 in a Nutshell , OREILLY
3	Jon Skeet : C# in Depth, 4th Edition, Manning publications Co., 2019
4	Tim Warren : ASP.NET For Beginners: The Simple Guide to Learning ASP.NET Web Programming Fast!, Kindle edition, 2019
5	Matthew MacDonald : Beginning ASP.NET 4.5 in C#, Apress

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The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mathematics**		**Academic Year**	**2021-22**

Post Graduate Diploma in Computer Applications: Regular Programme

Year	**I**	**Core / ~~Elective / Foundation~~ AMT****: Unix and Programming in C**	**Credits / Hours per week**	**05**
Semester	**I**	Year of Introduction: 2014 Year of Syllabus Revision: 2021	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) AMT4102

CO1 To understand computer fundamentals an to learn command structure of UNIX, various types of shells and types of commands and familiarize students with some general commands, directory and file related commands, process related and user communication related commands in UNIX.
CO2 To learn editors available in UNIX and the detailed working on the most Vi editor
CO3 To implement shell programming, wild cards and how to write simple shell programs, introduce concepts of decision control, looping, nested looping and control flow clauses in shell programming.
CO4 Learn about the flowchart and design an algorithm for a given problem and to develop simple C – programs using operators.
CO5 Study about Conditional and Iterative statements which are available in C – language.
CO6 Learned about the importance and use of Arrays and Functions in C – language.
CO7 Learned about Strings, Pointers, Structures, Unions and Command Line Arguments.
CO8 Understand the concepts like File Handling in C-language.

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction to computers: Characteristics of Computers, History of Computers, Generations of computers, Classification of computers, Applications of computers, Hardware, Software, Firmware, Computer Architecture & Organization, Information Representation & Codes, bits, bytes, memory size, Input/output Devices, Secondary Storage Devices, System	05	8.33	1,2,3,5	CO1	PSO1 PSO8	SD	G	PE

	Software (Translators, Interpreters, Compilers, Assemblers.) & Application Software, Popular Operating Systems, Generations of Languages, Number systems.								
2	History of UNIX, various UNIX versions. Overview of UNIX: UNIX goals, Interfaces to UNIX, Logging into UNIX¸ Password security. UNIX kernels & shells: Kernel and Shell layers, various shells.	10	16.67	1,2,3,5	CO1	PSO1 PSO8 PSO1 PSO8			
3	Files and directories in UNIX, UNIX utility programs. Fundamental concepts in UNIX: Process in UNIX, The UNIX memory model, the UNIX file system. input/output in UNIX. UNIX system calls: Process management, Memory management, Files and directory system calls. Input/output system calls. UNIX editors and Basic UNIX Commands. vi editor, Redirections, piping, Tees, Filters, UNIX Utilities. Unix shell scripts. Note: These may be introduced with reference to LINUX, IRIX, or any other UNIX.	10	16.67	1,2,3,5	CO2, CO3	PSO1 PSO2 PSO8			
4	Algorithms: Definition and properties, developing well-known algorithms, using flow-chart, machine language, assembly language, High-level languages.	05	8.33	1,2,3,5,6	CO4	PSO1 PSO3 PSO4 PSO8			
5	Structure of a C program, the function main, header files, C pre-processor. Built - in data types: int, float, char, double, Constants and variables, variable declarations, Input/Output of basic data types. Arithmetic operators, relational operators, logical operators, expressions, precedence and order of execution, the	15	25	1,2,3,5	CO5	PSO1 PSO3 PSO4 PSO6 PSO8			

	assignment operator. Control structures, if…else, else if, switch, while loop, for loop, do…while loop, break and continue statements.								
6	Arrays-one dimensional and two-dimensional arrays, their internal representation, benefits of using arrays, Built-in, user defined functions. Structures, unions, enumerated types. Pointers. File handling. Additional features of C(Macro, symbolic constants, preprocessor statements, etc.)	15	25	1,2,3,5	CO6 CO7 CO8	PSO1 PSO3 PSO4 PSO6 PSO8			

References

1	Gottfried **:**Programming with C, Mcgraw Hill, Schaum's outline series, 2018.
2	B. W. Kernighan and Denis M. Ritchie **:** The C Programming Language, Prentice Hall of India Ltd., 2015.
3	B.W.Kernighan & R Pike**:** The UNIX Programming Environment, P.H. of India, 2015.
4	S.Prata **:**Advanced UNIX-A Programmer's guide, BPB Pub., New Delhi, 2008.
5	Working with 'C': Yashwant Kanetikar, BPB Publications, 1994.
6	Sumitabha Das: Unix Concepts and Applications, McGraw Hill Education, 2017.
7	A.S.Tanenbaum **:**Modern Operating Systems, P.H. of India, 2009

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Syllabus of Courses

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Post Graduate Diploma in Computer Applications (P.G.D.C.A): Regular Programme			
Year	**I**	**Core / ~~Elective / Foundation~~** **AMT** **Web Technologies**	**Credits / Hours per week**	**05**
Semester	**I**	Year of Introduction: 2014 Year of Syllabus Revision: 2021	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) AMT4103

CO1 Understand the functionality of Internet, different protocols, need of a website and web publishing.
CO2 Write well-structured HTML code
CO3 Use CSS to present the HTML code in different formats.
CO4 Develop a dynamic webpage by the use of java script.
CO5 Develop server-side scripts and make dynamic and interactive web pages.
CO6 Create, deploy and maintain websites
CO7 Gain the skills and project-based experience needed for entry into web application and development careers

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Word Wide Web (WWW)** History, Working, Web Browsers, Its	08	13.33	1,2					

	functions, Concept of Search Engines, Searching the Web, HTTP, URLs, Web Servers, Web Protocols. **HTML** Concepts of Hypertext, Versions of HTML, Elements of HTML, Head & Body Sections, Building HTML documents, formatting tags, Backgrounds and Color controls, HTML tags for creating Table, lists, inserting images, hyperlinks, Use of Frames, iframes and Forms in web pages				CO1, CO2	PSO1, PSO3	EMP SD	G	PE
2	**JavaScript** JavaScript Overview, JavaScript and the WWW, JavaScript vs. VBScript, JavaScript vs. Java, JavaScript versions, Script element, Inline JavaScript, Including JavaScript. JavaScript Comments: Comments overview, When to comment, Types of comments Variables: Variables overview, Declaring variables, Types of variables, Casting variables, Alert box Functions: Functions introduction, Calling functions Expressions: Arithmetic operators, Assignment operators, Logical operators, Expressions and precedence Statements: If statement, For statement, While statement, break/Continue	08	13.33	1,2,3	CO2, CO4, CO7	PSO1, PSO2, PSO3, PSO4, PSO5			
3	Cascading Style Sheet (CSS) CSS introduction: Benefits of CSS, CSS Versions , History, CSS Syntax, External Style Sheet , Multiple Style Sheets, Value Lengths and Percentages CSS2-Selectors: ID Selectors , Class	12	20.00	1,2,3	CO3, CO7	PSO1, PSO2, PSO3, PSO4, PSO5			

	Selectors, Grouping Selectors, Universal Selector, Descendant / Child Selectors Attribute Selectors etc CSS style of Text Fonts, Tables, display positioning etc.								
4	**jQuery** jQuery Introduction: Adding jQuery to Web Pages, syntax, jQuery selectors: element selector, jQuery #*id* selector, jQuery class selector etc. jQuery Events, various jQuery Effects, jQuery HTML: jQuery GET, SET, ADD, REMOVE etc. jQuery for CSS manipulations: jQuery for Get and Set CSS classes, css() method jQuery traversing: ancestors, descendants of an element, siblings of an element. basic filtering methods, jQuery AJAX	12	20.00	1,2,3,4,5	CO4, CO5	PSO1, PSO2, PSO3, PSO4, PSO5			
5	**PHP** Introduction, decision and loops, strings, functions, arrays, file handling, forms, session management, database connectivity with MySQL	10	16.67	1,2,3,4,5	CO5, CO7	PSO1, PSO2, PSO3, PSO4, PSO5			
6	**Web Publishing** Concepts, Domain name Registration, Space on Host Server for Web site, HTML, Design tools, HTML editors, Image editors, Issues in Web site creations & Maintenance, FTP software for upload web site	10	16.67	3,4,5,6	CO6, CO7	PSO5, PSO6, PSO8			

Reference Books

1.	V.K.Jain,	O level Module - M 1.2 - Internet & web page, BPB Publications.
2.	Alexis Leon and Mathews	Internet for Everyone Leon, Vikas Publishing House Pvt. Ltd.,New Delhi
3.	A Beginner's Guide to HTML: http://www.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimerAll.html	

4.	Laura Lemay, Rafe Colburn, Jennifer Kyrnin	Mastering HTML, CSS & Javascript Web Publishing, BPB Publications
5.	Thomas Powell	HTML & CSS: The Complete Reference, Fifth Edition, MC Graw Hill
6.	Jon Duckett	JavaScript and JQuery : Interactive Front-End Web Development
7.	Jonathan Chaffer, Karl Swedberg	Learning jQuery , 4th edition, Kindle edition, Packt Publishing
8.	Ryan Benedetti, Ronan Cranley	Head first jQuery : A Brain-friendly guide 1st edition, O'REILLY
9.	Bear Bibeault, Yehuda Katz, Aurelio De Rosa:	jQuery in Action, 3rd edition, Manning Publishing

Proposed

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Syllabus of Courses **Proposed**

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Post Graduate Diploma in Computer Applications (P.G.D.C.A): Regular Programme

Year	**I**	**Core / ~~Elective / Foundation~~** **AMT **** MACHINE LEARNING AND DATA SCIENCE**	**Credits / Hours per week**	**05**
Semester	**II**	Year of Introduction: 2021 Year of Syllabus Revision: -	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO)

CO1 Ability to convert the data in the usable form and analyze it statistically
CO2 Enhanced skill to use machine learning and advance machine learning techniques
CO3 Ability to do text mining and handle big data

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Getting Started with Raw Data** The world of arrays with NumPy, Creating an array, Operations on arrays,	8	13	1, 2, 4	CO1	PSO4	EMP SD	G	PE

	Indexing and slicing, Shape manipulation, Empowering data analysis with pandas : Series, DataFrame, Panel Inserting and exporting data: CSV, XLS, JSON Database, Data cleansing, missing data, String operations, Merging data, Data operations, Aggregation operations, Joins **Advanced Visualization of Data** Controlling the line properties of a chart, Using the setp() command, Creating multiple plots, Styling your plots, Heatmaps, Area plots, A 3D plot of a surface								
2	**Machine Learning** Different types of machine learning: Supervised learning, Unsupervised learning, Reinforcement learning, Decision trees, Linear regression, Logistic regression, The naive Bayes classifier, The k-means clustering, Hierarchical clustering **Performing Predictions with a Linear Regression** Simple linear regression, Multiple regression, Logistic regression,Training and testing a model, Creating training and testing sets, Building a model, Model evaluation,	10	17	1,2,3,4,6	CO2	PSO4, POS9			

	Evaluating a model based on test data, Model building and evaluation with SciKit								
3	**Pushing Boundaries with Ensemble Models** Exploring the large data, Decision trees, Random forests **Applying Segmentation with k-means Clustering** The k-means algorithm and its working, A simple example, Determining the number of clusters	06	10	1,2,3,6	CO2	PSO4,PSO9			
4	**Inferential Statistics** Various forms of distribution: A normal distribution, A Poisson distribution, A Bernoulli distribution, A z-score, A p-value, One-tailed and two-tailed tests, Type 1 and Type 2 errors, A confidence interval, Z-test vs T-test, The F distribution, The chi-square distribution, Chi-square for the goodness of fit, The chi-square test of independence, ANOVA **Inference from data** Data mining, Presenting an analysis, Examples	12	20	1,2,4,5	CO1	PSO4			

5	**Estimating the Likelihood of Events**, Data preparation and Analysis **Generating Recommendations with Collaborative Filtering** Recommendation data, User-based collaborative filtering, Finding similar users, The Euclidean distance score, The Pearson correlation score, Ranking the users, Recommending items, Item-based collaborative filtering	12	20	1,2,3,6	C02	PSO4			
6	**Analyzing Unstructured Data with Text Mining** Preprocessing data, Creating a wordcloud, Word and sentence tokenization, Parts of speech tagging, Stemming and lemmatization, Stemming, Lemmatization, Entity Recognizer, sentiment analysis **Leveraging Python in the World of Big Data** Hadoop, The programming model, The MapReduce architecture, The Hadoop DFS, Hadoop's DFS architecture, Python MapReduce, The basic word count, Deploying the MapReduce code on Hadoop, File handling with Hadoopy	10	16.67	1,2,3,6	CO3	PSO4 PSO9			

Reference Books

1.	Samir Madhavan, Mastering Python for Data Science, Packt Publishing, 2015.

2.	Sebastian Raschka, Python Machine Learning, Packt Publishing, 2015.
3.	Frank Kane, Hands-On Data Science and Python Machine Learning 1st Edition, Packt Publishing, 2015.
4.	EthemAlpaydın, Introduction to Machine Learning, Second Edition, The MIT Press, 2010.
5.	Haykin, Simon Neural networks and learning machines —3rd ed., Pearson Prentice Hall, 2008.

PROPOSED

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: Post Graduate Diploma in Computer Applications (P.G.D.C.A.)

Programme Specific Outcome (PSO)

PSO1. Acquire conceptual skills in Computer Fundamentals as well as in Computer applications.

PSO2. Gain knowledge of database systems, operating systems, web technologies and relevant modern issues.

PSO3. Understand, analyze and develop computer programs in the areas related to application development, web design and networking for efficient design of computer-based systems of varying complexity.

PSO4. Acquire skills and apply standard practices and strategies in software project development using open source programming environments.

PSO5. Learn to design and make systems, components or processes to meet desired needs within realistic constraints.

PSO6. Communicate, develop, maintain and implement software systems.

PSO7. Implement and maintain network hardware and operating systems.

PSO8. Employ advanced computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

PSO9. Exposure to application development through project.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mathematics**		**Academic Year**	**2021-22**
Post Graduate Diploma in Computer Applications (P.G.D.C.A): Regular Programme				
Year	**I**	**Core / ~~Elective / Foundation~~** **AMT** **Object Oriented Programming**	**Credits / Hours per week**	**05**
Semester	**II**	Year of Introduction: 2014 Year of Syllabus Revision:2021	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO)

CO1 Understand difference between Procedural Programming and Object Oriented Programming
CO2 Learn basics of concepts of Java: Datatypes, Operators, condtional statements, Loop Statements, Arrays
CO3 Able to understand object oriented approach of Java: class, constructors, methods, instance of class
CO4 Able to implement concepts of java like inheritance, polymorphism, encapsulation,
CO5 Students will learn database connectivity with java and will learn about GUI
CO6 Learn to construct various UML models.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Introduction to programming and history of programming** Procedural programming, Structured programming and Object Oriented Programming. Main features of object	5	8.36	1,2,3,4,5	CO1, CO2	PSO1, PSO3, PSO4, PSO8			

	oriented programming: encapsulation, inheritance and polymorphism. History of Java Language; Java programming environment and JDK; Structure of a Java Program. Compiling and running a simple java program. Demonstration of important features of java from the simple program framework.						EMP SD	G	PE
2	**Language fundamentals** Data Types – Primitive and Reference types. Literals of primitive types and String type. Variables and type declaration statements. Assignment operator. Widening and narrowing conversions among primitive and reference types. Casting and type conversion. Wrapper classes and their methods. Defining a class. Attributes and methods. Access specifiers. Instance and class members. Constructors and constructor overloading. Constructor chaining. Method overloading. Creation of objects and accessing instance methods. Writing procedural programs within the framework of a single class.	15	25	1,2,3,4,5	CO1, CO2, CO3	PSO1, PSO3, PSO4, PSO8			
3	**Reuse of existing classes** Aggregation and Inheritance, Creating subclasses, Chaining constructors: super(). Method overriding and variable shadowing. Constructing Inheritance hierarchies. Upcasting and Dynamic binding. Runtime polymorphism, the Object class and its methods. Fundamental classes from Java.lang and java.util packages.	10	16.66	1,2,3,4,5	CO3, CO4	PSO1, PSO3, PSO4, PSO8			
4	Interfaces, Packages and CLASSPATH. Exception handling. Multi-threading. Thread synchronization. Input and Output: The Java.io package. Input stream and Output stream	05	08.33	1,2,3,4,5	CO4	PSO1, PSO3, PSO4, PSO8			

	classes. Filter classes. Reader and Writer classes.								
5	GUI using the Swing components: create graphical user interfaces (GUIs) for applications and applets, using the Swing components. JavaFX – Developing Java based desktop and rich Internet applications,	10	16.66	1,2,3,4,5,6	CO5	PSO3, PSO4, PSO5, PSO8			
6	Introduction to JDBC database access: Processing SQL Statements with JDBC Packaging programs in JAR Files	05	08.33	1,2,3,4,5	CO5	PSO2, PSO3, PSO4, PSO5, PSO8			
7	Object Oriented analysis and design concepts, UML diagrams (use case, class, activity, sequence)	10	16.66	1,2,3	CO6	PSO3 PSO5 PSO6			

Reference Books

1.	Arnold and Gosling	The Java Programming Language, Addison-Wesley, 2005.
2.	Horstmann and Cornell	Core Java, Sun Microsystems & Prentice-Hall2012.
3.	Naughton and Schildt	Complete Reference Java, Tata McGraw Hill, 2017.
4.	Pravin M. Jain	The class of JAVA, Pearson, 2011.
5.	Erikson and Penker	UML Toolkit, John Wiley & Sons
6.	Fowler & Scott	UML Distilled, Addison Wesley

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: Post Graduate Diploma in Computer Applications (P.G.D.C.A.)

Programme Specific Outcome (PSO)

PSO1. Acquire conceptual skills in Computer Fundamentals as well as in Computer applications.

PSO2. Gain knowledge of database systems, operating systems, web technologies and relevant modern issues.

PSO3. Understand, analyze and develop computer programs in the areas related to application development, web design and networking for efficient design of computer-based systems of varying complexity.

PSO4. Acquire skills and apply standard practices and strategies in software project development using open source programming environments.

PSO5. Learn to design and make systems, components or processes to meet desired needs within realistic constraints.

PSO6. Communicate, develop, maintain and implement software systems.

PSO7. Implement and maintain network hardware and operating systems.

PSO8. Employ advanced computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

PSO9. Exposure to application development through project.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mathematics**	**Academic Year**	**2021-22**

Post Graduate Diploma in Computer Applications (P.G.D.C.A): Regular Programme

Year	**I**	**Core / ~~Elective / Foundation~~** **AMT **** Programming in Python**	**Credits / Hours per week**	**05**
Semester	**I**	Year of Introduction: 2021 Year of Syllabus Revision: -	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO)

CO1 Familiar with Python environment, data types, operators used in Python. Compare and contrast Python with other programming languages.

CO2 Learn the use of control structures and numerous native data types with their methods.

CO3 Design user defined functions, modules, and packages.

CO4 Handling multidimensional arrays and implementing regression analysis, plotting 2D, 3D graphs

CO5 Identify and handle the exceptions in programs through appropriate exceptions handling methods

CO6 Familiar with the object oriented programming concepts

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Introduction to Python Programming Language:** Programming Language, History and Origin of Python Language, Features of Python,	5	8.3	1, 2, 3	CO1	PSO4	EMP SD	G	PE

	Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.								
2	**Python Data Types & Input/output:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. **Operators and Expressions:** Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators. **Control Structures:** Decision making statements, Python loops, Python control statements	15	25	1, 2	CO1, CO2	PSO1			
3	**Python Native Data Types**: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations). **Python Functions:** Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. **Python Modules:** Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.	10	16.7	1,2,3,4,6	CO3	PSO4			

4	**Numpy and Scipy libraries:** Multidimensional Numpy arrays, Numerical computation with Numpy arrays **Matplotlib and Data visualization:** 2-D and 3-D graphing Pandas library and handling data in CSV and various formats	10	16.7	1,2,3,6	C04	PSO4			
5	**Exception Handling:** Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. **File Management in Python**: Operations on files (opening, modes, attributes, encoding, closing, read() and write() methods, tell() and seek() methods, renaming and deleting files in Python, directories in Python.	10	16.7	1,2,3,6	CO5	PSO4			
6	**Classes and Objects:** The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.	10	16.7	1,2,3,6	CO6	PSO4			

Reference Books:

1.	John V. Guttag: Introduction to computation and Programming using Python, MIT Press (PHI reprint), Second edition, 2016
2.	Martin C. Brown: Python, The complete Reference, Mc Graw Hill Education
3.	A. Martelli, A. Ravenscroft, S. Holden: Python in a Nutshell, OREILLY
4.	Pooja Sharma : Programming in Python, BPB Publications, 2017
5.	R. Nageswara Rao: . Core Python Programming, 2nd Edition, Dreamtech

Web resources:

1.	https://docs.python.org/3/python 3.6 online documentation
2.	https://docs.python.org/3/tutorial/index.html Python online tutorial
3.	Python tutorials with Jupyter notebooks

MOOCs:	
1.	www.edx.org, Introduction to Computer Science Programming Using Python, Free online course offered by Eric Grimson, John Guttag from MIT
2.	www.coursera.org Programming for everybody (Getting started with Python). Charles Severance, University of Michigan