Re-Accredited by NAAC with 'A' Grade
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: નોટિસ :–

એકેડેમિક કાઉન્સિલની સભા **શુક્રવાર, તા.૨૧/૦૫/૨૦૨૧** નાં રોજ સવારે ૧૧:૦૦ કલાકે Social Distancing નું પાલન થાય તે રીતે ઓફલાઈન/ઓનલાઈન યુનિવર્સિટી કાર્યાલયના સેનેટ હોલમાં મળશે, જેમાં હાજર રહેવાની અનુકૂળતા કરવા વિનંતી છે.

–: કાર્યસૂચિ :–

(૧) એકેડેમિક કાઉન્સિલની **તા.૧૨/૦૫/૨૦૨૧** ની સભાની કાર્યવાહીની નોંધને બહાલી આપવા બાબત.
(નોંધ : પ્રસ્તુત એકેડેમિક કાઉન્સિલની સભાની કાર્યવાહી એકેડેમિક કાઉન્સિલનાં સભ્યશ્રીઓને તા.૧૨/૦૫/૨૦૨૧ ના પત્રક્રમાંક : એ/એ.કા./કા.વા./૬૨૯૪/૨૦૨૧ થી મોકલી આપવામાં આવી છે.)

(૨) B.C.A. (2nd Year), B.Sc.(ComputerScience) દ્વિતિય વર્ષ , M.Sc.(CA) દ્વિતિય વર્ષ, M.C.A. દ્વિતિય વર્ષના અભ્યાસક્રમ અંગે તા.૭/૦૧/૨૧ ની સભામાં નીમેલ પેટાસમિતિએ તૈયાર કરેલ અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંકઃ૨ અન્વયે નીચે મુજબના અભ્યાસક્રમ મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરેલ છે જે ભલામણ પર વિચારણા કરવા બાબત.

કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંકઃ ૨

:: આથી ઠરાવવામાં આવે છે કે, કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિની તા.૭/૦૧/૨૧ની સભામાં નીમેલ પેટાસમિતિએ તૈયાર કરેલ નીચે મુજબ નાં નવા અભ્યાસક્રમ મંજૂર કરી તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

(૧) B.C.A. (2nd Year) નો અભ્યાસક્રમ
(૨) B.Sc. (Computer Science) દ્વિતિય વર્ષનો અભ્યાસક્રમ
(૩) M.Sc. (CA) દ્વિતિય વર્ષનો અભ્યાસક્રમ
(૪) M.C.A. દ્વિતિય વર્ષના અભ્યાસક્રમ

(બિડાણ : ૧)
(એકેડેમિક વિભાગ)

(૩) એમ.એસ.સી.(આઈ.ટી./આઈ.સી.ટી.)ના એડહોક બોર્ડ દ્વારા મંજૂર થયેલા એમ.એસ.સી.(આઈ.ટી.) પ્રથમ વર્ષના અભ્યાસક્રમ અંગે ચર્ચા કરતા કોમ્પ્યુટર સાયન્સ અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંકઃ૩ અન્વયે મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરેલ છે જે ભલામણ પર વિચારણા કરવા બાબત.

<u>કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંકઃ ૩</u>

:: આથી ઠરાવવામાં આવે છે કે, એમ.એસ.સી.(આઈ.ટી./આઈ.સી.ટી.)ના એડહોક બોર્ડ દ્વારા મંજૂર થયેલા એમ.એસ.સી.(આઈ.ટી.) પ્રથમ વર્ષના અભ્યાસક્રમ મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

(બિડાણ : ૨)
(એકેડેમિક વિભાગ)

(૪) અધ્યક્ષશ્રીની મંજૂરીથી જે બાબત રજૂ થાય તે.

ક્રમાંક : એ/એ.કા./કા.સૂ./૬૪૩૪/૨૦૨૧
તા. ૧૭/૦૫/૨૦૨૧

ઈ.ચા. કુલસચિવ

પ્રતિ,
એકેડેમિક કાઉન્સિલના સર્વે સભ્યશ્રીઓ....

Syllabus for S.Y. B.C.A. (Sem-III and Sem-IV)

To be implemented from

Academic Year: June, 2021

: Submitted By:

Syllabus Committee

1) Dr. Snehal K. Joshi (Chairman)

2) Dr. Ashok Solanki

3) Dr. Bharat Patel

4) Prof. Dhananjy Patel

5) Dr. Kavita Ahuja

6) Prof. Vaibhav Desai

7) Prof. Pratiksha Patel

8) Mr. Indravadan Sadhwani

Veer Narmad South Gujarat University, Surat
Bachelor of Computer Application (B.C.A.)
Under the Faculty of Computer Science, Application and Information Technology

Name of Program:	**Bachelor of Computer Application**
Abbreviation:	**B.C.A.**
Duration:	**3 Years (Regular)**
Eligibility:	**Candidate must have passed standard 12th (H.S.C.) Examination in Science (Any Group) / Commerce / vocational / General stream through Gujarat Higher Secondary Board (G.H.S.E.B.) or any other equivalent board (C.B.S.E. / I.C.S.E. etc. which must be approved and possess equivalence certificate from Veer Narmad South Gujarat University) with English as one of the subject. In case of candidates passed out from 12th (H.S.C.) General Stream, Statistics/Economics/Business Mathematics must be one of the subjects. In case of Students passed out with 12th (H.S.C.) vocational stream, Computer and English must be one of the subject.**
Objective of the Program:	**Objective of the program is to open a channel of admission for courses in Computer Science for students who have completed standard 12th (H.S.C.) and are interested in taking computing/IT as a career.** **The program caters to the needs of the students aspiring to excel in the field of computer science. The program is designed to develop computer professionals versatile in almost all field of computer application. The main emphasis of the course is an applied computer use in various fields.**
Program Outcome:	**It will prepare the aspiring students to become computer programmers who can work in companies at entry level and can also work independently.**
Medium of Instruction:	**English**
Program Structure:	**Semester-wise Breakup of the course is given as follows :**

Program Structure: S.Y.B.C.A. (SEM – 3 and SEM – 4)
(w.e.f. Academic Year June, 2021 – 2022)
Bachelor of Computer Application (B.C.A.)

Program Structure	Semester-wise break up for the courses is given below:

SEMESTER - 3

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
301	Statistical Methods	2	0	2	3 Hrs	70	30	100
302	Software Engineering	3	0	3	3 Hrs	70	30	100
303	Database handling using Python	4	0	4	3 Hrs	70	30	100
304	OOPs and Data Structures	4	0	4	3 Hrs	70	30	100
305-01	Web Designing – 1	4	0	4	3 Hrs	70	30	100
305-02	Mobile Application Development – 1	4	0	4	3 Hrs	70	30	100
306	Practical	0	12	6	5 Hrs	140	60	200
	Foundation Elective (to be selected from NCC / NSS / Saptadhara)	0	2	2				
Total		17	14	25		490	210	700

- Colleges may offer any one subject from 305-01 and 305-02 to whole division.

For Practical:

1. Batch Size – 30 Maximum(desirable)
2. In case of more than 10 students in a batch, separate batch should be considered.
3. The journal should be certified by the concerned faculty and by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination.

SEMESTER – 4

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
401	Information System	2	0	2	3 Hrs	70	30	100
402	Internet of Things (IoT)	3	0	3	3 Hrs	70	30	100
403	Java Programming	4	0	4	3 Hrs	70	30	100
404	.NET Programming	4	0	4	3 Hrs	70	30	100
405-01	Web Designing-2	4	0	4	3 Hrs	70	30	100
405-02	Mobile Application Development-2	4	0	4	3 Hrs	70	30	100
406	Practical	0	12	6	5 Hrs	140	60	200
	Foundation Elective (to be selected from NCC / NSS / Saptadhara)	0	2	2				
Total		17	14	25		490	210	700

- Any one subject out of 405-01 or 405-02 can be offered to the students by college per division.
- To offer 405-01 paper, 305-01 is mandatory in sem-3.
- To offer 405-02, 305-02 is mandatory in Sem-3.

For Practical:

1. Batch Size – 30 Maximum(desirable)
2. In case of more than 10 students in a batch, separate batch should be considered.
3. The journal should be certified by the concerned faculty and by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination.

Program Passing Rules	As per University rules.

Consolidated Course Papers for S.Y.B.C.A. (SEM - III & SEM – IV)
Academic Year of Implementation: 2021-2022

Course: 301: Statistical Methods

Course Code	301
Course Title	Statistical Methods
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June 2021
Purpose of Course	To develop statistical problems solving abilities relevant to Computer Science.
Course Objective	1. To make students understand various statistical methods. 2. To develop the ability to compute descriptive statistics including diagrammatic representation and interpretation. 3. To be able to carry out simple linear regression analysis.
Pre-requisite	None
Course Out come	Ability to use computers to analyze data.
Course Content	**Unit 1. Introduction and Presentation of statistical data** Types of variables Univariate, bivariate and multivariate data Univariate and bivariate frequency distributions **Unit 2. Measure of central tendency-mean, median and mode** **Unit 3. Measures of dispersion (absolute as well as relative)** Mean deviation Standard deviation Coefficient of mean deviation and coefficient of variation **Unit 4. Correlation** Introduction Types of correlation and scatter diagrams Rank correlation coefficient **Unit 5. Regression** Concept of dependent and independent variables Introduction to liner regression Line of regression (with one independent variable) Methods should be explained conceptually and corresponding examples should be given. No proof should be given to any of the methods.

Reference Book	1. Introduction to mathematical statistics, Hogg R V & Craig A L - Tata McGraw Hill 2. An introduction to the theory of statistics, Yule U G & Kendall MG – C. Griffin & Co. 3. Statistical Methods, S. P. Gupta – Sultan Chand & Co
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course 302: Software Engineering

Course Code	302
Course Title	Software Engineering
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June 2021
Medium of Instruction	English
Purpose of Course	Computer software engineers apply the principles and techniques of computer science, engineering, and mathematical analysis to the design, development, testing, and evaluation of the software and the systems that enable computers to perform their many applications.
Course Objective	1. To make students understand how to engineer the software. 2. To make students understand various components of software process model and their working. 3. To make students understand various ways to test software.
Pre-requisite	Prior knowledge of types of software and their application areas.
Course Out come	After learning this subject, students are expected to get the knowledge about designing and testing of software.
Course Content	**Unit 1. Introduction** 1.1 Concepts of Software. 1.2 Software characteristics. 1.3 Software Engineering: definition. 1.4 Types of Software **Unit 2. Software Process Model** 2.1 Waterfall Model 2.2 Prototype Model 2.3 Incremental Model 2.4 Spiral Model **Unit 3. Requirement analysis** 3.1 Introduction. 3.2 Requirement gathering techniques & Fact Finding, Recording Outcome. 3.3 Effort distribution. 3.4 Importance of Requirement Specifications. 3.5 SRS Characteristics. 3.6 Software Requirement Specification Document. **Unit 4. System Design** 4.1 UML (Class Diagram, Use Case) 4.2 DFD, Data Dictionary and Process Specification. 4.3 Design model. 4.4 Principal and Concepts. 4.5 Functional Independence. 4.6 Effectiveness of Modular Design.

	Unit 5. Software Testing 5.1 Testing Fundamentals and principals. 5.2 Types of Testing. 5.2.1 Black Box & White Box 5.2.2 Unit Testing 5.2.3 Integration Testing 5.2.4 System Testing 5.3 Introduction to change Over 5.3.1 Types of change over
Reference Books	1. Software Engineering - A Practitioners' approach, R. S. Pressman – McGraw Hill. 2. Software Engineering concepts, Richard Fairley – McGraw Hill. 3. An Integrated Approach to Software Engineering, Pankaj Jalota – Narosa. 4. Software Engineering a Concise Study, Kelkar – PHI. 5. Fundamentals of Software Engineering, 4th Edition, Rajib Mall – PHI. 6. Software Engineering, Ian Sommerville - Pearson Education. 7. System Analysis & Design in changing world, Satzinger, Jackson, Burd – Course Technology. 8. Object Oriented Modelling and Designing with UML, Michael R Blaha & James R Rumbaugh - Pearson 9. System Analysis & Design, Elias M – Galgotia Publications. 10. System Analysis & Design & Introduction to S/W Engineering, Prof. S. Parthasarthy & Prof. B. W. Khalkar
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course: 303: Database handling using Python

Course Code	303
Course Title	Database Handling using Python
Credit	4
Teaching per Week	4 Hrs
Minimum weeks/ Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June, 2021
Medium of Instruction	English
Purpose of Course	- The course is aimed to give knowledge about use of SQLite and handle the dataset using Python. Basic purpose of this course to impart knowledge about database handling, dumping and converting to csv and text file using Python. - It also aims to understand connecting dataset with Python and execute queries using Python.
Course Objective	1. To make students understand working with SQLite. 2. To make students understand various components of database like Triggers. 3. To make students understand handling database and dumping the database to csv and text file as well as converting csv and text files to database. 4. To make students understand the importance of library functions to connect python with SQLite and handle the database using python. 5. To handle csv and excel files using python and use various statistical analysis using Numpy and Pandas library. 6. To make student understand and learn matplotlib functions to perform basic visualization of data.
Pre-requisite	- SQLite Installation, setup and configuration should be shown practically as part of the preparation. - DDL-Create, Alter, Drop table, Rename, Column, Vacuum - DML-Insert, Update ,Delete, Replace - Constraints : Keys (Primary, Unique, Foreign), Null, Check Constraint - Views (Create and Drop).
Course Out come	As an outcome of the subject, it is expected that the students will gain conceptual and practical knowledge about handling database, dump the database, restore database, database interaction with python, important python libraries, and perform basic statistical analysis and basic Data Visualization.
Course Content	**Unit-1: Introduction to SQLite:** 1.1 SQLite advantages, features and Fundamentals: 1.1.1 SQLite datatype : (Dynamic type, SQLite manifest typing & type affinity) (NULL, INTEGER, REAL, TEXT, BLOB) 1.1.2 Transaction, Rollback, Commit 1.2 Data Filtering and Triggers 1.2.1 Filtering: Distinct, where, between, in, like, Union,

	intersect, Except, Limit, IS NULL 1.2.2 Having, Group by, Order by, Conditional Logic (CASE) 1.3 SQLite joins: Inner, left, cross, self, Full outer joins. 1.4 SQLite Trigger: 1.4.1 Concepts of Trigger, Before and After trigger (on Insert , Update, Delete) 1.4.2 Create, Drop trigger, Disable and Enable trigger **Unit-2: Database backup and CSV handling:** 2.1 SQLite dump : 2.1.1 Dump specific table into file, Dump only table structure 2.1.2 Dump entire database into file 2.1.3 Dump data of one or more tables into a file 2.2 CSV files handling: 2.2.1 Import a CSV file into a table 2.2.2 Export a CSV file from table **Unit-3: Python interaction with SQLite:** 3.1 Module: Concepts of module and Using modules in python. 3.1.1 Setting PYTHONPATH, Concepts of Namespace and Scope 3.1.2 Concepts of Packages in python 3.2 Importing sqlite3 module 3.2.1 connect () and execute() methods. 3.2.2 Single row and multi-row fetch (fetchone(), fetchall()) 3.2.3 Select, Insert, update, delete using execute () method. 3.2.4 commit () method. **Unit-4: Python Interaction with text and CSV:** 4.1 File handling (text and CSV files) using CSV module : 4.1.1 CSV module , File modes: Read , write, append 4.2 Important Classes and Functions of CSV modules: 4.2.1 Open(), reader(), writer(), writerows(), DictReader(), DictWriter() 4.3 Dataframe Handling using Panda and Numpy: 4.3.1 csv and excel file extract and write using Dataframe 4.3.2 Extracting specific attributes and rows from dataframe. 4.3.3 Central Tendency measures : 4.3.3.1 mean, median, mode, variance, Standard Deviation 4.3.4 Dataframe functions: head, tail, loc, iloc, value, to_numpy(), describe() **Unit-5: Data Visualization using dataframe:** 5.1 importing matplotlib.pyplot and plotting: (only two dimensional Plots) 5.1.1 range() , subplot() , legend(), columns(), len() functions. 5.2 scatter plot: concept of Scatter plot, set title, xlabel and ylabel) 5.3 Line chart : concept of line plot: plot(), set_title(), legend() 5.4 histogram chart : Concepts of histogram hist(),set title,

	xlabel and ylabel 5.5 Bar Chart : Concepts of Bar chart, bar(),set title, xlabel and ylabel.
	[Practical implementation for this paper is not specific to any editor or UI .]
Reference Book	1. Learning with Python, Author: Allen Downe Publisher: DreamTech Press, ISBN: 978-9351198147 2. Python: The Complete Reference, Author: by Martin C. Brown, McGraw Hill Education,ISBN:978-9387572942 3. Learning Python: Powerful Object-Oriented Programming: 5th Edition, Author: Lutz M, Publisher: Shroff, ISBN:978-9351102014 4. Python In - Depth, Author: Ahidjo Ayeva , Kamon Ayeva, Publisher: BPB Publication, ISBN:978-9389328424 5. 5. The SQLite Handbook, Author: by Rita Blackburn, Publisher: Emereo Publishing, ISBN:978-1489136459 6. Using SQLite, Author: Jay A. Kreibich, Publisher: O'Reily, ISBN:978-0596521189 7. Android SQLite Essentials, Author: Sunny Kumar Adity, Publisher: Packt Publishing:978-1783282951
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course: 304: Object Oriented Programming and Data Structures (OOPP & D.S.)

Course Code:	**304**
Course Title:	**Object Oriented Programming and Data Structures (OOP & D.S.)**
Total Credits :	4 Credits
Nature of Subject :	Theory and Practical application
Teaching per Week:	4 Hours per week per Semester
Minimum weeks per Semester:	15 weeks (Including class work, examination, preparation etc.)
Review/Revision Year:	June, 2021
Purpose of Course :	- Understand Object Oriented Programming Concepts and skills necessary for developing programs using C++. And it is important for a computer programmer to understand the storage representation and implementation of various data structures used in a computer program. This helps a programmer to use various data structures efficiently which in turn makes the program efficient. This course introduces various data structures, their storage representation & implementation. - Data Structure concepts are important concepts to understand and implement. Purpose of the Data structure is to get basic ideas about how user defined data structures can be implemented. Implementation of Data Structure concept is not language specific.
Objective :	1. This course has been designed for the beginners to help them understand basic to advanced concepts related to C++ Programming language. 2. To make students understand the importance of OOP methodology and techniques. 3. Basic concepts of data structures, role and importance of data structures in computer programming. 4. Distinguish the key difference between storage & implementation of various data structures. 5. Recognize the problem properties and determine the use of appropriate data structures in different scenarios.
Pre-requisite:	Knowledge of C programming Language
Course Outcome :	- Students will be able to formulate a computing problem to executable computer program using C++ language. - Understand concepts of class, objects, polymorphism, Inheritence and other important Object oriented concepts. - Understanding about user defined data structures and their importance. - Basic implementations of Stack and Queue. - Concepts of variables, literals, data types, conversions of data types, input and output data and processing of data, inbuilt functions, arrays, header files, conditional and iterative statements.
Course Content:	**Unit 1. Concepts of OOPS: (Max. 20% of Weightage)** 1.1 Difference between procedural programming and OOPS 1.2 Various library(header) files require for C++ 1.3 Data types in C++ 1.4 Concepts of String: 1.4.1 character Array 1.4.2 pointer to character array 1.4.3 Use of String.h and its important functions: (strcmp, strcat, strcpy, strlen, strrev) 1.5 Concepts of Class and Objects. **Unit 2. Data Encapsulation and inheritance: (Max. 20% Weightage)** 2.1 Access controls concepts (Public, Private, Protected) and difference among

	them. 2.2 Declaring simple class, member variables and member functions. 2.3 Concepts and use of enum. 2.4 Concepts of Data hiding, abstraction and encapsulation with examples 2.5 Concepts of Inheritance and Types of Inheritance 2.6 Constructors and Destructors **Unit 3.Polymorphism (Max. 20% Weightage)** 3.1 Concepts of Polymorphism 3.2 Compile time and Run time Polymorphism 3.3 Overloading and Overriding: Concepts, difference and application 3.4 Concepts of friend function 3.5 Concepts of virtual function and pure virtual function **Unit 4.Data Structure (Max. 20% Weightage)** 4.1 Introduction of Data Structure and application areas. 4.2 Recursion concepts 4.3 Difference among Linear and Non-Linear Data Structure 4.4 Stack - Concepts of Stack(LIFO) - Pop, Push and Display(Peep) - Application areas of Stack (Infix to postfix, Infix to prefix) **Unit 5.Queue (Max. 20% Weightage)** 5.1 Concepts of Queue(FIFO) 5.1.1 Concepts of Queues and its basic operations 5.2 Implementation of Queue: 5.2.1 Simple Queue: insert, delete and display 5.2.2 Double ended Queue: insert, delete and display 5.2.3 Circular queue: Insert, delete and display.
Reference Books:	1. Let us C++, Yaswant Kanitkar - TMH Publication 2. Programming with C++, E Balaguruswamy - BPB Publication 3. C++ and Object-Oriented Programming Paradigm, Jana - PHI 4. The Complete Reference C++, Herbert Schildt - TMH 5. The C++ Programming Language, Stroustrup – Addison Wesley 6. OOP in Turbo C++, Robert Lafore - Galgotia Publication 7. C++ Primer, Lippman – Addison Wesley 8. Object Oriented Programming Fundamentals & Applications, Probal Sengupta – PHI 9. An Introduction to Data Structures with applications, Trembley – Tata McGraw Hill. 10. Algorithms – Data structure programs, Wirth Niclaus - PHI. 11. Data structures – A Programming Approach with C, Dharmender Singh Kushwaha and Arun Kumar Misra – PHI. 12. Fundamentals of Data structures, Horwitz E. and Sahni – Computer Science Press 13. Schaum's outline of Data Structure with C++, John R. H. - Tata McGraw Hill. 14. Expert Data Structure with C, R. B. Patel - Khanna Publication 15. Data structures - a Pseudocode approach with C++, Richard F. Gilberg and Behrouz A. Forouzan - Thomson books
Teaching Methodology:	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method:	30% internal assessment. 70% External assessment

Course: 305-1: Web Designing-1

Course Code	305
Course Title	Web Designing-1
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	June 2021
Purpose of Course	Design is the process of collecting ideas, and aesthetically arranging and implementing them, guided by certain principles for a specific purpose. Web design is a similar process of creation, with the intention of presenting the content on electronic web pages, which the end- users can access through the internet with the help of a web browser. This course deals with designing of websites.
Course Objective	To make students aware of web terminology and website designing tools. Student can understand and implement the real functions of website development.
Pre-requisite	Basic knowledge of Simple HTML and HTML-5 concepts, windows based applications. Some very basic acquaintance with computers and the www is assumed.
Course outcome	• Students will be able to create, organize and design websites. • Understand elements of design with regard to the web • Get to Grips with necessary functionalities elements
Course Content	**Unit 1. Working with HTML5 and CSS:** 1.1 concepts of CSS: 1.1.1 Adding CSS (Inline,Internal,External) 1.1.2 HTML Links and attribute.(_self, _blank, _parent, _top) 1.1.3 Absolute URL and Relative URL in <href> 1.1.4 <img> tag and its attributes (src, alt, style,width,height) 1.2 HTML forms : 1.2.1 form Elements and their attributes : 1.2.1.1 form (action, method, novalidate, autocomplete,target) 1.2.1.2 label, input (text, radio button, Checkboxes, submit/reset button) 1.2.1.3 select(id, name,<option>), 1.2.1.4 textarea (name, rows, cols), 1.2.1.5 button(type, onclick) 1.2.1.6 datalist 1.2.2 Media : Video, Audio **Unit 2. Design Web Sites Using Bootstrap4** 2.1 Bootstrap Introduction 2.2 Grid Structure 2.3 Table, Colours, Alerts, Form Controls 2.4 Buttons and ButtonGroups 2.5 Images, Media Objects 2.6 Pagination 2.7 Bootstrap Grids 2.8 Bootstrap Themes **Unit 3. Overview of Java Script** 3.1 Overview of Client & Server-SideScripting 3.2 Structure of Java Script 3.3 Data types and Variables

	3.4 Operators (Arithmetic, Assignment, Comparison, Logical and Conditional Operator) 3.5 Control Structure 3.5.1 If…Else, switch..case 3.5.2 While, Do…While, For Loop 3.5.3 break, continue 3.6 Java Script String and Events 3.6.1 Javascript Strings types 3.6.2 String functions: concat(), split(), indexOf(), lastIndexOf(),substring(), trim(), slice(), replace(), charAt() 3.6.3 Javascript Events : 3.6.3.1 Mouse Events : (click, mouseover, mouseremove, mouseout, mouseup) 3.6.3.2 keyboard Events : (keyup,keydown) 3.6.3.3 Form Event : (focus, submit, blur, change) **Unit-4: JavaScript Objects :** 4.1 Creating object : (By object literal, By creating instance of Object, By using an object constructor) 4.2 Date object : 4.2.1 Date constructor: Date(), Date(milliseconds), Date(dateString), Date(year, month, day, hours, minutes, seconds, milliseconds) 4.2.2 Date Methods: getDate(), getDay(),getMonth(), getHours(), setDate, setMonth(),setDay(), toString() 4.3 Document Object Model (DOM): 4.3.1 DOM concepts 4.3.2 DOM properties 4.3.3 DOM methods : write(), writeln(),getElementById(),getElementsByName() **Unit-5: JavaScript Functions:** 5.1 JavaScript Functions: 5.1.1 Defining function (with and without parameters) 5.1.2 calling function 5.1.3 return statement 5.1.4 Page redirection 5.2 Dialog boxes : Alert, confirm, prompt 5.3 Form validation : 5.3.1 Basic validation (All form details are filled) 5.3.2 Data format validation (email, number, string, mobile number, name) [All Units carry Equal Weightage]

Reference Books	1. HTML & CSS: The Complete Reference - Thomas Powell - McGraw Hill Education 2. HTML Unleased, Darnell Rick –Techmedia 3. HTML, XHTML, and CSS Bible - Steven M. Schafe - Wiley Publications 4. Cascading Style Sheets- The Definitive Guide, E. A Meyer –O'Reilly 5. Java Scripting Programming for Absolute Beginner, Harris -PHI 6. JavaScript Step by Step, Suehring -PHI 7. Bootstrap in 24 Hours, Sams Teach Yourself - JenniferKyrnin 8. Learning Bootstrap 4 - Matt Lambert – Packt Publishing 9. Bootstrap Responsive Web Development - Jake Spurlock - O'Reilly Media. 10. JavaScript and JQuery (Interactive Front-End Web Development) by Jon Duckett 11. JavaScript and JQuery (The missing manual) by David Sawyer MCFarland
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course: 305-02: Mobile Application Development - 1

Course Code	305-02
Course Title	Mobile Application Development – 1
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	June 2021
Purpose of Course	Mobile application development is the process of creating software applications that run on a mobile device, and a typical mobile application utilizes a network connection to work with remote computing resources. Mobile device is used for different purposes ranging from email to online shopping and multiple apps for different reasons. Hence, the mobile development process involves creating installable software bundles, implementing backend services such as data access with an API, and testing the application on target devices. Knowledge about mobile application development on Android platform and gradually on hybrid platform is need of the current era.
Course Objective	1) To understand concepts of Mobile Technology 2) Understand the development process and have edge over mobile user interface (UI) design. 3) Understand various UI development tools, Application design interfaces and creating basic app on Android platform.
Pre-requisite	Basic knowledge of Simple HTML, concept of Operating system and basics of coding. This course will be mandatory to pursue Paper-405-02 (Mobile Application Development -2) in Semester-4.
Course outcome	- Students will be able to understand the concepts of Mobile technology - Students will have concepts of Android and Android frame work - Understand how data can be transferred using XML. - Understand setting up of Android environment. - Edge over Android widgets and development of basic Android based Apps.
Course Content	**Unit-1: Concepts of Mobile computing.** 1.1 Fundamentals of Mobile computing: 1.1.1 Concepts of fixed and wireless network 1.1.2 Introduction of Multiplexing, Modulation 1.1.3 Fundamentals of spectrum, Bluetooth technology 1.1.4 Concepts of Wireless Application Protocol(WAP) 1.1.5 Concepts of Mobile Agents. 1.2 Introduction of Android 1.2.1 History, concepts and Features of Android 1.2.2 Concepts of API framework 1.3 Intro. of Android Architecture (Software Stack) 1.3.1 kernel Native Libraries 1.3.2 Concepts of Native Libraries and Android Runtime(Dalvik VM) 1.3.3 Application Framework 1.3.4 Application **Unit-2: Setting up Android Environment:** 2.1 Android Emulator 2.1.1 Setting up JDK and Android Studio

	2.1.2 Android SDK manager 2.2 Creating Android Virtual Device (AVD) 2.3 Creating first App: 2.3.1 Activity 2.3.2 Layout **Unit-3: XML (Extensible Markup Language)** 3.1 Characteristic and Use of XML 3.2 XML syntax (Declaration, Tags, elements) 3.3 root element, case sensitivity 3.4 XML document: 3.4.1 Document Prolog Section 3.4.2 Document element section 3.5 XML declaration and rules of declaration. **Unit-4:Creating basic App** 4.1 Basic App using Android studio 4.1.1 Create new android project 4.1.2 Write message and run 4.1.3 Understanding different components. 4.2 Dalvik Virtual Machine (DVM) 4.3 Understanding AndroidManifest.xml **Unit-5: Android Widgets(UI):** 5.1 Hiding Title bar 5.2 screen Orientation (Portrait, Landscape) 5.3 Form Widget Palette 5.3.1 Placing text fields and Button 5.3.2 Button onClick event 5.4 Displaying Notification: 5.4.1 Toast Class 5.4.2 Displaying message on Toast 5.5 ToggleButton: 5.5.1 ToggleButton Attributes:(textOff, textOn) 5.5.2 Event methods : getTextOff(), getTextOn(), setChecked() 5.6 CheckBox: 5.6.1 Event methods: isChecked(), setChecked()
Reference Books	1) Android Application Development (With Kitkat Support), Author: Pradeep Kothari, Publisher:DreamTech Press.,ISBN:978-9351194095 2) Android Studio 3.0 Development Essentials: Android 8 Edition , Author: Neil Smyth, ISBN:978-1977540096 3) Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, Author: Alessandro Biessek, Packt Publishing House,ISBN:978-1788996082 4) Beginning Flutter: A Hands On Guide to App Development, Author: Marco L. Napoli, Publisher: Wrox, ISBN:978-1119550822 5) Android Programming for Beginners - Second Edition, Author:John Horton, Publisher: Image Short ISBN: 978-1789538502 6) Android 9 Development Cookbook, Author: Rick Boyer, Publisher: Packet Publishing, ISBN:978-1788991216 7) The Dart Programming Language, Author:Bracha, Publisher:Pearson Education India, ISBN:978-9332570368 8) Google Flutter Mobile Development Quick Start Guide: Get up and running with iOS and Android mobile app development, Author: Prajyot Mainkar, Publication:Packt Publishing, ISBN:978-1789344967

	9) Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK ,Author: Frank Zammetti, Publisher: Apress, ISBN:978-1484249710
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course-306: Practical

Course Code:	**306**
Course Title:	**Practical**
Total Credits :	06 Credits
Nature of Subject :	Practical only
Teaching per Week:	12 Hours per week per Semester
Minimum weeks per Semester:	15 weeks (Including class work, examination, preparation etc.)
Review/Revision Year:	June, 2021
Purpose of Course :	- Practical implementation of technologies covered as part of syllabus using required software and learning application areas. - Working with database using SQLite. - Understanding features of Python and its interaction with SQLite. - Understanding and learning programming concepts and various concepts of object oriented features using c++ programming language. - Understanding concepts of Data Structure and implementation of Stack (Pop, Push and Display) and Queue (Simple and Circular Queue) operations using any of the languages out of (C, C++ or Python). - Working with Web Design in direction of implementing various tools and scripts like HTML5, CSS, Bootstrap and JavaScript. - As an option to Web Design student can also opt Mobile computing and understand fundamentals of Android based technology, mobile application working and basic design concepts using Android studio.
Objective :	Objective of this course is to (i) Understand some important features of Python programming language. (ii) Learn Database interaction with Python using SQLite database. (iii) Understand essentials of Object oriented concepts using C++. (iv) Concepts of Data Structure and its implementation (v) Students will select any one option out of Web Design or Mobile computing to excel their knowledge in direction of Web Designing or Mobile application development.
Pre-requisite:	Knowledge of C programming, SQL, HTML, HTML5 and fundamentals of Python.
Course Outcome :	- At the end of this course, students will have hands on experience of writing and applying codes using Python and interact with SQLite. They will have concepts of taking data backups and dumping the database. - Students will have edge over concepts of object oriented programming, concepts of class, objects, encapsulation, polymorphism, Inheritence and implementation of it. - Students will also have an edge over concepts of data structures and their implementation (Stack and Queue concepts). Implementation of Data Structure will be open for the student to select any of the language out of C, C++ or Python. - Students can select any one option out of web design or mobile computing and gain edge over web designing using HTML5, CSS, Bootstrap and JavaScript or development of basic mobile app based on Android platform depending upon selected track.
Course Content:	1. Codes and database interaction using Python and SQLite based on Paper-303 Version recommended : SQLite : ver. 2.8 or above, Python: 3.6 or above 303: - Database handling based on SQLite (Unit-1 and Unit-2). - Python interaction with SQLite, csv, text files. Data Visualisation using dataframe obtained from multi-column cleaned labelled dataset (SQLite table, csv or txt file). 2. Practical implementation of OOPs concepts based on Course-Paper-304 (Unit-1,

	2 and 3). 3. Practical implementation of Data Structure (Simple Stack operations (Push, Pop, Display) and Queue (Simple queue and circular queue)). 4. Practical implementation based on Course-Paper-305-01 or 305-02. (No specific Editor / IDE are recommended).
Teaching Methodology:	- Practical work - Lab sessions and hands on experience, Discussion, Self-Study - Students will create word document containing SQL based work including tables and queries and represent their work using presentation software at end of the semester.
Evaluation Method:	30% Internal assessment. 70% External assessment. [For Internal and External Examination Suggested distribution of question weight will be as per following Weightage distribution] : (i) Python and SQLite : 30% (ii) C++ : 20% (iii) Data Structure : 20% (iv) Question on Paper-305-01 or Paper-305-02 : 30%

SEMESTER - 4
Course: 401: Information System

Course Code	401
Course Title	Information System
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June 2021
Medium of Instruction	English
Purpose of Course	Make students aware and understand various types of Information Systems.
Course Objective	Learn the different types of Information Systems. To emphasize on the application of information to business management.
Pre-requisite	NIL
Course Out come	After completion of the course the students will understand and appreciate the basic concepts of Information System, importance of MIS for an organization and will be able to contribute effectively in the development and implementation of MIS in different types of organization.
Course Content	**Unit 1. Introduction** 1.1. Data & Information 1.2. Information need and benefits 1.3. Input, Processing, Output and feedback **Unit 2. Concepts of Systems** 2.1. Definition of system in an organization 2.2. Types of systems 2.2.1. Deterministic probabilistic systems 2.2.2. Open and close systems **Unit 3. Introduction to various Information Systems** 3.1. Business information Systems 3.1.1. Principal Function System in Business 3.1.2. Product flow and Information Flow 3.1.3. Principal Document Associated with Information Flow 3.2. ERP 3.3. Management Information Systems 3.3.1. Characteristics of MIS 3.3.2. Development process of MIS 3.4. Decision support systems **Unit 4. Transaction Processing Systems** 4.1. Overview of Transaction Processing System 4.2. Transaction Processing methods & objectives 4.3. Transaction Processing Activities 4.3.1. Data Collection 4.3.2. Data Editing 4.3.3. Data correction 4.3.4. Data Manipulation 4.3.5. Data Storage 4.3.6. Document Production and Reports 4.4. Traditional transaction processing Applications 4.4.1. Order Processing Systems 4.4.2. Purchase Systems 4.4.3. Accounting Systems **Unit 5. Case Studies Based on TPS** 5.1. Online Admission Process,

	5.2. Hospital Management and 5.3. Hotel Management.
Reference Book	1. Principles of information system, Ralf M. Stair & George W. Reynolds - Thomson Learning Publisher. 2. Introduction to system analysis and Design, NCC – Galgotia Publications 3. Management information Systems – Text & Applications, CVS Murthy – HPH 4. Management information Systems – Organization and technology, K. C. Laudan & J.P. Laudan – Prentice Hall India. 5. Management information system, W. S. Jawadekar – Tata McGraw Hill. 6. E-Business and IS Solutions, J. Buffam – Addison Wesley. 7. Decision Support System and Intelligence Systems, Efraim Turban & Jay E. Aronson – Addison Wesley
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

402- IoT (Internet of Things)

Course Code	**402**
Course Title	IoT (Internet of Things)
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June 2021
Medium of Instruction	English
Purpose of Course	The purpose of this course is to provide basic understanding of IoT.
Course Objective	To understand the concepts and protocols related to Internet of Things. To get an idea where the application areas are available for the Internet of Things to be applied.
Pre-requisite	Basic Knowledge of Networking
Course Out come	On completion of this course, students will be able to: - Understand about IoT Technologies behind intelligent and smart devices - Learn about basics of IoT Hardware/Devices
Course Content	**Unit 1: Introduction to Internet of Things** 1.1 Definition & Characteristics of IoT 1.2 Introduction to IoT Architecture 1.3 Physical Design of IoT 1.3.1Things in IoT 1.3.2IoT Protocols (Ethernet , WIFI , WIMAX, LR-WPAN(Wireless personal area network), 2G/3G/4G Mobile Communication, IPV6,6LOWPAN,MQTT, WEB SOCKET) 1.4 Logical Design of IoT 1.4.1IoT Functional Blocks 1.4.2IoT Communicational Models - Request – Response - Publish –Subscribe - Push –Pull - Exclusive Pair **Unit 2. IoT and M2M** 2.1 Introduction M2M 2.2 Introduction to Sensor Technology 2.3 Difference between IoT and M2M, 2.4 Security for IoT 2.5 IoT Enabling Technologies 2.5.1 Wireless Sensor Networks 2.5.2 Big Data Analytics, 2.5.3 Embedded Systems. **Unit 3.Sensors and Actuators in IoT** 3.1 Definition of Sensors 3.2 Types of sensors and its usage (Temperature, Humidity, Gas Detector, Ultrasonic, Fire detector, Light, Sound, IR, Water Level) 3.3 Introduction to Actuators 3.4 Types of Actuators 3.5 Difference between Sensors & Actuators

	Unit 4.Introduction to Raspberry pi and Arduiano 4.1 Introduction on IoT Devices 4.2 Basic Building blocks of an IoT Device 4.3 Introduction to Raspberry pi (Concepts, purpose, Application areas) 4.4 Components of Raspberry pi 4.5 Introduction to Arduiano (Concept, purpose and Application areas) 4.6 Difference between Raspberry pi and Arduiano **Unit 5. Case Study** 5.1 IoT for Smart city applications 5.2 IoT for Smart Home 5.3 IoT for Health & Lifestyle
Reference Books	1. Internet of Things , A Hands – On Approach, Arshdeep Bahga, Vijay Madisetti published by Arshdeep Bahga& Vijay Madisetti 2. Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education private limited, 2017 3. Learning Internet of Things, Peter Waher, / Packt Publishing Limited, 2015 4. The Internet of Things, Hakima Chaouchi, Wiley,2017 5. Getting started with the Internet of Things: by CunoPfister, O"Reilly Media. 6. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

403 - Java Programming Language

Course Code	403
Course Title	Java Programming Language
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June 2021
Medium of Instruction	English
Purpose of Course	To teach Object Oriented Programming (OOP) concepts through programming using Java as the programming language.
Course Objective	1. To make students understand Object Oriented Programming (OOP). 2. To make students understand various inbuilt Java classes and their working. 3. To make students understand the importance of OOP methodology. 4. To make students understand various types of OOP techniques.
Pre-requisite	Prior Knowledge object oriented concepts.
Course Out come	On completion of this course, students will be able to understand how OOP principles work and importance of various coding techniques of OOP. This course will also help students to appreciate the role of inbuilt classes. On successful completion of this course, students will be able to follow programming methodology and how to apply it in their application.
Course Content	**Unit 1. Introduction to Java** 1.1 Properties of Java 1.2 Comparison of java with C++ 1.3 Java Compiler, Java Interpreter 1.4 Identifier, Literals, Operators, Variables, Keywords, Data Types 1.5 Branching: If – Else, Switch 1.6 Looping: While, Do-while, For 1.7 Type Casting **Unit 2. Classes and Objects** 2.1 Simple Class, Field 2.2 Access Controls, Object creation 2.3 Construction and Initialization 2.4 Inheritance and Polymorphism in Java 2.4.1 Data encapsulation, overriding and overloading methods 2.5 this and super keywords 2.6 Static members, static block, static class 2.7 Interfaces: 2.7.1 Introduction to Interfaces, Interface Declaration. 2.7.2 Inheriting and Hiding Concepts. 2.7.3 Inheriting, Overloading and Overriding Methods and constructors. 2.7.4 Interfaces Implementations. **Unit 3. Basic Concepts of Strings and Exceptions :** 3.1 Strings 3.1.1 Basic String operations, String Comparsion 3.1.2 String methods (charAt(), concat(), equals(), indexOf(), isEmpty(), join(), lastIndexOf(), length(),split(), substring(),trim()) 3.1.3 StringBuffer class and its constructors. 3.1.4 StringBuffer methods : (append(),insert(),update(), delete(), reverse(),capacity())

	3.2 Introduction to Exceptions: 3.2.1 Exception Types, User defined Exception 3.2.2 Throw, Throws 3.2.3 Try, Catch and Finally **Unit 4. Threads and Packages:** 4.1 Thread 4.1.1 Introduction to Threads, Thread Model 4.1.2 Priority of Threads 4.2 Package Naming, Type Imports 4.2.1 Package Access, Package Contents 4.2.2 Package Object and Specification **Unit 5. Data Structure Implementation and Applet Classes** 5.1 Implementation of Data Structure using Java Class: 5.1.1 Concepts of singly and singly circular link-list 5.1.2 Singly Link List : Create, traverse, insert, delete node 5.1.3 Singly circular link list: create, traverse, insert, delete node 5.2 Applet Basics, Applet Architecture: 5.2.1 Applet skeleton, Applet Display Methods 5.2.2 HTML APPLET Tag (<APPLET>), Applet Viewer 5.2.3 Passing Parameters to Applets
Reference Books	1. Java Programming Language – Ken Arnold James Gosling, David Holmes: –Addison Wesley (Pearson Education) 2. Java – The complete reference, – Herbert Schildt: – Tata McGraw Hill 3. Java 2 From Scratch: – Steven Haines: –PHI. 4. Programming in Java – E-Balaguruswamy: – Tata McGraw Hill 5. Java: How to Program: – Deitel & Deitel: – PHI
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course: 404: .NET Programming

Course Code	**404**
Course Title	.NET PROGRAMMING
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	June 2018
Medium of Instruction	English
Purpose of Course	This syllabus has been prepared for the beginners to help them understand basic .Net programming. After completing this, students will get a moderate level of expertise in .Net programming from where - they can take themselves to next levels.
Course Objective	- To make students understand .Net as simple, modern, object-oriented computer programming language developed by Microsoft to combine the power of .NET Framework and the CLR with the productivity benefits. - To make students understand basic .Net programming and will also take through various advanced concepts related to .Net programming language.
Pre-requisite	Students are expected have concepts related to Programming techniques using Object Oriented.
Course Out come	On completion of this course, students will be able to understand the basic concepts of .Net framework and importance of various coding techniques. This course will also help students understand the role of CLR . After successful completion students will be able to follow programming methodology and how to apply it for their application.
Course Content	**Unit 1. Overview of Microsoft .NET Framework** 1.1. The .NET Framework 1.1.1. Managed Code MSIL, Metadata and JIT Compilation - Automatic Memory Management. 1.2. The Common Language Runtime (CLR) 1.3. The .NET Framework class Library **Unit 2. Programming in Visual basic .net** 2.1. IDE 2.2. Variables and Data Types 2.2.1. Boxing and Unboxing 2.2.2. Enumerations 2.2.3. Data Type Conversion Functions 2.2.4. Statements 2.3. String & Date Functions and Methods 2.4. Modules, Procedures and Functions 2.4.1. Passing variable number of arguments 2.4.2. Optional arguments 2.5. Using Arrays and Collections 2.6. Control Flow Statements 2.6.1. Conditional Statements 2.6.2. Loop Statements 2.6.3. MsgBox and InputBox **Unit 3. Introduction to Windows controls** 3.1. Working with Tool Box Controls 3.1.1. Common controls - Label, Text Box, Button, Check Box, Radio Button, Date Time Picker, List Box, Combo box, Picture Box, Rich Text Box, Tree View,

	Tool Tip, Progress bar, Masked Text box, Notify Icon, Link Label, Checked List box 3.1.2. Container Controls 3.1.3. Data - Data Set, Data Grid 3.1.4. Component - Image list, error provider, Help provider, Timer 3.2. Working with Menus and Dialogue Boxes 3.3. Exception Handling 3.3.1. Structured Error Handling 3.3.2. Unstructured Error Handling **Unit 4. Object Oriented Programming** 4.1. Creating Classes, Object Construction & Destruction 4.1.1. Properties, Methods, Events 4.1.2. Access Specifiers: Public, Private, Protected, Protected Friend 4.1.3. Me, MyBase and MyClass keywords 4.2. Abstraction, Encapsulation & Polymorphism 4.3. Interfaces & Inheritance **Unit 5. Database access using ADO.NET** 5.1. Visual Database Tools 5.2. ADO .NET Object Model 5.3. ADO .NET Programming
Reference Book	1. Visual Basic .NET Programming (Black Book) - By Steven Son Holzner, DreamTech Publication 2. Mastering Visual Basic.NET by Evangelos Petroutsos BPB Publication 3. Moving to VB.NET: Strategies, Concepts, and Code - by Dan Appleman – Apress Publication 4. Microsoft Visual Basic .NET Step by Step - by Michael Halvorson, PHI Publication 5. Database Programming with Visual Basic.NET and ADO.NET - by F. Scott Barker – Sams Publication 6. Beginning .NET Web Services Using Visual Basic .NET - by Joe Bustos and Karlli Watson, Wrox Publication 7. .NET – Complete Development Cycle - by G. Lenz, T. Moeller, Pearson Education 8. Professional VB.NET, 2nd Edition - by Fred Barwell, et al – Wrox Publication
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course: 405-01: Web Designing-2

Course Code	405-01
Course Title	Web Designing-2
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	June 2021
Purpose of Course	Web Design requires designers to create graphics, typography as well as images which are used only on the World Wide Web. While creating any design, web designers need to maintain balance between creating a good design as well as the speed and efficiency for the webpage/ website. This course deals with server-side communication.
Course Objective	To make students aware of web terminology and website designing tools. Student can understand and implement the real functions of website development.
Pre-requisite	305-01: Web Designing -1 course of Semester-3.
Course outcome	• Students will be able to create, organize and design websites. • Students gain formal understanding of XML-based technologies which are used in Web-service. • Students will be able to make dynamic changes to a web pages as well as respond to user and browser events through JQuery • Students will be able to learn cross-browser supports via Ajax and Jason • Students will be able to write asynchronous code using various techniques through node.js
Course Content	**Unit-1 : Introduction of XML:** 1.1 Characteristic and Use of XML 1.2 XML syntax (Declaration, Tags, elements) 1.3 root element, case sensitivity 1.4 XML document: 1.4.1 Document Prolog Section 1.4.2 Document element section 1.5 XML declaration and rules of declaration. **Unit-2: jQuery Fundamentals:** 2.1 Introduction and basics: 2.1.1 Advantage of jQuery and Syntax 2.1.2 jQuery Selectors: 2.1.3 jQuery Events (ready(),click(), keypress(),focus(),blur(),change()) 2.2 jQuery Effects: Show/Hide, Fade, Slide, Stop, Chaining, Callback 2.3 jQuery Manipulation methods: 2.3.1 Get/Set methods (text(), attr(), html(), val()) 2.3.2 Inert methods: (append(), prepend(),text(), before(), after(), wrap()) 2.3.3 Remove element methods : (remove(),empty(),unwrap()) 2.3.4 jQuery Get and Set CSS properties using css() method. **Unit-3: JSON: (JavaScript Object Notation)** 3.2 Concept and Features of JSON 3.3 Similarities and difference among JSON and XML

	3.4 JSON objects(with string and Numbers)) 3.5 JSON Arrays and their examples : 3.5.1 Array of string, Array of Numbers, Array of Booleans 3.5.2 Array of objects, Multi-Dimensional Arrays 3.5.3 JSON comments **Unit-4: AJAX (Asynchronous JavaScript and XML):** 4.1 Fundamentals of AJAX technology: 4.1.1 Difference between Synchronous and Asynchronous web application 4.1.2 XMLHttpRequest technology 4.2 XMLHttpRequest 4.2.1 Properties :(onReadyStateChange, readyState, responseText, responseXML) 4.2.2 XMLHttpRequest Methods : (Open(), send(), setRequestHeader()) 4.3 Working of AJAX and its architecture **Unit-5: Node.js :** 5.1 Concepts, working and Features 5.1.1 Downloading Node.js 5.2 Setting up Node.js server(HTTP server) 5.2.1 Installing on window 5.2.2 Components 5.2.2.1 Required modules, Create Server(http.createServer()) 5.2.2.2 Request and response 5.3 Built-in Modules 5.3.1 require() function 5.3.2 User defined module: create and include 5.3.3 HTTP module 5.4 Node.js as Web-server: 5.4.1 createServer() , writeHead() method 5.4.2 Reading Query String, Split Query String 5.5 File System Module: 5.5.1 Read Files (readFile()) 5.5.2 Create Files(appendFile(),open(),writeFile()) 5.5.3 Update Files(appendFile(),writeFile()) 5.5.4 Delete Files(unlink()) 5.5.5 Rename Files(rename())
Reference Books	1. JavaScript and JQuery (Interactive Front-End Web Development) by Jon Duckett 2. JavaScript and JQuery (The missing manual) by David Sawyer MCFarland 3. Essential ASP.NET Web Forms Development Full Stack Programming with C#, SQL, Ajax, and JavaScript Robert E. Beasley, Publisher: Apress 4Foundations of Ajax, Ryan Asleson, Schutla, Publisher: Apres 5Ajax: The Complete Reference By Thomas Powell, ISBN: 978-0-07-149216-4 6Head First Ajax , Author: Rebecca M.Riordan, publisher: O'Reilly 7Practical Node.js, Author: Azat Mardan,ISBN:978-1-4842-3038-1, Publisher: Apress 8Node.JS Guidebook, BPB Publication, ISBN: 9789387284432, Author: Dhruti Shah 9JavaScript for Modern Web Development, ISBN: 9789389328721, eISBN: 9789389328738, Authors: Abhilasha Sinha, Ranjit Battewad, Alok Ranjan 10 Mastering HTML, CSS & Javascript Web Publishing, Authors:by Laura Lemay,Rafe Colburn, BPB Publication

	11 JavaScript by Example, Author: Elitle Quigley,Publication: Prentice Hall, ISBN: 9780137054893, 9780137054893. 12 XML in easy steps, Publication: Tata McGrawHill 13 XML crash course, Publisher: Tata McGraw Hill, ISBN: 9780071815161, 9780071815161 14 Beginning jQuery: From the Basics of jQuery to Writing your Own Plug-ins, by Jack Franklin Russ Ferguson,978-1484230268
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course: 405-02: Mobile Application Development - 2

Course Code	**405-02**
Course Title	**Mobile Application Development – 2**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	June 2021
Purpose of Course	Mobile application development is the process of creating software applications that run on a mobile device, and a typical mobile application utilizes a network connection to work with remote computing resources. Mobile device is used for different purposes ranging from email to online shopping and multiple apps for different reasons. Hence, the mobile development process involves creating installable software bundles, implementing backend services such as data access with an API, and testing the application on target devices. Knowledge about mobile application development on Android platform and gradually on hybrid platform is need of the current era.
Course Objective	1) To understand concepts of Mobile Technology 2) Understand the development process and have edge over mobile user interface (UI) design. 3) Understand various UI development tools, Application design interfaces and creating basic app on Android platform. 4) Concepts of DART and introduction of FLUTTER.
Pre-requisite	Paper-305-02 (Mobile Application Development -1) in Semester-3.
Course outcome	- Students will be able to understand the internal concepts of Android. - Students will have concepts of important Android Widgets(UI) - Concepts of DART. - Working concepts of Flutter. - Edge over Basic Flutter Widgets.
Course Content	**Unit-1: Project structure of Mobile Application:** 1.1 Internal details of Android Application: 1.1.1 Dalvik VM, Screen Orientation 1.1.2 AndroidMenifest, R.java 1.2 Android Widgets (UI) 1.2.1 Default and Custom Checkbox 1.2.2 Dynamic and Custom RadioButton 1.2.3 Spinner, AlterDialog **Unit-2 : Basic Attributes and Events of Important Android Widgets(UI)** 2.1 ListView, Custom ListView 2.2 DatePicker, TimePicker, ProgressBar 2.3 Horizontal and Vertical ScrollView 2.4 AutoCompleteTextView, TextWatcher to EditText 2.5 ImageSlider, ImageSwitcher, SearchView 2.6 TAbLayout and FrameLayout **Unit-3: Working with DART:**

	3.1 DART overview, concept, features and installation 3.2 Online editor DartPad and dart2js tool 3.3 Executing Dart basic code using Command line, DartPad and IDE 3.3 Understanding DART syntax: 3.3.1 Identifiers, Datatypes, variables, comments 3.3.2 Decision making (if, if..else, if..else if..., switch..case) 3.3.3 Iterative statements (for, for...in loop, while, do..while) 3.3.4 break, continue, label 3.4 DART function : 3.4.1 Calling function, deleting function 3.4.2 Passing arguments to function, lexical scoping. **Unit-4: Introduction of Flutter:** 4.1 Fundamentals of Flutter: 4.1.1 Installation and Architecture of Flutter 4.1.2 Features of Flutter 4.1.3 Creating basic flutter project using Android Studio 4.2 Flutter Widget: 4.2.1 Types of flutter widget: 4.2.1.1 Visible and Invisible 4.2.1.2 StatelessWidget, StatefulWidget 4.2.1.3 Single child widget and Multiple child widget 4.2.2 Visible widget(Constructor and Properties): Text, Image, Button, Icon 4.3.3 Invisible widget(Constructor and Properties): column, row, center, padding, scaffold, stack **Unit-5: Basic Flutter widget (Constructor, attributes and Properties)** 5.1 Text, TextField, Buttons, Slider 5.2 Checkbox, Radio Button, Progress Bar, Lists 5.3 Stack, Forms, AlertDialog, Tooltip 5.4 Toast, Switch, Charts, Flutter Form.
Reference Books	1) Android Application Development (With Kitkat Support), Author: Pradeep Kothari, Publisher: DreamTech Press.,ISBN:978-9351194095 2) Android Studio 3.0 Development Essentials: Android 8 Edition , Author: Neil Smyth, ISBN:978-1977540096 3) Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, Author: Alessandro Biessek, Packt Publishing House,ISBN:978-1788996082 4) Beginning Flutter: A Hands On Guide to App Development, Author: Marco L. Napoli, Publisher: Wrox, ISBN:978-1119550822 5) Android Programming for Beginners - Second Edition, Author:John Horton, Publisher: Image Short ISBN: 978-1789538502 6) Android 9 Development Cookbook, Author: Rick Boyer, Publisher: Packet Publishing, ISBN:978-1788991216 7) The Dart Programming Language, Author:Bracha, Publisher:Pearson Education India, ISBN:978-9332570368 8) Google Flutter Mobile Development Quick Start Guide: Get up and running with iOS and Android mobile app development, Author: Prajyot Mainkar, Publication:Packt Publishing, ISBN:978-1789344967 9) Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK ,Author: Frank Zammetti, Publisher: Apress,

	ISBN:978-1484249710
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	30% Internal assessment. 70% External assessment.

Course-406: Practical

Course Code:	**406**
Course Title:	**Practical**
Total Credits :	06 Credits
Nature of Subject :	Practical only
Teaching per Week:	12 Hours per week per Semester
Minimum weeks per Semester:	15 weeks (Including class work, examination, preparation etc.)
Review/Revision Year:	June, 2021
Purpose of Course :	- Practical implementation of technologies covered as part of syllabus using required software and learning application areas. - Understanding and learning concepts like Java programming and its Object and class concepts. - Various important concepts of Core Java like interface, package, threads. Also basic concepts related to Applet and Applet life cycle. - Basic concepts of .Net technology and implementation of different components of .Net Technology. - Students who selected Android Application will learn fundamental application development concepts including DART and Flutter. - Students who will select Web Design Development course will learn fundamentals of various important scripts and languages like XML, JSON, jQuery, AJAX and Node.js. It will give them a concept of using server side and client-side interaction.
Objective :	- Fundamental knowledge about platform independent object oriented Programming language like Java. - Various features of Core Java like interface, Packages, Garbage Collection, Exception handling, Threads and Applet. - To learn and enhance knowledge about .NET Technology to develop UI applications using different components and event driven codes. - Advance features of Web-designing and important tools and scripts at Client-end, middleware or server-end like XML, JSON, AJAX, Node.js, jQuery for those students who opt the 405-01 paper. - Android based application development advance features and fundamental knowledge about DART and Flutter for those students who opt for 405-02 paper.
Pre-requisite:	Object oriented concepts, knowledge of SQL, PL/SQL, Python, C, C++, Web Design Concepts (HTML5, CSS, Bootstrap, Java Script)
Course Outcome :	- At the end of this course, students will have hands on experience of writing and applying codes using Java programming Language. Object oriented concepts of Java , threads and Applet. - Students will understand concepts of .Net technology. - Students will have edge over concepts Programming skills and clear idea about using conditional and iterative statements, use of library functions and creating user defined functions. - Students who select web-designing-II as elective paper will learn advanced Web-Design concepts like JQuery, JSON, Node.js, AJAX. - Students who select Mobile Application Development-II course as elective will be able to work on advanced concepts on Android based mobile application development by learning DART, Flutter and advanced Android features.
Course Content:	1. Practical implementation of Paper-403 by writing codes and execution of tasks based on Unit-1 to Unit-3 and Unit-5. 2. Practical implementation of Paper-404.

	3. Practical implementation of Paper-405-01 or Paper-405-02. 4. A Minor Project based on Course Paper-405 is recommended during semester however not mandatory.
Teaching Methodology:	- Practical work, Lab sessions and hands on experience, Discussion, Self-Study
Evaluation Method:	30% Internal assessment. 70% External assessment. [For Internal and External Examination Suggested distribution of question weight will be as per following Weightage distribution] : (i) Paper-403 : 30% (ii) Paper-404 : 30% (iii) Paper-405-01 OR Paper-405-02 : 40%

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT

Syllabus for S. Y. B. Sc 3rd Semester (Computer Science)

with effect from June 2021

Name of Program	Bachelor in Computer Science
Abbreviation	B.Sc.(Computer Science)
Duration	3 Years (Full Time – Regular Course)
Eligibility	Candidate must have passed standard 12th (H.S.C.) Examination in Science stream through Gujarat Higher Secondary Board (G.H.S.E.B.) or any other equivalent board (C.B.S.E. / I.C.S.E.) with English subject. Students passed with vocational stream in 12th (H.Sc.) are also eligible. Candidate passed ITI and Diploma are eligible as per the norms of Gujarat Government.
Objective of the Program	The basic objective of the program is to open a channel of admission for computing courses for students, who have done the 10+2 and are interested in taking computing/IT as a career. The program caters to the needs of the students aspiring to excel in the fields of computers. The program is designed to develop computer professionals versatile in almost all field of computer application .The main emphasis of the course is preparing students in the field of computer science and application areas of computer science including software development skills.
Program Outcome	It will open field for the aspiring students to opt further career or masters' level study in the fields of Research, Design, Architecture and software development. It is also preparing aspiring students to work in companies at entry levels and also independently.
Medium of Instruction	English
Program Structure	Three years of Graduate level course comprises of six semesters.

Course Structure for Second Year B.Sc.(Computer Science) Semester-III

Course	Paper Code	Paper Title	Theory (Marks)		Practical (Marks)		Total Credits
			Internal	External	Internal	External	
Core Compulsory	301	Object Oriented Programming: C++	20	50	10	20	3
	302	System Development using c# .Net	20	50	10	20	3
	303	Relational Database Management System - 1	20	50	10	20	3
IDS: Can course	ID-01 ID-02 ID-03	E-Commerce and Cyber Security Computerized Accounting Business Systems	20	50	-	-	2
Foundation Elective (to be selected from NCC / NSS / Saptadhara)			NIL	-	-	-	2
Total:							**13**

For Practical:

1. Batch Size – 25 Maximum
2. The journal should be certified by the concerned faculty and also by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination.
3. P.N.: In case of Generic Elective Paper available in both semesters, it can be opted only during one semester. The same title cannot be repeated in another semester.

Course Code	Theory		Practical		University Examination (Theory + Practical)		Internal Marks	Total Marks
	Credit	Hours	Credit	Hours	Duration	Marks		
301	2	2	1	2	2	50+20	20+10	100
302	2	2	1	2	2	50+20	20+10	100
303	2	2	1	2	2	50+20	20+10	100
IDS: Can course	2	2	-	-	2	50	20	70
Total:	**8**	**8**	**3**	**6**	**8**			

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-III
Effective From: June 2021
Course: 301: Object Oriented Programming: C++

Course Code	301
Course Title	Object Oriented Programming : C++
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Object Oriented Programming Language. The concepts of class, objects and related features of OOPs are covered in this course. The course is aimed to give inner depth of Object oriented programming language concepts.
Course Objective	To make students understand concepts of Class and Objects. To make students understand concepts of Inheritance, Polymorphism. To make students understand the basic concepts of Constructors/Destructors. To make students understand function overloading, operator overloading, virtual functions. To make students understand concepts of arrays, pointers, dynamic memory allocation
Pre-requisite	Concepts of C programming Language.
Course Out come	At the end of the course, student is expected to have clear concepts about the Class, Objects and related terminologies. Students can apply object oriented concepts which is essential for further studies.
Course Content	**Unit 1: Introduction to OOP** 1.1 Introduction to OOP, Features of OOP, Advantages of OOP 1.2 Difference between OOP and Procedural programming 1.3 Class, Object, Data member, member function 1.4 Access specifier - private, public, protected 1.5 Constructor and destructor, parameterized constructor, copy constructor, default constructor 1.6 Nested classes. 1.7 Inline function, default arguments 1.8 Friend functions, friend classes 1.9 Array of objects 1.10 new, delete operators and this pointer **Unit 2: Inheritance** 2.1 Base and derived class 2.2 Single inheritance 2.3 Multilevel and Multiple inheritance 2.4 Hybrid inheritance 2.5 Using constructor in inheritance 2.6 Abstract base class

	Unit : 3 Polymorphism 3.1 Overloading and overriding 3.2 Function overloading 3.3 Operator overloading rules and implementation 3.4 Virtual function 3.5 Early binding and late binding, runtime polymorphism 3.6 pure virtual function and its benefits **Unit 4: File handling and Template** 4.1 File - input and output - file opening modes 4.2 text and binary files 4.3 read, write operations 4.4 Benefits of text and binary files.
Reference Books:	1. The complete reference C++ : Herbert Schildt, TMH. 2. Object Oriented Programming in C++ : Robert Lafore - Galgotia Publication. 3. C++ : Effective Object Oriented Software Construction - Kayshav Dattari. 4. Object Oriented Programming using C++ - Addition Wesley. 5. Object Oriented Programming in C++ - Balaguruswamy.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-III
Effective From: June 2021
Course: 302: System Development using C#.Net

Course Code	302
Course Title	System Development using C#.Net
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of primarily an integrated, interactive development environment ("IDE"). The visual studio-IDE has been highly optimized to support rapid application development ("RAD"). It is particularly easy to develop graphical user interfaces and to connect them to handler functions provided by the application.
Course Objective	To make students understand concepts of GUI and .NET Framework. To make students able to develop desktop based applications along with databases.
Pre-requisite	Concepts of GUI.
Course Out come	At the end of the course, student is expected to have clear concepts about the GUI, IDE, CLR and Rapid Application development Tool. Students can understand the concept of front-end tool as a base for developing interactive project.
Course Content	**Unit-1: OVERVIEW OF MICROSOFT .NET FRAMEWORK** 1.1. What is .net framework & its benefits 1.2. The Common Language Runtime(CLR), Purpose of CLR 1.3. Managed/Unmanaged code, Compilation & Exception 1.4. Memory Management, Garbage Collection 1.5. The .Net Framework Class Library. 1.6. Introduction to MS Visual Studio .NET **Unit-2: C#.NET PROGRAMMING LANGUAGE** 2.1 Data Types, Types Conversion Functions, Operator & Exceptions 2.2 Variable Declaration : Level, Lifetime, Scope & Accessibility 2.3 Decisions Structures 2.4 Loop Statements: While, Do…. Loop, For…Next, For Each…Next 2.5 Nested Control Statements, Exit Statement 2.6 Exception Handling 2.6.1 Exception Handling Overview , 2.6.2 Structures Exception Handling, Debugging

	Unit-3: Designing Using Interface 3.1Working with Forms 3.2 Basic Windows Controls 3.3 Menus, Timer, Common dialog control, Rich Textbox 3.4 Treeview & Listview controls, Toolbar, Statusbar 3.5 SDI & MDI Application **Unit-4: Data Access** 4.1 History of Microsoft Data Access Technologies 4.2 Overview of ADO.NET 4.3 The Server Explorer & Query Builder 4.4 ADO.NET Object Model 4.5 Programming ADO.NET-provider, Adapter, Reader, command objects 4.6 Disconnected Architecture
Reference Books:	1. Beginning c# by wrox publication 2. Programming in c# by E. Balaguruswami TMH 3. Visual C#.Net Black book by Kogent Learnig Solutions 4. Professional C# by wrox Publication
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-III
Effective From: June 2021
Course: 303: Relational Database Management System -I

Course Code	303
Course Title	Relational Database Management System –I
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Database Management System, Entity Relationship model, Relational Model, SQL (DDL, DML and DCL).
Course Objective	To make students understand concepts of Database. To make students understand concepts of Entity Relationship Management. To make students understand the basic concepts of Relational Model. To make students able to work with various SQL statements.
Pre-requisite	Concepts of Data and Data storage.
Course Out come	At the end of the course, student is expected to have clear Concepts about database, storage of data, database models, Entity and relationship, various keys and SQL.
Course Content	**Unit-1: Introduction to DBMS** 1.1 Concepts of Database and Database System 1.2 Requirement of database system.(data integrity, data isolation, data consistency, Data redundancy, Concurrency) 1.3 Data models and data independence 1.4 DDL, DML 1.5 Database Manager, Database Administrator. **Unit-2: Entity Relationship Models** 2.1 Entities and Entity sets 2.2 Relationship and relationship sets 2.3 Mapping constrains 2.4 Super Key, Candidate Key, Primary keys, Foreign Key, Unique Key 2.5 Integrity constraints-Domain, Entity and Referential 2.6 Entity Relationship diagram and reducing it to tables. 2.7 Structure of relational database. **Unit-3: SQL-1 : DDL and DML statements** 3.1 Overview of SQL and Database system (mySQL / SQLServer / PostgreSQL / Oracle etc), Loading and Dumping a Database. 3.2 Various data types and operators: logical, wildcard operators 3.3 DDL Statements: 3.3.1. CREATE TABLE command - Declaring Constraints,

	Table level Constraints, attribute level constraints, PRIMARY KEY constraint, FOREIGN KEY constraint, Limitation of Foreign key , On Delete Cascade 3.3.2 Altering a table, Dropping a table. 3.4. DML Statements: 3.4.1. INSERT statement, INSERT FROM statement. 3.4.2 UPDATE, UPDATE with multiple columns, Updating to NULL values, using sub queries with UPDATE command, 3.4.3 DELETE statement **UNIT 4 SQL-2: DQL statements** 4.1. SELECT statement- FROM and WHERE clause, ORDER BY, with NULL 4.2 Formatting Query output : Ordering output by fields, multiple columns, Aggregate Group, Column number, String and expressions , functions in query 4.3 Use of operators: Use of relational operators, use of Boolean operators, IN, BETWEEN, LIKE, NOT IN , 4. 4 Use of Table and Column Alias 4. 5 Retrieval of information from tables: GROUP BY clause, HAVING clause 4.6 Use of aggregate functions: avg(), max(), min(), sum(), count()
Reference Books:	1. Henry Kroth & Silbershats, Database System Concept. 2. C.J. Date, Introduction to Database Design, Addition Wesley, Nasora. 3. Martin Gruber, Understanding SQL, BPB Pub., New Delhi. 4. Ivan Bayross, SQL, PL/SQL The Programming Language of ORACLE, BPB Pub., New Delhi. 5. SQL / PLSQL programming By P.S. Despande wiley Dream Tech Pub. 6. J Ullman, Principles of Database Systems, Galgotia Pub., New Delhi. 7. ORACLE Manuals. 8. SQL Manuals 9. ORACLE 10g The Complete Reference, ORACLE Press, TMH, Delhi. 10. Oracle PL/SQL programming - Oracle press - Tata McGraw hill.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT

Syllabus for S. Y. B. Sc (Computer Science)

with effect from June 2021

Name of Program	Bachelor in Computer Science
Abbreviation	B.Sc.(Computer Science)
Duration	3 Years (Full Time – Regular Course)
Eligibility	Candidate must have passed standard 12th (H.S.C.) Examination in Science stream through Gujarat Higher Secondary Board (G.H.S.E.B.) or any other equivalent board (C.B.S.E. / I.C.S.E.) with English subject. Students passed with vocational stream in 12^{th} (H.Sc.) are also eligible. Candidate passed ITI and Diploma are eligible as per the norms of Gujarat Government.
Objective of the Program	The basic objective of the program is to open a channel of admission for computing courses for students, who have done the 10+2 and are interested in taking computing/IT as a career. The program caters to the needs of the students aspiring to excel in the fields of computers. The program is designed to develop computer professionals versatile in almost all field of computer application .The main emphasis of the course is preparing students in the field of computer science and application areas of computer science including software development skills.
Program Outcome	It will open field for the aspiring students to opt further career or masters' level study in the fields of Research, Design, Architecture and software development. It is also preparing aspiring students to work in companies at entry levels and also independently.
Medium of Instruction	English
Program Structure	Three years of Graduate level course comprises of six semesters.

Course Structure for Second Year B.Sc.(Computer Science) Semester-IV

Course	Paper Code	Paper Title	Theory (Marks)		Practical (Marks)		Total Credits
			Internal	External	Internal	External	
Core Compulsory	401	Data Structure using C++	20	50	10	20	3
	402	Web Development using C#.Net	20	50	10	20	3
	403	Relational Database Management System - 2	20	50	10	20	3
IDS: Can course	ID-01 ID-02 ID-03	E-Commerce and Cyber Security Computerized Accounting	20	50	_	_	2
Foundation Elective (to be selected from NCC / NSS / Saptadhara)			NIL	-	-	-	2
Total:							**13**

For Practical:

1. Batch Size – 25 Maximum
2. The journal should be certified by the concerned faculty and also by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination.
3. P.N.: In case of Generic Elective Paper available in both semesters, it can be opted only during one semester. The same title cannot be repeated in another semester.

Course Code	Theory		Practical		University Examination (Theory + Practical)		Internal Marks	Total Marks
	Credit	Hours	Credit	Hours	Duration	Marks		
401	2	2	1	2	2	50+20	20+10	100
402	2	2	1	2	2	50+20	20+10	100
403	2	2	1	2	2	50+20	20+10	100
IDS: Can course	2	2	-	-	2	50	20	70
Total:	**8**	**8**	**3**	**6**	**8**			

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-IV
Effective From: June 2021
Course: 401: Data Structure using C++

Course Code	401
Course Title	Data Structure using C++
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Data Structure. The concepts of Primitive and non-primitive data structures are covered in this course. It covers concepts of Arrays, Stack, Queue, Link list and sorting searching methods. The course is aimed to give inner depth and practical implementation of non-primitive data structures and its related applications.
Course Objective	To make students understand concepts of Primitive and non-primitive Data structure. To make students understand concepts of stack, queue and types of queues. To make students understand the implementation of Link-list and related applications. To make students understand concept of polish notation. To make students work with searching and sorting techniques.
Pr-requisite	C++ programming Language.
Course Out come	At the end of the course, student is expected to have clear concepts about the primitive and non-primitive data structure. Implementation of non-primitive data structure. Application implementation using stack, queue, link list.
Course Content	**Unit 1: Introduction** 1.1 Introduction data structure and its types 1.2 Array, structure, union, self referential structure 1.3 Concept of Algorithm analysis 1.4 Algorithm performance Analysis criteria (Time / Space) 1.5 Average case / Best Case / Worst case **Unit 2: Linear Data Structures** 2.1 Stack data structure, operations on stack (Push, Pop, Peep) 2.2 Applications of stack(Recursion, Evaluation of postfix, converting infix to postfix) 2.3 Simple Queue data structure and its operations (insert, delete and view) 2.4 Circular queue, Dequeue and Priority queue 2.5 Applications of queue (printer queue simulation, round robin Algorithm, Simulation)

	Unit 3: Non-linear data structures 3.1 Linked list - representation, advantages and disadvantages 3.2 Various operations on one way (singly) linked list 3.3 Various operations on two way (doubly) linked list 3.4 Various operations on circular linked list 3.5 Introduction to Tree and Binary tree 3.6 Tree traversal methods 3.7 Concept and Applications of Binary Search Tree (No practical implementation) **Unit 4: Searching and Sorting** 4.1 Searching Techniques- linear search, Binary search 4.2 Sorting - Internal and external sort 4.3 Quick sort 4.4 Merge sort 4.5 Insertion sort 4.6 Selection sort
Reference Books:	1. An Introduction to Data Structure with Applications : Trembley & Sorenson – McGraw Hill 2. Data Structures Using C & C++ - Langsam, Augenstein & Tanenbaum - PHI 3. Wirth, Niclaus, Algorith+Data Structure Programs, Prentice Hall. 4. Horwith E and Sahni S, Fundamental of Data Structure, Computer Science Press. 5. Aho A.V., Hopcrott and Ullman, Data Structure and Algorithms , Addition – Wesslely.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Note: Practical should be done using C++

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-IV
Effective From:June 2021
Course: 402: Web Development using C#.Net

Course Code	402
Course Title	Web Development using C#.Net
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	This course imparts the knowledge of web programming based on .NET technology. It covers the concepts of ASP.NET server controls, Client server communication, ADO .NET technology, Web Service Development etc. The course is aimed to give inner depth of ASP .NET technology.
Course Objective	To make students understand concepts of ASP .NET. To make students understand concepts of Server controls. To make students understand the basic concepts of client server communication. To make students understand of ADO .NET technology. To make students understand concepts of web config.
Pre-requisite	Concepts of .NET technology Framework and CLR.
Course Out come	At the end of the course, student is expected to have clear concepts about the ASP .NET. Students can apply .NET technology for implementing applications.
Course Content	**Unit 1: Introduction ASP.Net Web development** 1.1 Introduction to ASP.Net 1.2 Structure of ASP.Net Application 1.3 ASP.Net Application Life Cycle 1.4 ASP.Net Page Life Cycle 1.5 Request Object & Response Object 1.6 Page Class 1.7 web.config & global.asax file 1.8 Introduction to ASP.NET Core Framework and MVC architecture **Unit 2: Application Designing** 2.1 Basic Standard Controls 2.2 Master Page in ASP.NET 2.3 Navigation Control: Treeview, Menu & SiteMapPath 2.4 CSS, Theme & Skin file in ASP.NET 2.5 Validation Controls 2.6 AdRotator Control

	Unit 3: Accessing data using ADO.Net 3.1 Introduction to ADO.Net [Data Provider, Data Set] 3.2 Connection Object, Command Object, Data Adapter Object 3.3 Data Binding [Binding data to control Combo Box, List Box] 3.4 Data Control: Grid view control, Form view control, Listview control , Repeater control **Unit 4: State Management and Web services in ASP.NET** 4.1 Client-side State Management Technique 4.1.1 View State 4.1.2 hidden Fields 4.1.3 Query String 4.1.4 Cookies 4.2 Server-side State Management Technique 4.2.1 Session State 4.2.2 Application State 4.3 Web Services: 4.3.1 Introduction to web service-Architecture 4.3.2 Integration-Web Service Description Language – Accessing web service using different Clients.
Reference Books:	1. Beginning ASP.NET 4.0 in C# and VB by Imar Spaanjaars Wrox Pubs. 2. ASP.NET 4.0 – Black Book - Dream Tech 3. Professional ASP.NET in C# and VB Wrox Pubs. 4. Pro ASP .NET 4.5 in C# (Professional Apress) by Mario Szpuszta Adam Freeman, Matthew MacDonald (Author) 5. ASP.NET Core in Action by Andrew Lock Web References: http://www.asp.net http://www.w3cschool.com for ASP.NET http://www.tutorialspoint.com for ASP.NET
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-IV
Effective From:June 2021
Course: 403: Relational Database Management System - II

Course Code	403
Course Title	Relational Database Management System – II
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	This course imparts the knowledge of Relational Database Management System, specifically database normalization. Understanding of PL/SQL blocks structure. Exception handling mechanism and concept of package is covered. The course is aimed to give inner depth of Relational Database Management system using.
Course Objective	To make students understand and carryout Database Normalization. To make students understand concepts of PL/SQL . To make students understand the basic concepts of cursors and their types. To make students understand concepts of functions, procedures, triggers and package.
Pre-requisite	Concepts of Database management System and SQL.
Course Out come	At the end of the course, student is expected to have clear concepts about the Transaction concepts, Concurrency control, PL/SQL block structure, Error Handling , Exception handling and package
	.
Course Content	**Unit-1: Relational Database Design** 1.1 Functional Dependencies 1.2 Need for Normalization 1.3 Normal forms (1NF, 2NF, 3NF and B.C.N.F.) 1.4 Data Dictionary 1.5 Tables, Table spaces & Data files, Views. **Unit 2 :Advanced SQL** 2.1 Join Queries : 2.1.1. Basic concept of Joining table 2.1.2 Inner Join, Outer Join (Left, Right, Full),self Join 2.2 Subqueries : DISTINCT with subqueries, Predicates with subqueries, Aggregate Functions in subqueries, Correlated subqueries, Correlating tables to itself, Correlated subqueries in HAVING, UNION, INTERSECT,NOT IN. 2.3 CREAT VIEW Command : Updating views, Group views and Joins, Views and sub queries, Changing values through views, 2.4 Grant command, using ALL and PUBLIC arguments, GRANT and REVOKE OPTION.

	2.5 Introduction to Transactions, Commit, Rollback, Savepoint **Unit-3:**PL/SQL: 3.1. PL/SQL Block Structure 3.2 Using Variables,, Constants and Data Type 3.3 User Defined Record 3.4 Assigning Values to Variables 3.5. Control Statements (IF…THEN statement, Loop, FOR...Loop, While Loop) 3.6 Exception handling 3.7 User-Defined RECORD and TABLE data types. 3.8 Concepts of Cursor 3.8.1 Types of Cursors 3.8.2 Handling Cursors **Unit 4 :PL/SQL Programs** 4.1 Anonymous PL/SQL Blocks 4.2 Procedures and Functions, 4.3 Triggers 4.4 Packages
Reference Books:	1. Henry Kroth & Silbershats, Database System Concept. 2. C.J. Date, Introduction to Database Design, Addition Wesley, Nasora. 3. Martin Gruber, Understanding SQL, BPB Pub., New Delhi. 4. Ivan Baross, SQL, PL/SQL The Programming Language of ORACLE, BPB Pub., New Delhi. 5. James Martin, Computer Database Organization, PHI, New Delhi. 6. J Ullman, Principles of Database Systems, Galgotia Pub., New Delhi. 7. ORACLE Manuals. 8. SQL Manuals 9. George Koch and Kevin Loney, ORACLE 8 The Complete Reference, ORACLE Press, TMH, Delhi. 10. Oracle PL/SQL programming - Oracle press - Tata McGrawHill.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

The Enclosed papers are to be included as IDS CAN course for S.Y.B.Sc.(Computer Science) along with the existing CAN courses. Students are supposed to select one IDS in 3rd semester and one in 4th semester.

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc.(Computer Science) – CAN course.
Effective From: June-2021
Course: ID-01: E-Commerce and Cyber Security

Course Code	ID-01
Course Title	E-Commerce and Cyber Security
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Electronic commerce, online order processing concepts and related threats. The concepts of electronic transactions, e-commerce framework, related security issues and threats are covered in this course. It also highlights the issues related to cyber crime, types of possible cyber crimes and related issues. The course is aimed to give e-commerce related issues and concepts.
Course Objective	To make students understand concepts of e-commerce framework. To make students understand concepts of types of online transactions. To make students understand the basic concepts of security issues pertaining to e-commerce. To make students understand various possible cyber crimes and its related laws.
Pre-requisite	Concepts of electronic commerce and online transactions.
Course Out come	At the end of the course, student is expected to have clear concepts about the e-commerce, types of e-commerce, e-commerce framework, security issues pertaining to e-commerce, cyber crimes and related cyber laws.
Course Content	**Unit-1:** 1.1 Introduction to E-commerce 1.1.1 What is E-commerce 1.1.2 E-commerce frame work 1.2. E-commerce consumer applications 1.2.1 E-commerce organization applications 1.2.2 Network for E-commerce 1.2.3 what is information way

	Unit-2:E-commerce and World wide web 2.1 E-commerce application services 2.2 Consumer to Business Transaction 2.3 Business to Business Transaction 2.4 Security on the web 2.5 Categories of Internet data and transactions **Unit-3: E-commerce security Issues** 3.1 Secure Socket layer 3.2 Types of Electronic payment systems 3.2.1 E-cash 3.2.2 Electronic checks 3.2.3 Smart cards and electronic payment systems 3.2.4 Credit card and debit cards payment and their authentication **Unit-4: Introduction to Cyber Crimes** 4.1 Category of cyber crimes 4.2 Technical aspects of cyber crimes 4.2.1 Unauthorized access & Hacking 4.2.2 Trojan , virus and Worm attacks 4.3 E-mail & IRC related crimes 4.3.1 Email spoofing and Spamming 4.3.2 Email bombing 4.3.2.1 Sending threatening emails 4.3.2.2 Defamatory emails 4..3.2.3 Email frauds , IRC related 4.3.2.4 Denial of Service attacks 4.3.2.5 A distributed denial of service attack **Unit-5: Prohibited actions on Cyber** 5.1 Pornography 5.2 IPR violation , software piracy , copyright infringement, trademarks violation, theft of computer source code, patent violations 5.3 Cyber Squatting 5.4 Cyber terrorism 5.5 Banking/Credit card related crimes 5.6 E-commerce/Investment Frauds- Sales and investment frauds

	5.7 Sales of Illegal articles 5.8 Defamation(Cyber smearing) 5.9 Cyber stalking
Reference Books:	1. E-commerce Stategies --- Charle s Trepper 2. E- Commerce an Indian Perspective—Joseph- PHI 3. Electronics Commerce : A Managerial Prespective – Efraim Turban, Jae Lee 4 Cyber Crime in India ---- Dr M Dasgupta 5 Cyber Law and Crimes – BarkhaU, Rama Mohan 6 Cyber Laws Law---Dr Sarla Gupta 7 Email Hacking - Ankit Fadia 8 Ethical hacking Guide to Corporate Security—Ankit Fadia
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc.(Computer Science) – CAN course.
Effective From: June-2021
Course: ID-02: COMPUTERISED ACCOUNTING

Course Code	ID-02
Course Title	Computerised Accounting
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Introduction to Accounting System, Accounting Concepts, Accounting Equation & Transaction Analysis, Concepts of Book-Keeping and accounting package. The course is aimed to give inner depth of Accounting and Book keeping concepts.
Course Objective	To make students understand concepts of Accounting system. To make students understand concepts of Book Keeping. To make students understand the basic concepts of Accounting Equations & Transaction Analysis. To make students understand computerized accounting package.
Pre-requisite	Concepts of Accounts and basic knowledge of computerized application package.
Course Out come	At the end of the course, student is expected to have clear concepts about the Accounting System, Accounting Concepts, Accounting Equation & Transaction Analysis, Concepts of Book-Keeping and accounting package. Students can apply Accounting and Book Keeping concepts which are to understand commercial accounting packages.
Course Content	**Unit-1: Fundamentals of Accounting** 1.1.Introduction to Accounting System 1.1.1 Meaning & Definition of Accounting 1.1.2 Objectives of Accounting 1.1.3 Concepts and Features of Book Keeping 1.1.4 Branches of Accounting (Financial Management, Cust) 1.1.5 Basis of Accounting (Accrual Bases, Cash Bases) 1.2. Accounting Concepts 1.2.1 Accounting Concept

	1.2.2 Accounting Equation Concept 1.2.3 Accounting Period Concept 1.2.4 Concept of Matching Realization Accrual **Unit-2: Accounting Equation & Transaction Analysis** 2.1 Accounting Equation & Transaction Analysis 2.1.1 Introduction to Assets, Liabilities, Equities 2.1.2 Concepts of Transaction Analysis 2.1.3 Classification of Accounts (Real Account, Personal Account, Nominal Account) 2.2 Concepts of Book-Keeping 2.2.1 Introduction of Single Entry System and its advantages/disadvantages 2.2.2 Introduction of Double Entry System and its advantages 2.2.3 Types of Business Transaction 2.2.3.1 Cash Transaction 2.2.3.2 Credit Transaction 2.2.3.3 Barter Transaction **Unit-3: Journal & Subsidiary Books (With Preliminary examples)** 3.1 Meaning of Journal 3.2 Format of Journal 3.3 Concept and format of cash Book 3.4 Concept and format of Petty cash Book **Unit-4: Concept of Accounting Mechanism** 4.1 Meaning and Definition of Ledger 4.2 Types of Ledger 4.3 Concepts of posting Bank Reconciliation Statement 4.4 Trial Balance and its objectives 4.5 Concepts of Suspense Account **Unit-5 Application of Accounting Using Accounting Package** 5.1 Creation of Company 5.2 Voucher Printing Entry 5.3 Alteration, Deletion of Vouchers 5.4 Types of Voucher entry (Receipt, Payment, Contra, Purchase, Sales, Journal, Physical Stock, Reversing Journal) 5.5 Generating Trial Balance 5.6 Maintaining Account Books & Reports

	5.6.1 Cash Book, Bank Book, Ledger 5.6.2 Sales Register, Purchase Register 5.6.3 Day Book, Inventory Book, Stock Summary 5.6.4 Balance Sheet
Reference Books:	1. Accounting for Management – By Dr. Hawaharlal 2. Financial Management - By Dr. S.N. Maheshwari 3. Accounting for Management – By S.K. Bhattacharya & John Deardon 4. Advanced Accountancy – By S.P. Jain & K.I. Narang 5. Implementing Tally 6.3 – By K.K. Nathani – BPB Publication 6. Implementing Tally 7.2 – By A.K. Nathani & K.K. Nathani BPB Publication
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc.(Computer Science) – CAN course.
Effective From: June-2021
Course: ID-03: Business Systems

Course Code	ID-03
Course Title	Business Systems
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June-2018
Purpose of Course	This course imparts the knowledge of various business information systems needed to be model, design and program as software engineer.
Course Objective	To provide comprehensive knowledge of concepts related to various business information systems To provide basics for system and data modelling. To provide insight into business operations and their significance in information system
Pre-requisite	Concept of information system
Course Out come	At the end of the course, student will be able to 1. Understand business operations and related information systems. 2. Perform system and data modelling for given business information system
Course Content	**Unit 1 Introduction** 1.1 Introduction to Business Data Processing 1.2 Overview of Business systems 1.3 Management Functions, Levels of Management 1.4 Sources of Information, Applications like Payroll, Accounting, Inventory, MIS, DSS **2. Inventory Control System** 2.1 Objectives of good inventory control system 2.2 Transaction for an inventory system (Purchase, Issue, Purchase Return and Issue Return) 2.3 Creation of transaction file, Item master file for purchase, issue, purchase return and sales return. 2.4 Consumption analysis, A B C analysis, Year-end processing and Periodic housekeeping

	3. Payroll System 3.1 Objectives of payroll systems 3.2 Classification of employees based on payment of wages 3.2.1 Monthly dated employees 3.2.2 Daily rated employees (Time rated employees, Piece rate employees) 3.3 Leave entitlements, Overtime wages, bonus, provident fund contribution and other deductions 3.4 Computerizing a Payroll system: Case Study **4. Banking System** 4.1 Objectives of banking systems 4.2 Present level of computerization 4.3 IT packages and services in India 4.4 Core modules and reports 4.5 Internet Banking 4.6 e-Banking in India 4.7 Business payment solutions **5. Services Oriented Business System & ERP** 5.1 Service Definition, Types of Services 5.2 Process of Services, Effects of Services, Software as a Service 5.3 Evolution of ERP, Definition of ERP, Various Modules of ERP, Advantage of ERP. 5.4 Case study based on ERP.
Reference Books:	1. Business applications using computers Ramachandran Nambissan T.M BPB publications 2. Enterprise resource planning Alexis Leon Tata McGrawhill 3. Services Marketing People, Technology, Strategy: Chrestopper Lovelock and Jochen Wirtz - Pearson Education. 4. Production And Operations Management: K. Aswathappa And Shrddhara Bhat, Himalaya Publishing House. 5. Retailing Management: Levy writz - TMH. **6.** Logistics And Distributed Management: Alan Rushton, John Oxley Phil Croucher -Kogan Page.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Master of Science (Computer Application) 2019-20

Name of Program	Master of Science (Computer Application)
Abbreviation	MSC(CA)
Duration	2 Years (Regular)
Eligibility	Candidate must have passed Bachelors Degree in Computer Science / Computer Application / Information Technology / Computer Engineering / equivalent degree in Computer / IT field.
Objective of Program	The Objective of the program is to impart knowledge of advanced and/or latest theories, concepts, methods, techniques and tools related to various areas of Computer Science, Applications and Information Technology and specifically in the area of Mobile based, cloud based, Web based Application Development, Software Engineering, Data Management and Intelligent Systems.
Program Outcome	At the successful completion of the program, students will be able to start their career in the Information Technology industry.
Program Structure	**Semester 1**

Course Code	Title	Teaching Hrs. per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
101	Advanced Software Engineering / Fundamentals of Artificial Intelligence	4	0	4	3 Hrs	70	30	100
102	Advance Database Management System	4	0	4	3 Hrs	70	30	100
103	Fundamentals of Web Client Technologies.	4	0	4	3 Hrs	70	30	100
104	Enterprise Data Management and ERP / Fundamentals of Big Data	4	0	4	3 Hrs	70	30	100
105	Web Programming Using Java	4	0	4	3 Hrs	70	30	100
106	Practical in Web Programming Using Java	0	4	4	4Hrs	70	30	100
107	Practical in Web Client Technologies	0	3	3	2 Hrs	70	30	100
108	Practical in Advanced Database Management System	0	3	3	2 Hrs.	70	30	100

Semester -2

Course Code	Title	Teaching Hrs. per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
201	Service Oriented Architecture	4	0	4	3 Hrs	70	30	100
202	Web Programming Using C#	4	0	4	3 Hrs	70	30	100
203	Advanced Scripting Languages	4	0	4	3 Hrs	70	30	100
204	Data Warehousing and Data Mining Internet of Things	4	0	4	3 Hrs	70	30	100
205	Information Security	4	0	4	3 Hrs	70	30	100
206	Practicals in Web Programming Using C#	0	4	4	2 Hrs	70	30	100
207	Practicals in Advanced Scripting Languages	0	4	4	2 Hrs	70	30	100
208	Practicals on Cryptography	0	2	2	2 Hrs	70	30	100

2nd Year Master of Science (Computer Application) 2020-21

Semester 3

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
301	Advance PHP Programming	4	0	4	3 Hrs	70	30	100
302	Mobile Application Development	4	0	4	3 Hrs	70	30	100
303	Software Testing	4	0	4	3 Hrs	70	30	100
	AI Modeling with Python							
304	Elective 1	4	0	4	3 Hrs	70	30	100
305	Elective 2	4	0	4	3 Hrs	70	30	100
306	Practicals on Advanced PHP Programming	0	3	3	2 Hrs	70	30	100
307	Practicals on Mobile Application Development	0	4	4	2 Hrs	70	30	100
308	Practicals on Software Testing Practicals on AI modeling with Python	0	3	3	2 Hrs	70	30	100
TOTAL		20	10	30		560	240	800

Elective 1 and 2 are to be selected from the following papers:

a) Distributed Databases
b) Multimedia Systems
c) Advanced Artificial Intelligence
d) Cyber Security and Forensics
e) Search Engine Optimization and Digital Marketing

Semester 4

Course Code	Title	Course Credits	University Marks	Internal Exam Marks	Total Marks
401	Project	24	280	120	400
402	Seminar	6	70	30	100
TOTAL		30	350	150	500
Program Passing Rules		As Per the University Norms of PG Rules			

Course : 301 : Advanced PHP Programming

Course Code	301
Course Title	Advanced PHP Programming
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2017
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool related to PHP for professional web application development , management and maintenance.
Course Objective	To Provide in-depth knowledge of most recent Open Source based server side programming technology.
Pr-requisite	Basic Understanding of Web, HTTP, HTML, Database Systems, Networks and Open Source Concepts
Course Out come	After completion of this course, the student will be capable to develop , manage and maintain professional web applications using PHP
Course Content	**Unit 1 Codeigniter Framework** 1.1 Introduction to Codeigniter: setup, Configuration files support, Application flow control and model-view-controller architecture 1.2 Codiginiter URL□ s , Helper's file and URI routing, Codeigniter in-built libraries, Common functions, Error Handling 1.3 OOP in Codeigniter **Unit 2 Web Application Development using Codignitor** 2.1 Working with forms and validations 2.2 Cookies and Session Management 2.3 Using built in helpers for Email and SMTP support 2.4 Crud operation in Codeigniter using SQLite / MYSQL **Unit 3 Working with images, pdf files and XML (with OOP/Codeigniter)** 2.1 Working with images 2.1.1 Creating and manipulating images 2.1.2 Using Text in Images 2.1.3 Saving and building on existing image. 2.2 Generating PDF file with text, shapes and images. 2.3 PHP with XML 2.3.1 XML Introduction 2.3.2 Generating XML Document 2.3.3 Parsing XML Document **Unit 4 Web services in PHP** 4.1 Creating web services 4.2 Discovering web service 4.3 Accessing web services. 4.4 API integration using third-party libraries in Codeignitor (EX: Google Maps CI, Linkedln API Wrapper , etc.) **Unit 5 Laravel Framework** 5.1 Introduction to Laravel, features and advantages 5.2 Composer installation for Laravel:

	5.2.1 Create Project in IDE 5.2.2 Setup Local Host file: Vhost Entry, httpd.conf, MOD Rewrite, Restart Apache 5.3 Application Structure : App, Console, Events, Exceptions, Http, Jobs, Listner, Config, Database, Resources, Storage, Vendor 5.4 Environment configuration , Setup the DB 5.5 Laravel Routing : Basic Routing, Route Parameters, Named Routes 5.6 Laravel Middleware , Request & Response 5.7 Laravel View & Blade template 5.8 Laravel Controllers & Redirecting. 5.9 Basic introduction to Database migrations and Eloquent Models

Reference Book	1. Programming with Codeigniter MVC BY Eli Orr and Yehoda Zadik, Shroff publication, ISBN – 13:978-93-5110-330-1 2. Codeigniter 1.7 by Jose Argudo Blanco and David Upton Shroff publication ISBN – 13:978-81-8404-606-0 3. The complete reference – PHP by Steven Holzner Mc Graw Hill ISBN – 13:978-0-07-0223622 4. AJAX and PHP: Building Modern Web Applications by Cristian Darie Second edition Packt publishing, ISBN: 1904811825, 9781904811824 5. XML and PHP by Vikram Vaswani SAMS Publishing ISBN - 0735712271, 9780735712270 6. PHP Web Services APIs for the Modern Web By Lorna Jane Mitchell O'Reilly Media, ISBN: 978-1-4493-5656-9 | ISBN 10:1-4493-5656-7
Teaching Methodology	Discussion, Independent Study, Seminars / Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation,class test, quiz, assignment / seminar, internal examination etc. 70% assessment is based on end semester written examination

Course: 302: Mobile Application Development

Course Code	302
Course Title	Mobile Application Development
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2017
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool of mobile application development using Android for development , management and maintenance of mobile device based application.
Course Objective	To Provide in-depth knowledge of most recent Mobile Devices Application Development technology.
Pr-requisite	Basic Understanding Java Programming, Object Oriented Concepts and Networks.
Course Out come	After completion of this course, the student will be capable to develop, manage and maintain professional mobile applications using Android
Course Content	**Unit 1.Introduction To android** 1.1 Architecture Of Android OS 1.2 Types Of Android Application - Foreground Applications, Background Services, Intermittent Applications, Widgets & Containers. 1.3 Components Of Android Application - Activities, Services, Broadcast Receivers, Content Providers 1.4 Application Lifecycle, Priority and States 1.5 Android Activity- Activity Lifecycle and Activity Stack 1.6 Android Development Tools 1.6.1. Android SDK and SDK Manager 1.6.2. The Android Virtual Device, Emulator 1.6.3. Dalvik Debug Monitor Service (DDMS) 1.6.4. Android Debug Bridge (ADB) 1.7 Introduction to cross-platform development using flutter **Unit 2. Programming with Android** 2.1 Directory Structure of Android Application 2.2 Creating And Working with Android Activities 2.3 Application Manifest 2.4 Creating User Interface 2.4.1. Fundamental UI Design 2.4.2. Layouts and its attributes 2.4.3. Drawable Resources 2.4.4 Fragments 2.5 Deploying Android Application **Unit 3. Working with Data** 3.1 Working with SqLite database 3.2 Shared Preferences-Creating, Saving, Retrieving Shared Preferences. 3.3 Creating and using Content Providers. 3.4 Working with Firebase Realtime Database **Unit 4. Advanced Android Programming** 4.1 Working with advanced UI controls 4.1.1 Working with Listviews - Simple Listview, Custom Listview 4.1.2. Working with Menus

	4.1.3 Working with Dialog classes - Alert dialog, Specialist input dialog, Using Activities as dialogs. 4.2 Working with Webview 4.3 Working with Intents-Intents, Linkify, Broadcast Receivers, Intent Filters 4.4 Working with Notifications **Unit 5. Working with other Resources** 5.1 Using Internet Resources, Services, Google App engine, Geocoder and Google Maps 5.2 Audio, Video and Using the Camera 5.2.1 Playing and recording Audio and Video 5.2.2 Working with the Camera
Reference Book	1. Professional Android 4 Application Development Reto Meier, WROX Publication-2015 2. Android for Programmers-An App Driven Approach, Deitel, Deitel, Deitel and Morgano, Pearson Publication-2012 3. Android Programming Unleashed, Harwani, Pearson Publication-2013 4. Professional Android Programming-with MONO McClure, Blevins, Croft, Dick and Hardy, Wiley India-2012 5. Android application development for java programmer, James C Sheusi, Cenage Learning-2013 6. Android Essentials, Chris Haseman, Apress Publication, 2009 7. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd, 2009 8. Pro Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd, APress-2009
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course: 303: SOFTWARE TESTING

Course Code	303
Course Title	SOFTWARE TESTING
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2017
Purpose of Course	The course gives students an idea about Software Testing fundamentals and practice followed to test the software.
Course Objective	To Provide in-depth knowledge of most Software Testing and Industrial practices in it.
Pr-requisite	Basic Understanding of Programming and Software Engineering.
Course Out come	After completion of this course, the student will be capable of implementing the concepts, methods and tools of software testing.
Course Content	**Unit -1 Software Testing** 1.1 Role and objective of Testing, Central Issue in Testing, Testing Activities 1.2 Testing Approaches-Whitebox, Blackbox and Greybox 1.3 Levels of testing : Unit, Integration, System and Acceptance **Unit 2: Types of testings** 2.1 Code coverage-program statement and Line coverage, Branch coverage, condition Coverage, path coverage, function/procedure coverage 2.2 Data Testing-Testing for Boundary conditions, Sub-Boundary conditions, Default, Empty, Null, Zero, None, Invalid, Wrong, Incorrect, Garbage Data 2.3 Functional Testing: 2.3.1 Testing for Correctness, Completeness, Accuracy, Precision 2.3.2 Test to pass and test to fail 2.4 Behavioral Testing: State based testing, Testing for Stress, Load, Performance, Security 2.5 Regression testing, Smoke testing and Sanity Testing 2.6 Basics of Usability Testing, Configuration Testing and Compatibility Testing 2.7 Basics of Testing for Web & Mobile Applications **Unit 3: Test Automation** 3.1 Manual Testing Vs. Automated Testing 3.2 Criteria for Test Automation 3.3 Tool Selection and Introduction criteria 3.4 Cost Effectiveness of Tool Introduction 3.5 Types of test tools 3.5.1 Requirements and basic characteristic of Tool for Test management and Control 3.5.2 Requirements and basic characteristic of Tool for Test Case Generation 3.5.3 Requirements and basic characteristic of Tool for Test Execution 3.5..4 Requirements and basic characteristic of Tool for Regression Testing

	Unit 4 Test Automation Tools 4.1 Unit Testing with NUnit 4.1.1 NUnit framework, Test Fixture, Test, Sepup & Tear Down, Asserts and Exception 4.1.2 Writing and executing testcases with NUnit 4.2 Unit Testing with JUnit 4.2.1 JUnit framework, Test Fixture, TestCase, Sepup & Tear Down Asserts and Exception 4.2.2 Writing and executing testcases with JUnit 4.3 Functional Web Testing Using Selenium and Selenium Web Driver 4.3.1 Creating, Saving and Exporting TestCases and TestSuites 4.3.2 Test recording and playback using Selenium 4.3.3 Fundamentals of Selenium commands, parameters, element locators filters and string match patterns **Unit 5: Other testing Tools** 5.1 Test case generation Tool-case study of TestCaseGenerator 5.2 Tool for Bug Tracking- case study of Bugzilla 5.3 Tool for Test Management-case study of Tlink
Reference Book	1. Ron Patton "Software Testing", Techmedia Publication, 2000 2. Dr. K.V.K.K prasad, "Software Testing Tools", Dreamtech, 2006 3. Srinivas D and Gopalswamy R, "Software Testing: Principles and Practices". Pearson Education, 2013 4. Rajiv Chopra,"Software Testing- A Practical Approach", 5. K. Mustafa and R.A Khan, "Software Testing -concepts and practices", Narosa, 2012 6. Bill Hamilton, "NUnit: pocket Referance", SDP-OReilly, , 2004 7. Andrew Hunt and David Thomus, "Pragmatic Unit Testing in Java with JUnit", SPD, 2006 8. Aditya Garg and Ashish Mishra, "A Practitioner□ sGuide to Test Automation using Selenium", McGrawHill Education, 2015 9. S.A Kelkar, " Software Quality and Testing- A Concise Study",
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : 303 : AI Modeling with Python

Course Code	303
Course Title	**AI Modeling with Python**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool related to python for modeling various AI applications.
Course Objective	◆ To learn Python programming and usage of various libraries ◆ To learn and implement Data processing and visualization routines ◆ To implement and evaluate various AI models in Python
Pr-requisite	Only those Students who have completed any one of the following courses can opt this course: 1) M.Sc(Comp. Appl). Sem-1- 101: Fundamentals of Artificial intelligence 2) M.Sc(Comp. Appl). Sem-II- 204: Datawarehousing and Data mining
Course Out come	After completion of this course, the student will be capable to model some AI applications using Python.
Course Content	**Unit 1 Basic Python Libraries : Numpy and Pandas** 1.1 Arrays and Vectorized Computation using NumPy 1.1.1 The NumPy ndarray: A Multidimensional Array Object 1.1.2 Universal Functions: Fast Element-wise Array Functions 1.1.3 Data Processing and File I/O with Arrays 1.2 Data Operations and Pre-Processing with Pandas 1.2.1 Operations on Data 1.2.2 Reading and Writing Data in Text Format 1.2.3 Summarizing and Computing Descriptive Statistics 1.2.4 Handling Missing Data, Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, String Manipulation 1.2.5 Plotting and Visualization using Pandas **Unit 2: Plotting and Visualization using Matplotlib** 2.1 PyPlot and Plotting 2.2 Markers, Lines and Lables 2.3 Grids, Sublpots and Scatter Plots 2.4 Bars Histograms and Piecharts 2.5 Images, Contours and Fields 2.6 Working with Shapes, Collections and Stylesheets 2.7 Introduction to Animation and Event Handling in Matplotlib **Unit 3 Modeling AI Applications in Python** 3.1 Overview of Machine Learning 3.2 Supervised Learning and Classifiers 3.3 Model Train-Test and Learning Concepts, Model Evaluation 3.4 Modeling Supervised Machine Learning - Naive Bayes classifiers Modeling k-Nearest Neighbor 3.5 Modeling Decision Tree based classifier 3.6 Confusion Metrics **Unit 4 Linear Models and Artificial Neural Networks** 4.1 Regression, Generalization, Overfitting, and Underfitting, Relation of Model Complexity to Dataset Size 4.2 Linear Regression and its application

	4.3 Modeling Neural Network 4.2.1 Defining ANN in Python - layers and Multilayer Perceptron, weights, bias, Activation Function, Loss function, Epochs 4.2.2 Training and testing Neural Network, Feed Forward Neural Network, Backpropagation Neural Network, Error calculation **Unit 5 Model Evaluation and Improvement** 5.1. Cross-Validation and its benefits 5.1.1. Cross-Validation in scikit-learn 5.1.2. Stratified k-Fold Cross-Validation and Other Strategies 5.2. Evaluation Metrics and Scoring 5.2.1. Keep the End Goal in Mind 5.2.2 Metrics for Binary Classification, Multiclass Classification, Regression Metrics 5.2.3. Using Evaluation Metrics in Model Selection 5.2.4 Overview of Model Deployment
Reference Book	1. Core Python Programming – by Wesley J Chun ISBN-13: 978-0132269933 2. Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython , By William McKinney Publisher: O'Reilly Media 3. Pandas Cookbook Paperback – by Theodore Petrou (Author) 4. Python for Data Science for Dummies-By Mueller and Massaron, Wiley Publication 5. Introduction to Machine Learning with Python by Sarah Guido, Andreas C. Müller Publisher: O'Reilly Media, Inc. ISBN: 9781449369880 6. Machine Learning in Python-Michael Bowles, Wiley Publication 7. Machine Learning (in Python and R) for Dummies- By Mueller and Massaron, Wiley Publication 8. Python for Everybody: Exploring Data in Python 3, by Charles Severance (Author), Aimee Andrion (Illustrator), Elliott Hauser (Editor), Sue Blumenberg (Editor) 9. An Introduction to Python - by van Rossum Guido ISBN: 9780954161767, 0954161769 10 Python for everybody, Charles, Serverance, SPD 11. Python Programming using Problem Solving Approach-By Reema Thareja Oxford University Press 12. Introduction to Computer Science using Python-Charles Dierbach, Wiley Publication
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective - A - DISTRIBUTED DATABASE MANAGEMENT SYSTEM

Course Code	ELECTIVE B
Course Title	DISTRIBUTED DATABASE MANAGEMENT SYSTEM
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2015
Purpose of Course	The course gives students an idea about Distributed Database System and Query processing in Distributed Database System.
Course Objective	To provide comprehensive knowledge of Distributed Database Systems and aspect related to it.
Pre-requisite	Deep understanding of Database Management System concepts, Database Design, Database Management, Database Storage, Querying and Query Processing, Query Evaluation and Optimization and Object Oriented Concepts.
Course Out come	After completion of this course, the student will gain comprehensive knowledge of Distributed Database Systems and aspects related to it.
Course Content	**Unit 1 Introduction to Distributed database Management System** **1.1** Distributed data processing, What is a DDBMS? **1.2** Advantages and disadvantages of DDBMS. **1.3** Problem areas, Overview of database and computer network concepts **1.4** Architecture **1.5** Transparencies in a distributed DBMS **1.6** Distributed DBMS architecture Global directory issues **Unit 2 Distributed Database Design** **2.1** Alternative design strategies **2.2** Distributed design issues **2.3** Fragmentation, Data allocation **Unit 3 Query Processing Issues & query optimization in distributed databases** **3.1** Objectives of query processing, Characterization of query processors **3.2** Layers of query processing, Query decomposition **3.3** Localization of distributed data **3.4** Factors governing query optimization **3.5** Centralized query optimization, Ordering of fragment queries **3.6** Distributed query optimization algorithms **Unit 4 Distributed Object Management and query processing** **4.1** Object model features **4.2** Fundamental object management issues **4.3** DOM architectures **4.4** Object caching, Object clustering, Object migration **4.5** Distributed object base systems **4.6** Problems in accessing distributed objects **4.7** Goals of Distributed object assembly problem **4.8** Strategies for distributed object assembly

	Unit 5 Transaction Management in Distributed Databases **5.1** The concept of „transaction **5.2** Goals of transaction management, Characteristics of transactions **5.3** Taxonomy of transaction models
Reference Book	1. Principles of Distributed Database Systems - M.T. Özsu and P Valduriez – Prentice-Hall 2. Principles of Distributed Database Systems, 3rd edition - M.T. Özsu and P Valduriez – Springer , 2011 . 3. Distributed Object Management By Morgan Kaufman - M.T. Özsu and P Valduriez (editor) - 4. Distributed Databases Principles and Systems – S. Ceri and G.Pelagatti – Macgraw Hill Book Company ISBN : 5. Oracle 9i Distributed Database Replication Manual Mordern Database systems. 6. The Object Model Interoperability and Beyond - W.KIM(editor) – APRESS 7. Advances in Object-Oriented Database Systems – A.Dogac, M.T Ozsu, A Billiris and T.Sellis (editors) - Springer –Verlag 8. Object Oriented Database System – Approaches & Architectures - C.S.R PRABHU - PHE Pub. 9. Fundamental of Database Systems 3rd edition – Elinisky & Navathe – Addison Welsey 10. Database Management Systems – Raghu Ramkrishnana and Johannes Gehrke – McGraw Pub.
Teaching Methodology	Discussion, Independent Study, Seminars / Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective -B MULTIMEDIA SYSTEMS

Course Code	ELECTIVE C
Course Title	MULTIMEDIA SYSTEMS
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2015
Purpose of Course	The course gives students an idea about Multimedia Systems .
Course Objective	The aim of this course is to provide knowledge of the basic concepts and techniques related to Multimedia System
Pre-requisite	Students should be familiar with basics of computer graphics and multimedia..
Course Out come	After completion of this course, the student will gain knowledge of basic concepts and techniques related to Multimedia System
Course Content	**1. Computer graphics** 1.1 Fundamentals 1.2 Vector graphics 1.3 Shapes 1.4 Transformations and Filters 1.5 3-D Graphics 1.6 Bitmapped graphics 1.7 Resolution 1.8 Image Manipulation 1.9 Geometrical Transformation 1.10 Combining Vectors and Bitmaps 1.11 File Formats **2. Video & Animation** 2.1 Digitizing Video 2.2 Video Standards 2.3 Video Compression techniques 2.4 Digital Video Editing and Post-Production 2.5 Streamed Video and Video Conferencing 2.6 Captured Animation and Image Sequences 2.7 „Digital Cel and Sprite Animation 2.8 Key Frame Animation 2.9 3-D Animation **3. Sound** 3.1. The Nature of Sound 3.2. Digitizing Sound 3.3. Processing Sound 3.4. 4.4 Compression 3.5. Formats 3.6. MIDI 3.7. Combining Sound and Picture

	4. Distributed Multimedia system 4.1. Operating System Introduction to DMS 4.2. Main Features of DMS 4.3. Resources Management of DMS 4.4. Networking 4.5. Multimedia 4.6. Distributed Multimedia Servers 4.7. Distributed Multimedia Application **5. Multimedia Data Compression** 5.1 Data Compression Terminology 5.2 A Classification of Data Compression Terminology 5.3 Data Compression Technology 5.4 Compression Standards 5.5 Image Compression 5.6 Video compression 5.7 Audio compression
Reference Book	1. Digital multimedia 3/e illustrated – Chapman, Nigel P. Chapman, Jenny Chapman – Wiley , 2009 2. Multimedia – Making it Work – Tay Vaudhan Tata Mcgraw Hill ISBN 3. Streaming Multimedia – Steve Mack - John Wiley 4. Multimedia Communication System - LPE Pearon – Education Publication.
Teaching Methodology	Discussion, Independent Study, Seminars /Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective -C Advanced Artificial Intelligence

Course Code	ELECTIVE D
Course Title	Advanced Artificial Intelligence
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	--
Purpose of Course	The course gives students advanced knowledge of AI systems and applications
Course Objective	◆ To learn and understand AI and Expert systems ◆ To learn and understand AI in Natural language processing & Translation ◆ To learn and understand AI for Computer Vision and Robotics
Pre-requisite	Only those Students who have completed the following course can opt this course: 1) M.Sc(Comp. Appl). Sem-1- 101: Fundamentals of Artificial intelligence
Course Out come	After completion of this course, the student will gain knowledge of AI systems and applications like Expert Systems, Natural Language Processing, Computer Vision and Robotics
Course Content	**Unit 1: Expert Systems** 1.1 Overview of Expert System, Characteristics, Development of Expert System and Technology, Domains and applications, Elements of an Expert System, Production system, Artificial Neural System 1.2 Design of Expert System - Stages in development of an Expert System, Software Engineering and Expert System, The Expert System Life Cycle, Expert System Life Cycle Model, 1.3 Expert System Architecture - Overview of expert System Tools, Expert System Shells, Black Board Architecture, Truth Maintenance Architecture System, Rule Induction by Machine Learning **Unit 2: Natural language processing** 2.1 Introduction - Communication as action, fundamentals of language, the component steps of communication, 2.2 Language Models - *N gram* character models, model smoothing, model evaluation, *N gram* word models 2.3 Text Classification 2.4 Information Retrieval - IR scoring functions, IR system evaluations, IR refinements, The PAGERANK algorithm,The HITS algorithm, Question answering 2.5 Information Extraction - Finite state automata for IE, Probabilistic models for IE, Conditional Random fields for IE, Ontology extraction from large corpora, Automated template construction, Machine Reading **Unit 3: Natural language for Communication** 3.1 Introduction - Communication as action, fundamentals of language, Grammar Formal isms and their generative capacity,the component steps of communication, 3.2 Phrase structure Grammars - The lexicon of E0, The grammar of E0, 3.3 Syntactic Analysis(Parsing) - CYK algorithm, Learning probabilities for PCFGs 3.4 Augmented Grammars and Semantic Interpretation - Lexicalized PCFGs, Augmented Grammar Rules, Case agreement and subject-verb agreement, Semantic interpretation, Complications in grammar of real English 3.5 Machine Translation-machine translation systems, Statistical machine translation, 3.6 Speech Recognition - Acoustic model, Language model, Building a

	speech recognizer **Unit 4. Perception** 4.1 Image Formation-The pinhole camera, Lens systems, Scaled Orthographic projection, Light and Shading, Color 4.2 Early Image-Processing Operations - Smoothing, Edge detection, Texture, Optical flow, Image segmentation 4.3 Object Recognition by Appearance-Complex appearance and pattern elements, pedestrian detection with HOG features 4.4 Reconstructing the 3D World - Motion parallax, Binocular stereopsis, Multiple views, Texture, Shading, Contour, Objects and geometric structures of scenes 4.5 Object Recognition from Structural Information - The geometry of bodies, Coherent appearance 4.6 Using Vision- The problem of image tagging/annotation, Reconstruction from many views, Using vision for controlling movement **5. Robotics** 5.1 Introduction 5.2 Robot Hardware-Sensors, Effectors 5.3 Robotic Perception - The problems of state estimation, Localization and mapping, other types of perceptions, machine learning in robot perception, 5.4 Planning to Move - Configuration space, Cell decomposition methods, Modified cost functions, Skeletonization methods, 5.5 Planning Uncertain Movements- Robust methods 5.6 Moving - Dynamics and control, Potential field control, Reactive control, Reinforcement learning control, 5.7 Robotic Software Architectures - Subsumption architecture, Three-layer architecture, Pipeline architecture 5.8 Application Domains of robotics
Reference Book	1. Artificial Intelligence –A Modern Approach (2nd Edition/ 3rd Edition) - by Stuart J. Russell and Peter Norvig, Pearson Education 2. Artificial Intelligence-Building Intelligent Systems- By Kulkarni and Joshi, PHI 3. Artificial Intelligence - By Anamitra Deshmukh-Nimbalkar and Manmohan Singh, Technical Publications 4. Introduction to AI Robotics - By Robin Murphy, PHI 5. Natural Language Processing and Information Retrieval-By bSiddiqui and Tiwari, Oxford University Press 6. Speech and Language Processing - By Jurafsky and Martin, Pearson Education 7. Introduction to Artificial Intelligence and Expert Systems – Dan W. Patterson –PHI 8. Foundation of Artificial Intelligence and Expert Systems – By V.S Janakriraman, K.Sarukesiand P.Gopalkrishnan – Macmilan 9. Expert Systems : Principles and Programming – By Joseph C Giarratano, Gary D Riley Course Technology 10 Introduction to Expert Systems – By Peter Jackson – Addison Wesley Publishing Company
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based practical examination at the end of semester.

Course: Elective D- Cyber Security and Forensic

Course Code	Elective E
Course Title	Cyber Security and Forensic
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2017
Purpose of Course	The course gives students Understanding about major concept of Cyber Security and Forensic
Course Objective	To provide fundamental knowledge of Cyber crimes, Cyber security and Computer Forensics.
Pr-requisite	Basic Understanding of Networking , Web Application, Relational Database, Mobile Application
Course Out come	After completion of this course, the student will gain comprehensive knowledge of Cyber security and Forensic and aspects related to it.
Course Content	**Unit 1 Introduction to Cyber Crime and Cyber offences** 1.1 Introduction of Cybercrime:- Definition, Cyber Crime and Information Security, Types and Category of Cyber Crime 1.2 Techniques of CyberCrimes 1.2.1 E-Mail Spoofing, Spamming, Cyberdefamation, Salami Attack, Data diddling, Hacking, Online fraud, Software Piracy, computer Sabotage, Email Bombing, Computer Network Intrusions, Password Sniffing, Credit Card Frauds 1.3 How Criminal Plans Attacks 1.3.1 Reconnaissance Attack, Passive Attack, Active Attack, Scanning/ Scrutinizing information, Gaining and Maintaining the system Access 1.3.2 Cyberstaking:- Types of Cyberstaking cases of cyberstaking, How Stalking works 1.3.3 Botnets:- The fuel of cybercrime, Botnet Attack. 1.3.4 Honeypot **Unit 2 Cyber Crime: Mobile and Wireless Devices** 2.1 Introduction 2.1.1 Proliferation of Mobile and Wireless Devices, 2.1.2 Trends in Mobility, 2.1.3 Credit Card Frauds in Mobile and Wireless Computing , 2.1.4 Types and Techniques of Credit Card Frauds 2.2 Security Challenges 2.2.1 Security Challenges by Mobile Devices, Registry Settings for Mobile devices 2.2.2 Authentication Services Security Cryptographic Security For Mobile Devices, LDAP Security of Hand-Held Mobile computing devices 2.2.3 RAS Security for mobile devices, Media Player Control Security, Networking API Security for Mobile Computing Applications 2.3 3 Attacks on Mobile Cell Phones 2.3.1 Mobile Phone Theft,

2.3.3 Mobile Viruses Mishing, Vishing, Smishing
2.3.2 Hacking Bluetooth

2.4 Security Implication for Organization
2.4.1 Managing Diversity and Proliferation of Handheld devices,
2.4.2 Unconventional Storage Device threat through stolen devices
2.4.3 Protecting Data on lost devices
2.5 Organizational Measures for handling Mobile devices
2.5.1 Security issues , Encrypting Organizational database including mobile devices and securitystrategy
2.5.2 Organizational security polices for mobile computing Devices
2.5.3 Operating guidelines for implementing mobile Security polices
2.5.4 Organizational polices for use of Mobile, Handheld devices Laptops and Physical Counter measures

Unit 3: Tools and Methods used in Cyber Crimes
3.1. Proxy Server and Anonymizers
3.2 Phishing: How phishingworks
3.2.1 Password Cracking:-Online Attack, offline Attacks Strong, weak and Randoms Passwords
3.3 Keylloggers and Passwords
3.3.1 Software Keyloggers
3.3.2 Hardware Keyloggers,
3.3.3 Antileyloggers
3.3.4 Spywares
3.4 Penetration testing tools:
3.4.1 NMAP, External and internal network scanning,
3.4.2 WIFI Penetration testing.
3.5 Cloud Security
3.6 IoT Security
3.7 Securing and processing the evidence
3.7.1 Incident handling steps & process
3.7.2 Creating duplicate images of storage media
3.7.3 Investigating Website & web application
3.7.4 Tracing the activity of target computer
3.7.5 Registering and processing cyber crime complaint

Unit 4 Computer Forensics
4.1 History of Cyberfornesic and Digital Forensic
4.2 Need of Computer Forensic
4.3 Cyberforensics and Digital Evidence
4.4 Digital Forensic Life cycle
4.5 Forensic Analysis of Email
4.6 Network Forensic Importance of OS1-7 layer to computer forensic
4.7 Computer Forensic Investigation
4.8 Computer Forensic and Steganography
4.9 Analysis of CCTV Footage
4.10 computer forensics security or privacy threat
4.11 OS Forensic: Windows forensics, Android and IOS forensic
4.12 Analysis of Audio evidences, Analysis of Image and Video evidences
4.13 Introduction to Blockchain and Cryptocurrencies

	4.14 Legal admissibility of multimedia evidences 4.15 Compliance perspective for Computer forensic 4.16 Challenges, Special Tools and Technique 4.17 Cyber Security Audit and Compliance **Unit 5: Forensic of Hand Held Device** 5.1 Understanding cell phone working characteristics 5.2 Hand Held devices and digital forensic 5.2.1 Mobile Phone Forensic 5.2.2 PDA Forensic 5.2.3 Printer and scanner forensic 5.2.4 Smartphones and iPhones forensic 5.2.5Toolkits for handheld Devices Forensics
Reference Book	1 . Cyber Security Understanding cyber crimes computer forensics and legal Perspectives by Nina Godbole , Sunit Belapur by Wiley India Publications . 2. Internet Forensic Using Digital Evidences to Solve Computer Crime by Robert Jones O□ ReillyOctober 2005. 3 . Windows ForensicThe Field Guide for conducting Corportate computer Investigations by Chad Steel Wiley India Publications. 4. Digital Evidence and Computer Crime by Eoghan Casey Academic Press 2011 3rd Edition . 5. CyberCrimes and Fraud Management by Mr. Petrick Kishore, macmillan education
Teaching Methodology	Classroom Discussion, Independent Study, Seminars / Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective -E SEARCH ENGINE OPTIMIZATION AND DIGITAL MARKETTING

Course Code	ELECTIVE F
Course Title	SEARCH ENGINE OPTIMIZATION AND DIGITAL MARKETTING
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	To provide comprehensive knowledge about theory behind Search Engine Optimization and search engine working
Course Objective	To provide the student sufficient knowledge to learn steps, need ,execute and evaluate the Search Engine Optimization initiatives and prepare them for Digital Marketing
Pr-requisite	Fundamental Knowledge about Web Development, Searching Technologies and Metadata
Course Out come	After completion of this course, the student will gain comprehensive knowledge of Search engines and their working and various search engine optimization techniques and will be ready to work in the field of Digital Marketing
Course Content	**Unit 1 Search Engine and Ecommerce** 1.1 Mission of Search Engine 1.2 Human Goals of Searching, Determining searcher intent. 1.3 Challenges for Marketer and search engine 1.3.1 People search, 1.3.2 Search engine drive ecommerce on web 1.4 Eye Tracking:- User Scans Results pages, Click Tracking **Unit 2 Search Engine Basic, SEO objectives** 2.1 SEO Objectives 2.2 Anatomy of a Search Engine 2.2.1 Query interface 2.2.2 Crawlers, spiders, and robots 2.2.3 Databases 2.3 Identifying Site Development Process 2.3.1 Defining Site information Architecture 2.3.2 Auditing current site and Identify SEO problem 2.3.3 Identifying Current Server Statistics Software 2.3.4 Determine Top Competitor 2.4 Theory of Keyword Search 2.4.1 Keyword Research Tools 2.4.2 Leveraging of Long Tail of Keyword Demand 2.4.3.Keyword Demand :- Seasonality, Trending, Seasonal Fluctuation **Unit 3 Tracking the Result and Measuring Success** 3.1 Measuring Success of SEO Process 3.2 Measuring Search Traffic 3.3 SEO Tools - Google Webmaster Tools and Google Analytics 3.4 Google Webmaster Tools - Webmaster Tools Setup, Dashboard, The "Site configuration" Section, The "Your site on the web" Section, The Diagnostics Section 3.5 Google Analytics- Installation and Setup, Navigating Google Analytics, Dashboard, Traffic Sources, Content, Goals, Google Analytics Shortcomings **Unit 4 Digital Marketing Fundamentals** 4.1 Marketing v/s Sales, Inbound v/s Outbound marketing

	4.2 Content marketing, Strategic flow for marketing activities Understanding Leads 4.3 Facebook Marketing Fundamentals 4.3.1 Profiles and Pages, Business Categories 4.3.2 Creating Facebook Pages, Page Info and Settings , Facebook Page Custom URL, Invite Page Likes 4.3.3 Facebook Events, Facebook Insights Reports 4.4 Affiliate marketing **Unit 5 YouTube Marketing and Email Marketing** 5.1 Video Flow 5.2 Google Pages for YouTube Channel 5.3 Verify Channel and Linking Custom Channel URL 5.4 Uploading Videos, Uploading Defaults Creator Library, Live Broadcasting and Practical Examples 5.5 Email Marketing, Content writing,Email Software and Tools
Reference Book	1.The Art of SEO : Mastering Search Engine Optimization by Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola O REILLY Publication 2nd edition 2. The Art of SEO : Mastering Search Engine Optimization by Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola O REILLY Publication 3nd edition 3.SEO Search Engine Optimization Bible by Jerri L Ledford 2nd Edition Wiley India 4.SEO Warrior : Essential Techniques for Increasing Web Visibility by John I Jerkovic O Reilly Publictation 5.Search Engine Optimization For Dummies by Peter Kent John Wiley and Son 5th Edition 6.Digital Marketing -by Seema Gupta. McGrawHill, Second Edition 7. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson , Wiley Publication 8.Digital Marketing For Dummies by Russ Henneberry, Ryan Deiss, For Dummies Publication
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : 306 Practicals on Advanced PHP Programming

Course Code	306
Course Title	Practicals on Advanced PHP Programming
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods and tools learnt in course 301 Advanced PHP Programming.
Course Objective	The Objective of these course is to to enable students to develop web applications in PHP
Pr-requisite	Programming Skill in Structured and Object Oriented Programming, Scripting Skills in HTML, Basics of Operating Systems, Networks and Database systems, Concepts of Web, HTTP etc.
Course Out come	After completion of this course, the student will be capable of developing professional web applications using PHP.
Course Content	The students will be required to carry out practical in Web Application Development on the topics covered in Paper 301: "Advanced PHP Programming" using the methods and tools discussed there in. A Journal must be prepared for the practical work done**.**
Reference Book	As Per Paper 301
Teaching Methodology	Lab Work
Evaluation Method	30% Internal assessment is based on Practical attendance, problem solving and , internal examination etc. 70% assessment is based practical examination at the end of semester.

Course : 307 Practicals on Mobile Application Development

Course Code	307
Course Title	Practicals in Mobile Application Development
Credit	4
Teaching per Week	4 hours
Minimum weeks per Semester	15 (Project work, Self-Study, examination, preparation, holidays etc.)
Review / Revision	--
Purpose of Course	The purpose of the course is to make students capable of developing professional applications using latest tools and technologies of Mobile Application Development.
Course Objective	To expose students to industrial practices and activities of software engineering and train them about the same using Mobile Application Development Tools and Technologies.
Pre-requisite	Knowledge of Advanced Programming, Latest Technologies and Tools and Software Engineering
Course Out come	After completion of this course, the student will be capable of developing professional applications using latest tools and technologies of Mobile Application Development.
Course Content	The students will be required to carry out practical in Mobile Application Development on the topics covered in Paper 302: "Mobile Application Development" using the methods and tools discussed there in. A Journal must be prepared for the practical work done**.**
Reference Book	As per Paper:302 Mobile Application Development
Teaching Methodology	LabWork
Evaluation Method	30% Internal assessment is based on project presentation and/or demonstration and viva-voice examination. 70% assessment is based Project Presentation and/or demonstration and viva-voice examination at the end of semester.

Course : 308 Practical on Software Testing

Course Code	308
Course Title	Practical on Software Testing
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2017
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques of software testing learnt in course **303 Software Testing**
Course Objective	The Objective of these course is to enable students to Test desktop and Web Applications.
Pr-requisite	1) Basic understanding of Programming and Software Engineering 2) Only those students must have studied one of the following courses can opt this course: ◆ **M.Sc(Comp. Appl). Sem-3- 303 : Software Testing**
Course Out come	After completion of this course, the student will be capable of performing various types of testing on Software and Web Applications.
Course Content	The students will be required to carry out practical on Software Testing on the topics covered in Paper 303: "Software Testing" using the methods and tools discussed there in. A Journal must be prepared for the practical work done**.**
Reference Book	.As per paper 303 - Software Testing
Teaching Methodology	Lab Work
Evaluation Method	30% Internal assessment is based on Practical attendance, Problem Solving, internal examination etc. 70% assessment is based practical examination at the end of semester.

Course : 308 Practicals on AI modeling with Python

Course Code	308
Course Title	Practicals on AI modeling with Python
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques of software testing learnt in course **303 AI modeling with Python**
Course Objective	The Objective of these course is to enable students to : ◆ To learn Python programming and usage of various libraries ◆ To learn and implement Data processing and visualization routines ◆ To implement and evaluate some AI models in Python
Pr-requisite	1) Basic understanding of Programming and fundamentals of AI or Supervised Learning 2) Only those students must have studied the following courses can opt this course: **M.Sc(Comp. Appl). Sem-3- 303 : AI modeling with Python**
Course Out come	After completion of this course, the student will be capable of performing various types of testing on Software and Web Applications.
Course Content	The students will be required to carry out practical on Software Testing on the topics covered in Paper 303: "AI modeling with Python" using the methods and tools discussed there in. A Journal must be prepared for the practical work done**.**
Reference Book	.As per paper 303 - AI modeling with Python
Teaching Methodology	Lab Work
Evaluation Method	30% Internal assessment is based on Practical attendance, Problem Solving, internal examination etc. 70% assessment is based practical examination at the end of semester.

Course : 401 Project

Course Code	401
Course Title	PROJECT
Credit	24
Teaching per Week	20 hours (i.e. 2 Students / hour / Week)
Minimum weeks per Semester	15 (Project work, Self-Study, examination, preparation, holidays etc.)
Last Review / Revision	June 2013
Purpose of Course	Students will get trained in industrial practices and activities of Software Engineering
Course Objective	To expose students to industrial practices and activities of software engineering and train them about the same
Pr-requisite	Knowledge of Advanced Programming, Latest Technologies and Tools and Software Engineering
Course Out come	After completion of this course, the student will be capable to start professional career and/or research work in the field of Information Technology
Course Content	Entire semester is allocated for a full-time project work. All the students have to undergo a project preferably in an industry or any reputed institute. The students must prepare documentation of the project work done as per the software Engineering Guidelines. At the end of the semester, the students have to submit their project report in bounded form to the respective institution. The project presentation and viva – voice will be conducted on the basis of it. The students have to submit the following reports to their respective institution: 1. Project Joining Report 2. Appropriate name of the project 3. Monthly Progress Report duly sign by the concern external guide 4. Project Completion Certificate 5. Institution/College Certificate 6. Software Coding declaration…(if industry/organization doesn t permit students to submit the source code) (To be submitted at the time of joining project training) 7. Attendance Report Without such reports student will not be allowed to appear in his/her final Project Presentation and Viva-Voice
Reference Book	.---
Teaching Methodology	Project guidance, review
Evaluation Method	30% Internal assessment is based on project presentation and/or demonstration and viva-voice examination. 70% assessment is based Project Presentation and/or demonstration and viva-voice examination at the end of semester.

Course : 402 Seminar

Course Code	402
Course Title	SEMINAR
Credit	6
Teaching per Week	10 hours (i.e. 4 Students / hour / Week)
Minimum weeks per Semester	15 (Project work, Self-Study, examination, preparation, holidays etc.)
Review / Revision	June 2015
Purpose of Course	The purpose of the course is to make student capable of gaining additional knowledge (besides the curricula) in the field of information technology by self learning practices and presenting and/or demonstrating it .
Course Objective	Additional knowledge building in the field of Information Technology using self-learning practice.
Pr-requisite	Basic Knowledge of Information Technology theories, activities, methods, techniques & tools
Course Out come	After completion of this course, the student will have gained some additional knowledge (besides the curricula) in the field of information technology by self learning practices and will be capable of presenting and/or demonstrating it
Course Content	In this paper students will have to select any topic related to information technology field– preferably based on the current trends and technologies for the seminar. Individual student is required to prepare a seminar report. At the end of the semester student has to submit seminar report with satisfactory detail study in the bounded form to the respective institution. The seminar presentation and viva voice will be conducted on the basis of selected topic at the end of the semester. The students have to submit the following documents to their respective institution: 1. Name and abstract of the Topic selected. 2. Monthly Progress Report duly signed by the concern internal guide 3. Work Completion Certificate by internal guide 4. Institution/College Certificate
Reference Book	.----------
Teaching Methodology	Seminar Guidance and Report
Evaluation Method	30% Internal assessment is based on seminar presentation and viva-voice examination. 70% assessment is based on seminar presentation and viva-voice examination at the end of semester

Veer Narmad South Gujarat University

Teaching and Evaluation Scheme

MCA 3rd Semester (Web Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things / Machine Learning	4	0	4	3 Hrs	70	30	100
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	Advanced Web Technologies / Advanced Java Programming	4	0	4	3 Hrs	70	30	100
304	Full Stack Technology	4	0	4	3 Hrs	70	30	100
305	Open Source Web Based Programming	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 3rd Semester (Database Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things / Machine Learning	4	0	4	3 Hrs	70	30	100
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	ERP Using SAP / NoSQL Databases	4	0	4	3 Hrs	70	30	100
304	Advanced Database Administration	4	0	4	3 Hrs	70	30	100
305	Data Warehousing and Data Mining / Big Data	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 3rd Semester (Network Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things Machine Learning	4	0	4	3 Hrs	70	30	100
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	Network Essential & its Security	4	0	4	3 Hrs	70	30	100
304	Network Administration	4	0	4	3 Hrs	70	30	100
305	Wireless Network & Mobile Computing	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 3rd Semester (General Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things Machine Learning	4	0	4	3 Hrs	70	30	100
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	Network Essential & its Security	4	0	4	3 Hrs	70	30	100
304	Advanced Database Administration	4	0	4	3 Hrs	70	30	100
305	Open Source Web Based Programming	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 4th Semester

Teaching and Evaluation Scheme

Paper	Title	Credits	University Exam Marks	Internal Exam Marks	Total Marks
401	Seminar	6	70	30	100
402	Project	24	280	120	400

MCA 3rd Sem. (Web Group)

Course: 301: **Internet of Things (IoT)**

(Elective)

Course Code	301
Course Title	**Internet of Things (IoT)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 1. To make student understand IoT 2. To understand the working of Micro-Controller & Micro-Computer 3. To explain various types of sensors 4. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	**Unit 1: Introduction to IoT** 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet **Unit 2: Networking and Communication** 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS **Unit 3: Sensors** 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network **Unit 4: Micro-Controller: Arduino, NodeMCU** 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture 4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU

	4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout **Unit 5: IoT App Interaction & Introduction to Raspberry Pi** 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madisetti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: **Machine Learning**
(Elective)

Course Code	301
Course Title	**Machine Learning (ML)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	**Unit 1 : Introduction** 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance **Unit 2 : Data Wrangling** 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization **Unit 3 : Supervised Learning** 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour 3.3.2 Support Vector Machines

	3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine **Unit 4 : Neural Network** 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network **Unit 5 : Unsupervised Learning** 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: **Design Patterns**

Course Code	302
Course Title	**Design Patterns**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 1. To study various Design Patterns 2. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	**Unit -1 Creational Patterns** 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern **Unit-2 Structural Patterns** 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern **Unit-3 Behavioural Pattern** 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern **Unit-4 Additional Design Patterns** 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern **Unit-5 Pattern Applicability** 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore 5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud

	Self-Study : Pattern Languages
Reference Books	1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addision Wesley 2. Head First Design Patterns, Eric Freeman, O'Reilly 3. Design Patterns in C#, Vaskaran Sarcar, Apress 4. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 5. Modern C++ design: generic Programming and design patterns applied, Alexendrescu, Andrei, Addison-Wesley 6. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: **Advanced Web Technologies**

(Elective)

Course Code	303
Course Title	**Advanced Web Technologies**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To teach ASP .Net for web application development
Course Objective	To impart knowledge of web application development using ASP .Net
Pre-requisite	Fundamental of .Net framework, HTML and C# desirable
Course Out come	Students will be able to development web application using ASP .Net
Course Content	**Unit : 1 : Introduction to ASP.NET** 1.1. Overview of ASP.NET 1.2. Page Class and Page Life Cycle 1.3. Web Configuration files 1.4. Exception Handling 1.5. Error Pages 1.6. ASP.NET State Management 1.7. Introduction to Caching **Unit : 2 : ASP.NET Controls** 2.1 Web Controls 2.1.1 Common Web Server Controls 2.1.2 Specialized Web Server Controls 2.1.3 Table, Image, FileUpload 2.1.4 PostBack / Auto PostBack 2.2 Validation and Rich Controls 2.3 Website Navigation Controls - Sitemap, Treeview, Menu Controls 2.4 ASP.NET AJAX Controls 2.4.1 Introduction 2.4.2 Server Callbacks / Script Manager 2.4.3 ASP.NET AJAX Server Controls 2.4.4 UpdatePanel **Unit : 3 : ASP .NET Web Application with Database** 3.1. ADO.NET Architecture 3.2. Direct Data Access 3.3. Disconnected Data Access 3.4. Data Binding & Data Controls 3.4.1. Single-view, Repeated-Value, Data Source 3.4.2. Grid view ,Detail View, Form View 3.4.3. Data Repeater Control 3.5. LINQ 3.5.1. LINQ Language Features 3.5.2. LINQ to Objects 3.5.3. LINQ to SQL **Unit : 4 : ASP .NET - MVC , WCF Services & API** 4.1. ASP.NET MVC 4.1.1. MVC Architecture 4.1.2. URL Routing Engine 4.1.3. Wiring Controller, Model, and View 4.1.4. Data Access 4.1.5. Introduction to Entity Framework 4.2. WCF Services 4.2.1. Introduction to Web Services 4.2.2. RESTful API

	4.2.3. Working with WCF Services 4.3. API 4.3.1. Introduction to JSON 4.3.2. Web API 4.3.3. API Creation and Consumption **Unit : 5 : ASP.NET CORE** 5.1. Overview of C#.NET CORE 5.2. .NET CORE Assemblies and Libraries 5.3. Pattern Matching 5.4. Tuples and Deconstruction 5.5. Local/Nested Functions 5.6. NuGet Package
Reference Book	1. Professional ASP.NET, Wrox Publication 2. ASP.NET – From Novice to Professional, Wrox Publication 3. ASP.NET Bible, By Mridula Parihar 4. Beginning ASP.NET 4.5, Wrox Publication 5. ASP.NET MVC with Entity Framework and CSS, APress 6. Programming Microsoft ASP.NET, Microsoft Press 7. Beginning AJAX with ASP.NET, Wrox Publication 8. Professional ASP.NET MVC 5, Wrox Publication 9. Professional C# 7 and .NET Core 2.0 , Wrox Publication 10. ASP.NET Core 2 Fundamentals, Packt Publication 11. Pro ASP.NET MVC 5, Apress 12. Programming ASP.NET Core, Microsoft Press 13. Pro C# 7 with .NET and .NET Core, Apress 14. Pro ASP.NET Core MVC by Adam Freeman, Springer, 2016
Teaching Methodology	Classroom, seminar and assignment
Evaluation Method	As per University rules

Course: 303: **Advanced Java Programming**

(Elective)

Course Code	303
Course Title	**Advanced Java Programming**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	This course is advance level java course to learn web & web enabled application development using Java Technologies.
Course Objective	To develop web application skills using Java web technology
Pre-requisite	Core Java, Object oriented Programming
Course Outcome	After studying this students will be able to understand how to develop web application. This course will also help students to know various java web servers available. After successful completion students will be able to develop web applications using java.
Course Content	**Unit 1: Advance JDBC (Java Database Connectivity)** 1.1 Types of JDBC Drivers 1.2 Connecting to databases like Access, MySQL, SqlServer, Oracle 1.3 Interacting with Database using SQL Queries 1.4 JDBC Objects: Connection, Resultset, Statement, Metadata 1.5 More JDBC Objects: DataSource, RowSet, RowSet events 1.6 Calling Stored Procedures 1.7 Managing Transactions 1.8 JDBC Connection Pooling 1.9 Handling Errors/Warning **Unit 2: Java Servlets** 2.1 Introduction to Servlets 2.2 Servlet Lifecycle 2.3 Handling HTTP GET and POST requests 2.4 Invoking other web resources 2.5 Maintaining client state 2.6 Servlet Annotations 2.7 Servlet Filter 2.8 File Upload **Unit 3: Java Server Pages(JSP), JSTL (Standard Tag Library) & EL** 3.1 Introduction to JSP, page lifecycle 3.2 JSP Elements – directives, scriplet, action 3.3 Implicit JSP objects 3.4 Using JavaBeans in JSP, Session Tracking 3.5 JSTL – Using Java Standard Tag Library 3.6 JSTL Core & Database tags 3.7 Introduction to EL (Expression Language) 3.8 EL implicit objects **Unit 4: Web Services with XML & JSON** 4.1 Introduction to Web Services 4.2 Building XML based web services with JAX-WS 4.3 Building Restful web services with JAX-RS 4.4 Reading/Writing XML files in Java (JAXP) 4.5 Introduction to AJAX

	Unit 5: JPA, EJB & MVC Introduction 5.1 Introduction to Java Persistence API (JPA) 5.2 Entity Beans & Session Beans 5.3 Overview of MVC Framework 5.4 Spring Architecture 5.5 Spring XML Configuration 5.6Aspect oriented programming
Reference Books	1. Java EE Tutorial Basic Concepts by Oracle Corporation 2. Beginning Java™ EE Platform with GlassFish™ : From Novice to Professional by Antonio Goncalves 3. Beginning EJB 3 Application Development From Novice to Professional by Raghu R.Kodali and Jonathan Wetherbee with Peter Zadrozny, Apress Publication 4. Pro JPA 2: Mastering the Java™ Persistence API 5. Head First Servlets and JSP By: Bryan Basham, Kathy Sierra, BertBates Publisher: 'Reilly Media 6. Core Servlets and Javaserver Pages: Author Marty Hall , LarryBrown, Sun Micro System 7. Java Servlet & JSP Cookbook by Bruce W. Perry O;reilly Publication 8. Beginning JSP™, JSF™ and Tomcat™ Web Development: FromNovice to Professional by Giulio Zambon and Michael Sekler 9. JAVA Complete Reference , TMH Publication 10. Professional Java Development with Spring Framework , WroxPublication
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation,class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University Externalexamination

Course: 304: **Full Stack Technology**

Course Code	304
Course Title	**Full Stack Technology**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make the students capable of developing full stack web applications.
Course Objective	The objective of the course is to make student understand full stack development
Pre-requisite	HTML, CSS, Front-end Scripting
Course Outcome	After completion of this course, the students will be able to design and develop Full Stack web applications
Course Content	**Unit 1: Introduction** 1.1 JavaScript 1.1.1 Execution Context and Call Stack 1.1.2 Hoisting in JavaScript 1.1.3 Spread Operator 1.1.4 Scope Chain, Temporal Dead Zone 1.1.5 Block Scope, Shadowing 1.1.6 Closures 1.2 Full Stack Technology **Unit 2: React.js** 2.1 React Introduction 2.1.1 What is React 2.1.2 What is a Component 2.1.3 JSX Overview 2.2 create-react-app 2.2.1 Understanding basics of react app 2.3 Understanding virtual DOM, SPA 2.4 Components 2.4.1 Class Components 2.4.2 Functional Components 2.4.3 Parent, Child Components 2.4.4 Conditional Rendering 2.4.5 State, setState Method 2.4.6 Props 2.5 Event Handling in React 2.5.1 Event Handling in Class Components 2.5.2 Event Handling in Functional Components 2.6 Lifecycle 2.6.1 Class Component Life Cycle Methods 2.7 React Hooks 2.7.1 What is a React Hook 2.7.2 useState Hook 2.7.3 useEffect Hook 2.8 Building forms in React 2.9 React Router 2.10 Controlled vs Uncontrolled Components 2.11 State Management 2.11.1 Single Source of Truth 2.11.2 Lifting State Up 2.11.3 Prop Drilling 2.11.4 useContext 2.11.5 Redux

	2.12 HTTP Methods 2.12.1 Fetch 2.12.2 Axios **Unit 3: Node.js & Express.js** 3.1 Introduction to Node.js 3.2 Creating a Simple Server 3.3 Response types - HTML, JSON 3.4 Modules 3.5 NPM 3.6 Introduction to Express.js 3.7 Express Params and Query String 3.8 Express Router **Unit 4: Mongo DB** 4.1 SQL/NoSQL landscape 4.2 Document Vs. Other types of Storage 4.3 MongoDB feature set 4.4 Introduction to BSON and JSON 4.5 Simple Queries 4.6 Connecting with Node JS 4.6.1 Inserts and Retrievals 4.6.2 Updates and Deletes **Unit 5: MERN & Deployment** 5.1 Connecting React and Node 5.2 Building an application in MERN 5.3 Github and CI/CD 5.4 Deploy using Netlify / Heroku
Reference Books	1. Eloquent JavaScript: A Modern Introduction to Programming, No Starch Press 2. You Don`t Know JS, Shroff/O'Reilly 3. The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React.js, Zaccheus Entertainment 4. React Explained: Your Step-by-Step Guide to React, OS Training, LLC 5. Beginning React, Greg Lim 6. Learning React: Functional Web Development with React and Redux, Shroff/O'Reilly 7. Learn React Hooks: Build and refactor modern React.js applications using Hooks, Packt Publishing Limited 8. Pro React, Apress 9. Web Development with Node and Express: Leveraging the JavaScript Stack, O'Reilly Media 10. Express in Action: Writing, building, and testing Node.js applications, Manning Publications 11. Beginning Node.js, Express & MongoDB Development, Greg Lim 12. MongoDB: The Definitive Guide - Powerful and Scalable Data Storage, Shroff/O'Reilly; Third edition 13. Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, Packt Publishing Limited 14. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Open Source Web Based Programming**

Course Code	305
Course Title	**Open Source Web Based Programming**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand fundamentals of Open Source web based Programming. The course also imparts students learning about Open source web based scripting language PHP and Mysql database. It also includes MVC or Three tier architecture of web based programming.
Course Objective	Student will learn fundamentals and advance topics of Open source Web technology
Pre-requisite	Knowledge of HTML and SQL
Course Out come	After studying the course, students will be able to understand how Open source web technology works. They will also be able to create database driven Websites.
Course Content	**Unit 1 : Introduction to Open source Web based Programming** 1.1 Introduction to PHP & MySql 1.2 Installation of PHP and MySql 1.3 Language Characteristics & Features 1.4 Operators and Variables, Control Structures, Looping and Error handling 1.5 PHP functions 1.5.1 String Functions 1.5.2 Array Functions 1.5.3 Mathematical Functions 1.5.4 Graphics Library (GD Support) 1.5.6 Date and Time Functions 1.5.7 Misc. Function 1.6 State management Techniques 1.7 Object Oriented Features of PHP 1.7.1 Classes and Objects 1.7.2 Use of constructors 1.7.3 Serialization 1.7.4 Inheritance **Unit 2 : MySQL database server** 2.1 Configuring the MySQL Server 2.2 MySQL Tables, Displaying MySQL Database ,Adding and removing user access 2.3 Database connection and data processing functions **Unit 3 : Advance PHP** 3.1 Ajax Basics 3.1.1 HTTP Request and Response Fundamentals 3.1.2 The XMLHttpRequest Object XMLHttpRequest Methods 3.1.3 XMLHttpRequest Properties 3.1.4 Cross-Browser Usage Sending a Request to the Server 3.1.5 PHP and Ajax Client-Driven Communication 3.1.6 Server-Side Processing Expanding and Contracting Content 3.1.7 Form Validation 3.1.8 Ajax-Based Database Querying 3.2 XML 3.3 Web services

	Unit 4 : MVC 4.1 Introduction to MVC 4.2 Introduction to Laravel, Architecture Concepts 4.3 Routing 4.4 Middleware 4.5 Controllers 4.6 Request & Response 4.7 View 4.8 URL generation 4.9 Validation 4.10 Session & Cookie 4.11 Form & File uploading 4.12 Error Handling 4.13 Security 4.14 Database **Unit 5 : Advance Concepts of MVC** 5.1 Blade Templates 5.2 Mail 5.3 Authentication 5.4 Authorization 5.5 Encryption
Reference Books	1. Beginning PHP, Apache, MySQL Web Development - Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Gary Mailer – Wrox Publication 2. Professional PHP Programming - Jesus Castagnetto ,Wrox Press Ltd 3. Beginning PHP and MySQL: From Novice to Professional - W. Jason Gilmore, Apress 4. Php: The Complete Reference - Steven Holzner, Tata Mcgraw Hill Education Private Limited 5. AJAX and PHP: Building Responsive Web Applications - Bogdan Brinzarea, CristianDarie packtpub 6. Php manual – www. Php.com 7. Beginning Laravel Build Websites with Laravel 5.8 - Sanjib Sinha · 2019 - Apress 8. Laravel The Ultimate Beginner's Guide to Learn Laravel Step by Step, 2nd Edition - Mem Lnc, Rufus Stewart
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz,assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: **Programming Skills VIII**

Course Code	306
Course Title	**Programming Skills VIII**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: **Programming Skills IX**

Course Code	307
Course Title	**Programming Skills IX**
Credit	3
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the advanced concepts of .NET/Java practically.
Course Objective	Learning to implement the advanced topics of .NET/Java practically.
Pre-requisite	Practical programming in basic .NET/Java.
Course Outcome	After studying the course, students will be able to practically work on advanced technology platforms of .NET/Java.
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: **Programming Skills X**

Course Code	308
Course Title	**Programming Skills X**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students in developing full stack web applications.
Course Objective	Practically learn full stack development
Pre-requisite	HTML, CSS, Front-end Scripting
Course Outcome	After completion of this course, the students will be able to design and develop Full Stack web applications
Course Content	Practical based on paper no 304. (Full Stack Technology) Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: **Programming Skills XI**

Course Code	309
Course Title	**Programming Skills XI**
Credit	3
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the basic and advanced concepts of PHP/MySql practically.
Course Objective	Learning to develop and deploy websites using PHP/MySql practically.
Pre-requisite	Basic scripting, programming, html.
Course Outcome	After studying the course, students will be able to practically develop dynamic websites using PHP/MySql.
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

MCA 3rd Sem. (Database Group)

Course: 301: **Internet of Things (IoT)**

(Elective)

Course Code	301
Course Title	**Internet of Things (IoT)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 5. To make student understand IoT 6. To understand the working of Micro-Controller & Micro-Computer 7. To explain various types of sensors 8. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	**Unit 1: Introduction to IoT** 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet **Unit 2: Networking and Communication** 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS **Unit 3: Sensors** 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network **Unit 4: Micro-Controller: Arduino, NodeMCU** 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture

	4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU 4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout **Unit 5: IoT App Interaction & Introduction to Raspberry Pi** 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madisetti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: **Machine Learning**
(Elective)

Course Code	301
Course Title	**Machine Learning (ML)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	**Unit 1 : Introduction** 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance **Unit 2 : Data Wrangling** 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization **Unit 3 : Supervised Learning** 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour

	3.3.2 Support Vector Machines 3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine **Unit 4 : Neural Network** 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network **Unit 5 : Unsupervised Learning** 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: **Design Patterns**

Course Code	302
Course Title	**Design Patterns**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 3. To study various Design Patterns 4. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	**Unit -1 Creational Patterns** 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern **Unit-2 Structural Patterns** 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern **Unit-3 Behavioural Pattern** 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern **Unit-4 Additional Design Patterns** 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern **Unit-5 Pattern Applicability** 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore

	5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud **Self-Study :** Pattern Languages
Reference Books	7. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addision Wesley 8. Head First Design Patterns, Eric Freeman, O'Reilly 9. Design Patterns in C#, Vaskaran Sarcar, Apress 10. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 11. Modern C++ design: generic Programming and design patterns applied, Alexendrescu, Andrei, Addison-Wesley 12. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: **ERP Using SAP**

Course Code	303
Course Title	**ERP Using SAP**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	This course imparts fundamental as well as detailed Enterprise Resource Planning using SAP technology platform.
Course Objective	Learn ERP applications and its programming
Pre-requisite	Fundamentals of ERP, DBMS
Course Outcome	After studying this students will be able to understand how to work with ERP modules. After successful completion, students will be able to develop ERP application using SAP.
Course Content	**Unit 1: Introduction** 1.1 Introduction to ERP 1.2 Introduction to SAP 1.3 Example: How SAP works in an Organization **Unit 2: Architecture of SAP Application Server** 2.1 3-Tier Architecture 2.2 Application Servers 2.3 Work processes and its Type **Unit 3: Data Dictionary & Data Structures in ABAP** 3.1 Introduction to Data dictionary 3.2 Different Types of Data structures 3.3 Internal Tables and its operation **Unit 4: Modularization Techniques** 4.1 Include Programs 4.2 Subroutines 4.3 Function Module. 4.4 Types of Function Module(Simple, RFC enabled, BAPI) **Unit 5: List Report, ALV Report** 5.1 Simple List Report 5.2 Interactive List Report 5.3 Events in List Reports 5.4 Field catalog generation in ALV 5.5 Operation on ALV(Sorting, Filtering, Totals, Subtotals, Download, Hide Columns) **Unit 6: Module pool programming / Screen Programming** 6.1 Screen Elements(Simple & Complex) 6.2 Screen Events(PBO/PAI) 6.3 Transactions **Unit 7: Selection-Screen programming** 7.1 Defining Selection Screen. 7.2 User Actions on Selection Screen. 7.3 Events of Selection Screen

	Unit 8: Smartform/Sapscript 8.1 Form printing with smartform 8.2 Form printing with Sapscript **Unit 9: BDC & LSMW** 9.1 Data upload through BDC 9.2 Data upload through LSMW **Unit 10: Enhancement(Exits & BADI)** 10.1 What is Enhancement 10.2 User-Exits 10.3 BADI(Business Add-in)
Reference Books	1. ABAP Cookbook by James Wood 2. BC - ABAP Programming from SAP-AG 3. Teach Yourself ABAP/4 in 21 Days by Ken Greenwood, SAMS 4. SAP Smart Forms by Christoph Wachter, Werner Hertleif 5. SAPscript by Michaelson Buchanan 6. Developing Sap's R/3 Application with Abap/4 7. Data Migration Made Easy - R/3 Simplications Group, SAP Labs 8. ABAP Development for SAP NetWeaver BW: Exits, BAdIs, and Enhancements by Dirk Herzog 9. Next Generation ABAP Development (2nd Edition) by Rich Heilman and Thomas Jung
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 303: **NoSQL Databases**

Course Code	303
Course Title	**NoSQL Databases**
Credit	4
Teaching per Week	4
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To teach the emerging trends in NoSQL databases
Course Objective	To impart knowledge of NoSQL Databases
Pre-requisite	Fundamentals of DBMS
Course Outcome	Students will be able to learn NoSQL databases – namely MongoDB and Cassandra
Course Content	**Unit 1: Introduction** 1.1 History 1.2 Concepts and Characteristics of NoSQL databases 1.3 Primary benefits of NoSQL databases **Unit 2: MongoDB** 2.1 SQL/NoSQL landscape 2.2 Document Vs. Other types of Storage 2.3 MongoDB feature set 2.4 Introduction to BSON and JSON 2.5 MongoDB Architecture 2.6 Documents and Collections 2.6.1 Creating Documents 2.6.2 Managing Documents in collections 2.6.3 Iterating over Documents 2.7 Queries 2.7.1 Simple Queries 2.7.2 Complex Queries 2.7.2.1 Existential field values 2.7.2.2 Aggregations and groups 2.7.2.3 Aggregations and groups in hierarchical data 2.8 Updates and Deletes 2.9 Updates and Arrays 2.10 Indexing 2.11 MongoDB RESTful API 2.12 MongoDB Security 2.13 MongoDB Replication and Sharing 2.14 Introduction to MapReduce **Unit 3: Cassandra** 3.1 Cassandra Architecture 3.1.1 Cassandra P2P Architecture 3.1.2 Clustering Structures- Nodes 3.1.3 Rings 3.1.4 Virtual Nodes 3.1.5 Consistency & Hashing 3.1.6 Gossip Protocol 3.1.7 Data Replication 3.1.8 Replication Factors & Indexes 3.1.9 Tunable Consistency 3.1.10 High & Rapid Scalability Memtables, SStables & Commitlogs

	3.1.11 Repairs 3.1.12 Tombstones 3.1.13 Repairs 3.1.14 Replication Factors 3.1.15 Compaction and Anti-Entropy 3.1.16 Bloom Filters 3.2 Data Modelling in Cassandra 3.3 Cassandra Administration 3.4 CQL3 3.5 Integration with Hadoop
Reference Books	1. Chodorow, K. (2013). MongoDB: The Definitive Guide (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 978-1449344689 ISBN-10: 1449344682. 2. Shashank Tiwari, Professional NoSQL, Sierra Nevada Books, ISBN-13: 978-0470942246 3. Amol Nayak, Instant MongoDB, Packt Publishing Limited, 2013, ISBN-13**:** 978-1782169703 4. Kristina Chodorow, MongoDB Definitive Guide 2e, O'Reilly, 2013, ISBN-13: 978-1449344689 5. Eben Hewitt, Cassandra Definitive Guide, O'Reilly, 2010, ISBN:ISBN 10:1-4493-9041-2
Teaching Methodology	Classroom, seminar and assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: **Advanced Database Administration**

Course Code	304
Course Title	**Advanced Database Administration**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding advanced database administration
Course Objective	To learn advanced database administration, database tuning and maintenance
Pre-requisite	RDBMS
Course Out come	After studying the course, students will be able to perform Database Administration
Course Content	**Unit 1. Oracle10g Instance creation and management** 1.1 Oracle Instance 1.2 Installing Oracle 1.3 Oracle Optimal Flexible Architecture (OFA) 1.4 Locating initialization, listener.ora & sqlnet.ora files 1.5 Finding the alert log 1.6 Common environment variables 1.7 Structures in an Oracle Instance 1.8 Oracle Memory Structures, SGA and PGA 1.9 Oracle Processes and their purposes 1.10 Startup, nomount, mount and open database commands **Unit 2. Oracle10g Database Architecture** 2.1 Oraclde10g management framework 2.1 Using the Database Creation Assistant (DBA) 2.3 Creating and dropping a database 2.4 Tablespaces 2.5 Tables and Indexes 2.6 Clusters 2.7 Partitioning of Tables and Indexes 2.8 Gathering and applying patches **Unit 3. Concurrency Management** 3.1 Transactions, serialization, locks and latches 3.2 Lock modes 3.3 Detecting and resolving lock conflicts 3.4 Managing deadlocks **Unit 4. Interfacing with Oracle** 4.1 Oracle transaction management 4.2 Using SQL*Plus and iSQL*Plus 4.3 Using embedded Oracle with Pro*C & Java 4.4 PL/SQL & Triggers 4.5 Pining PL/SQL packages & compiling PL/SQL 4.6 System-level triggers – startup trigger, logon trigger, PL/SQL error trigger **Unit 5. Oracle*Net** 5.1 Basic Network structure 5.2 Oracle*Net Files 5.3 Multi-threaded server 5.4 Create additional listeners 5.5 Create Oracle Net service aliases

5.6 Configure connect time failover
5.7 Oracle*Net names resolution

Unit 6. Tablespace Management Overview
6.1 Dictionary Managed Tablespaces
6.2 Locally Managed Tablespaces
6.3 Automatic Segment Space Management
6.4 Moving tablespaces online and offline

Unit 7. UNDO Tablespace Management
7.1 Use of undo segments
7.2 Creating an undo tablespace
7.3 User managed undo tablespaces
7.4 Automatic undo management
7.5 Monitor & Configure undo retention
7.6 Use the Undo Advisor
7.7 Size the undo tablespace

Unit 8. Oracle Utilities
8.1 Datapump - Import/export
8.2 SQL*Loader
8.3 Oracle Streams
8.4 Automatic Database Diagnostic Monitor
8.5 Automatic Tuning Optimizer
8.6 Automatic Shared Memory Tuning

Unit 9. Oracle Performance Tuning
9.1 Locate invalid and unusable objects
9.2 Gather SQL optimizer statistics with dbms_stats
9.3 Basic Oracle performance metrics
9.4 Use OEM and dbms_alert to set warning and critical alert thresholds
9.5 The SQL Tuning Advisor
9.6 The SQL Access Advisor
9.6 Interpreting server generated alerts
9.7 Oracle advisory utilities vdb_cache_advice, vshared pool_advice, v$pga_aggregate_target_advice
9.8 Using OEM performance screens
9.9 Fixing performance issues

Unit 10. User Management
10.1 Creating Users
10.2 Altering users
10.3 User Profiles
10.4 User resource groups
10.5 Granting privileges & roles
10.6 Auditing user activity with dbms_audit

Unit 11. Oracle Security
11.1 Password use in Oracle, Password encryption and password aging, External authentication, Using Single sign-on (SSO)
11.2 Object security
11.3 Virtual Private Databases (VPD) in Oracle
11.4 Oracle “grant execute” security
11.5 Use of Roles in Oracle
11.6 Register for security updates

Unit 12. Backup & Recovery

	12.1 Oracle backup & recovery planning 12.2 Parallel instance recovery 12.3 Basics of checkpoints, redo log files, and archived log files 12.4 Using ARCHIVELOG mode 12.5 Creating consistent Oracle backups 12.6 Online hot backups 12.7 Incremental Oracle backups 12.8 Automating database backups with dbms_scheduler 12.9 Monitor the flash recovery area 12.10 Recovering from loss of a Control file 12.11 Recovering from loss of a Redo log file 12.12 Recovering from loss of a system-critical data file 12.13 Recovering from loss of a non system-critical data file
Reference Books	1. Essentials : Oracle Database 10g by Rick Greenwald, Robert Stackowiak, Jonathan Stern, O'Reilly 2. Oracle High Performance Tuning for 9i and 10g by Gavin Powell, Digital Press 3. Oracle Database 10g, DBA Handbook by Loney, Kevin, Bryla, Bob, Oracle Press 4. Oracle Database 10g - The Complete Reference by Loney, Kevin, Oracle Press 5. Oracle Database 10g: A Beginner's Guide by Micheal Abbey, Ian Abramson Osborne, Oracle Press Series
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Data Warehousing & Data Mining**

Course Code	305
Course Title	**Data Warehousing & Data Mining**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding Data Warehousing and Data Mining
Course Objective	To understand data warehousing and data mining - concepts and methods, and apply them in practice
Pre-requisite	RDBMS, Basics of statistics
Course Outcome	After studying the course, students will learn data warehousing and data mining and its effective use in various applications
Course Content	**Unit 1: Data warehouse: Introduction** 1.1 Data Warehouse characteristics 1.2 Data Marts 1.3 OLTP and OLAP systems 1.4 Star, Snowflakes, and Fact Constellations Schemas for Multi-dimensional Databases 1.5 OLAP Operations in the Multidimensional data model 1.6 Type of OLAP servers **Unit 2: Developing Data Warehouse** 2.1 Building a Data Warehouse 2.2 Three-Tier Data Warehouse Architecture 2.3 Metadata Repository **Unit 3: Data Pre-processing** 3.1 Descriptive Data Summarization: central tendency, disperation of data 3.2 Data Cleaning : missing values, noisy data 3.3 Data Integration & Transformation 3.4 Data Reduction: Attribute selection 3.5 Data Discretization & Concept Hierarchy Generation **Unit 4: Data Mining: Introduction** 4.1 Knowledge discovery and Data Mining. 4.2 Basic Introduction to Data Mining Functionalities: 4.2.1 Concept/Class Description Characterization & Discrimination 4.2.2 Mining Frequent Patterns, Associations, and Correlations 4.2.3 Classification & Prediction 4.3.4 Cluster Analysis 4.2.5 Outlier Analysis 4.2.6 Evolution analysis **Unit 5: Mining Frequent Patterns, Associations, and Correlations** 5.1 Basic concepts: Frequent Itemsets & Closed Itemsets, Association Rules 5.2 The Apriory algorithm: Finding Frequent Itemsets Using Candidate Generation 5.3 FP-growth: Finding Frequent Itemsets without Candidate Generation 5.4 Generating Association Rules from Frequent Itemsets 5.5 Introduction to multilevel and multidimensional Association rules **Unit 6: Classification & Prediction**

	6.1 Introduction to Classification & Prediction? 6.2 Prediction: Linear Regression, Nonlinear Regression 6.3 Decision Tree Algorithm 6.3.1 Decision Tree Induction 6.3.2 Attribute Selection Measures- Information Gain and Gain Ratio 6.3.3 Tree Pruning 6.4 Bayesian Classification 6.4.1 Bayes' Theorem 6.4.2 Naïve Bayesian Classification 6.5 Accuracy and Error Measures for classification **Unit 7: Cluster Analysis** 7.1 Classification vs. clustering 7.2 What is Partitioning & Hierarchical Clustering Methods 7.3 Classical Partitioning Methods: k-Means **Unit 8: Application and Trends in Data Mining**
Reference Books	1. Data Mining: Concepts & Techniques by Han & Kamber , Morgan Kaufmann Publishers 2. Introduction to Data Mining with Case Studies by G. K. Gupta, PHI 3. Data Mining Introductory and Advanced Topics by Dunha, Pearson 4. Data Warehouse Toolkit by R. Kinball, John Wiley & Sons 5. Data Warehouses and OLAP: Concepts, Architectures, and Solutions by Robert Wrembel, Christian Koncilia I, GI 6. Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management by Gordon S. Linoff, Michael J. A. Berry, Wiley 7. Data Preparation for Data Mining by Dorian Pyle, Morgan Kaufmann Publishers 8. Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals by Paulraj Ponniah, Wiley 9. Data Warehousing: Concepts, Techniques, Products and Applications by C.S.R. Prabhu, PHI Learning 10. Advanced Data Mining Techniques by David Louis Olson, Dursun Delen, Springer
Teaching Methodology	Class work, Discussion, Self-study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Big Data**

Course Code	305
Course Title	**Big Data**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding distributed computing, Big Data and Hadoop
Course Objective	To learn Big Bata and Hadoop
Pre-requisite	RDBMS
Course Out come	After studying the course, students will have understanding distributed computing and will have hands-on experience on Hadoop
Course Content	**Unit 1: Introduction** 1.1 Evolution of Big Data 1.2 Structuring Big Data 1.3 Elements of Big Data(V's) 1.4 Big Data Analytics 1.5 Commercial use of Big Data **Unit 2: Big Data Technology** 2.1 Distributed and Parallel Computing 2.2 Introducing Hadoop 2.3 HDFS and MapReduce 2.4 Cloud Computing and Big Data 2.5 In-Memory Computing **Unit 3: Hadoop** 3.1 HDFS Architecture 3.2 Blocks 3.3 Name Nodes and Data Nodes 3.4 Using HDFS Files 3.5 Hadoop Specific File System Types 3.6 HDFS Commands 3.7 org.apache.hadoop.io package 3.8 MapReduce Architecture 3.9 Hadoop YARN 3.10 HBase 3.11 Combining HBase 3.12 Hive 3.13 Pig and Pig Latin 3.14 Sqoop **Unit 4: Technology Foundations** 4.1 Big Data Stack 4.2 Virtualization and Big Data **Unit 5: Storing Data in Databases and Processing of Data** 5.1 RDBMS and Big Data 5.1.1 CAP Theorem 5.3 NoSQL Databases 5.4 Polygot Persistence 5.5 Integrating Big Data with traditional Data Warehouses 5.6 Big Data Analytics

	5.7 Processing Data with MapReduce 5.8 Customizing MapReduce Execution and implementing MapReduce Program 5.9 Testing and Debugging MapReduce Applications 5.10 Analytical Approaches and Tools to Analyze Data
Reference Books	1. D T Editorial services, Big Data Black book, Dreamtech Press, ISBN 978-93-5119-931 2. Alex Holmes, Hadoop in Practice, Manning Publication company, 2014, ISBN 1617292222, 9781617292224 3. Kuan-Ching, Li Hai Jiang, Laurence T. Yang Alfredo Cuzzocrea, Big Data : Algorithms, Analytics and Applications. CRC Press 4. Hu, Wen Chen, Big Data Management, Technologies and Applications, IGI Global 5. Tom White, Hadoop The Definitive Guide, o'Reilly
Teaching Methodology	Class work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: **Programming Skills VIII**

Course Code	306
Course Title	**Programming Skills VIII**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: **Programming Skills IX**

Course Code	307
Course Title	**Programming Skills IX**
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the concepts of SAP/NoSQL practically
Course Objective	Learning to implement the ERP using SAP/NoSQL databases practically
Pre-requisite	DBMS
Course Outcome	After studying the course, students will be able to practically work on SAP/NoSQL Databases
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: **Programming Skills X**

Course Code	308
Course Title	**Programming Skills X**
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to handle advanced database administration activities
Course Objective	Advanced database administration
Pre-requisite	Practically learning advanced database administration
Course Outcome	After studying the course, students will be able to handle database administration, tuning and maintenance in various fields
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: **Programming Skills XI**

Course Code	309
Course Title	**Programming Skills XI**
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement Data warehousing & data mining / Big Data practically.
Course Objective	Learn to use Data warehousing and data mining techniques in various practical environments / use Big data practically.
Pre-requisite	Databases, SQL, Advanced SQL
Course Outcome	After studying the course, students will be able to understand Data warehousing and data mining/Big Data practically
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

MCA 3rd Sem. (Network Group)

Course: 301: **Internet of Things (IoT)**

(Elective)

Course Code	301
Course Title	**Internet of Things (IoT)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 9. To make student understand IoT 10. To understand the working of Micro-Controller & Micro-Computer 11. To explain various types of sensors 12. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	**Unit 1: Introduction to IoT** 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet **Unit 2: Networking and Communication** 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS **Unit 3: Sensors** 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network **Unit 4: Micro-Controller: Arduino, NodeMCU** 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture

	4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU 4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout **Unit 5: IoT App Interaction & Introduction to Raspberry Pi** 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madisetti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: **Machine Learning**
(Elective)

Course Code	301
Course Title	**Machine Learning (ML)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	**Unit 1 : Introduction** 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance **Unit 2 : Data Wrangling** 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization **Unit 3 : Supervised Learning** 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour

	3.3.2 Support Vector Machines 3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine **Unit 4 : Neural Network** 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network **Unit 5 : Unsupervised Learning** 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: **Design Patterns**

Course Code	302
Course Title	**Design Patterns**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 5. To study various Design Patterns 6. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	**Unit -1 Creational Patterns** 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern **Unit-2 Structural Patterns** 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern **Unit-3 Behavioural Pattern** 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern **Unit-4 Additional Design Patterns** 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern **Unit-5 Pattern Applicability** 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore

	5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud **Self-Study :** Pattern Languages
Reference Books	13. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addision Wesley 14. Head First Design Patterns, Eric Freeman, O'Reilly 15. Design Patterns in C#, Vaskaran Sarcar, Apress 16. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 17. Modern C++ design: generic Programming and design patterns applied, Alexendrescu, Andrei, Addison-Wesley 18. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: **Network Essentials and its Security**

Course Code	303
Course Title	**Network Essentials and its Security**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	To make students learn Network essentials and various security measures for the challenges to which the IT industry is exposed
Course Objective	To understand Network Management and its security
Pre-requisite	Computer Network, TCP/IP
Course Outcome	Students will be able to solve and determine best solutions for the challenging area of Network Security
Course Content	**Unit 1: Network Essentials** 1.1 Repeaters & Bridges 1.1.1 LAN Expansion 1.1.2 Repeaters 1.1.3 Bridges 1.1.4 How Bridges Work 1.1.5 Creating the routing table 1.1.6 Segmenting Network Traffic 1.1.7 Remote Bridges 1.1.8 Differentiating between bridges and repeaters 1.2 Routers & Gateways 1.2.1 Routers 1.2.2 How routers work 1.2.3 Routing benefits 1.2.4 Routing protocols 1.2.5 Routing V/S Bridging 1.2.6 B Routers 1.2.7 Gateways 1.2.8 How Gateways work 1.3 Network Administration 1.3.1 Bottlenecks 1.3.2 Simple Network Management Protocol 1.3.3 Data Protection 1.3.4 Backup Methods 1.3.5 Testing and Storage 1.3.6 Implementing a Backup System 1.3.7 Uninterruptible Power Suppliers 1.3.8 How Gateways work 1.3.9 Implementing Fault Tolerant Systems 1.3.10 RAID 1.3.11 Sector Sparing 1.4 Advance WAN Transmission 1.4.1 Overview 1.4.2 Multiplexing, Packet and Circuit Switching Networks 1.4.3 X.25 1.4.4 Asynchronous Transfer Mode (ATM) 1.4.5 ISDN 1.4.6 SONET 1.4.7 SMDS **Unit 2: Introduction to Network Security** **Unit 3: Cryptography Techniques** 3.1 Classical Cryptography

	3.2 Conventional Cryptography 3.2.1 DES 3.3 Public – key Cryptography 3.3.1 RSA 3.4 Digital Signatures 3.4.1 DSA **Unit 4: Security Services** 12.1 Message Integrity 12.2 Confidentiality and Authentication 12.3 Certification and Key Management 4.3.1 PKI **Unit 5: Network Security Applications** 5.1 IP Security 5.1.1 IPsec 5.2 Web Security 5.2.1 SSL, TLS, SET 5.3 Electronic Mail Security 5.3.1 PGP, S/MIME 5.4 SNMP Security **Unit 6: Access Control in Computer Networks** 6.1 Authentication Protocols and Services 6.1.1 Kerberos and X.309 6.2 Firewalls 6.3 Virtual Private Networks (VPNs) **Unit 7: System Security** 7.1 Intrusion detection 7.2 Viruses **Unit 8: Mobile System & E-Commerce Securities** 8.1 3G Security 8.2 E-Payment Systems 8.3 Fair Data Exchange
Reference Books	1) Cryptography and Network Security, 2/e, ISBN: 0-13-869017-0 - W. Stallings - Pearson Education, 1999 2) Network Security Essentials: Applications and Standards, 1/e, ISBN: 0-13-016093-8 - W. Stallings - Pearson Education, 2000 3) SSL and TLS: designing and building secure systems, ISBN: 0-201-61598-3 - E. Rescorla - Addison-Wesley, 2001 4) Implementing Secure Intranets and Extranets, ISBN: 0-89006-447-4 - K M Phaltankar - Artech House Publishers, 2000 5) Secure Electronic Commerce: Building the Infrastructure for Digital Signature and Encryption, ISBN: 0-13-027276-0 - W. Ford, and M. Baum - Prentice Hall, 2001 6) Security in Computing, ISBN: 0-13-185794-0, 2/e - C. P. Pfleeger - Prentice Hall, 1997 7) Building Internet Firewalls, 2/e, ISBN: 1-56592-871-7 - E. D. Zwicky, et al - O'Reilly, 2000 8) CDMA Cellular Mobile Communications & Network Security, ISBN: 0-13-598418-1 - M. Y. Rhee, - Prentice Hall, 1998 9) Journal of Computer Security 10) ACM Transactions on Information and System Security 11) ACM Conference on Computer and Communications Security 12) IEEE Symposium on Security and Privacy

	13) Internet documents - RFCs (Request for Comments) 14) Guide to Networking Essentials, Fourth Edition - Greg Tomsho, et al 15) Computer Networking Essentials - Debra Littlejohn Shinder 16) Networking Essentials: Hands-On, Self-Paced Training for Supporting Local and Wide Area Networks - Microsoft Corporation (Corporate Author) 17) Computer Network - A. S. Tanenbaum
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: **Network Administration**

Course Code	304
Course Title	**Network Administration**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding advanced network administration
Course Objective	To learn advanced network administration, its configuration and maintenance
Pre-requisite	Computer Network, TCP/IP
Course Outcome	After studying the course, students will be able to perform Network Administration
Course Content	**Unit 1: Networking and TCP/IP on Linux** a. Fundamentals of Linux Networking b. Fundamentals of TCP/IP on the Linux Operating System c. Advanced Linux TCP/IP Concepts d. Introduction to Dial-up Technologies **Unit 2: Dynamic Host Configuration Protocol** 2.1 Introduction to BOOTP and DHCP 2.2 Installing and Examining a Linux DHCP server 2.3 Examining Additional DHCP Options and Configurations **Unit 3: Domain Name System** 3.1 Introduction to the Domain Name System 3.2 Installing and Configuring DNS **Unit 4: The Network File System** 4.1 Introduction to the Network File System 4.2 Configuring NFS **Unit 5: Linux Remote Administration** 5.1 Introduction to Remote Administration 5.2 The Telnet Protocol 5.3 The open secure Shell protocol **Unit 6: The Cron Daemon** 6.1 Introduction to Automation 6.2 Configuring the Cron Daemon **Unit 7: Samba** 7.1 Introduction to Samba 7.2 Cross-Platform Connectivity 7.3 Installing and Configuring Samba **Unit 8: Linux System-Wide Logging** 8.1 Introduction to System-wide Logging 8.2 Configuring System-Logging **Unit 9: The Network Information Service** 9.1 Introduction to NIS 9.2 Setting Up and Configuring an NIS server
Reference Books	1) TCP/IP Network Administration - Craig Hunt - O'Reilly & Associates 2) Managing NFS and NIS - Hal Stern - O'Reilly & Associates

	3) DNS and BIND - Albitz/Liu - O'Reilly & Associates 4) Sendmail - Bryan Costales/Eric , Allman/Neil Rickert - O'Reilly & Associates 5) UNIX System Administration Handbook - Second Edition - Nemeth/Snyder/Seebass - Prentice Hall 6) Red Hat Linux Networking and System Administration – Terry Collings, Kurt Wall 7) Red Hat Linux 9 Bible - Christopher Negus 8) Official Red Hat Linux User's Guide - Red Hat Inc. 9) Official Red Hat Linux Administrator's Guide - Red Hat Inc. 10) Red Hat Linux Security and Optimization - Mohammad J. Kabir
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Wireless Network and Mobile Computing**

Course Code	305
Course Title	**Wireless Network and Mobile Computing**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding Wireless Network and Mobile Computing
Course Objective	To understand various aspects related to Wireless Network technologies, mobile networks and its computing
Pre-requisite	Computer Network
Course Outcome	Students will be able to implement various Wireless Network protocols and learn Mobile Computing
Course Content	**Unit 1: Introduction to Wireless Network Technologies** 1.1 Introduction 1.2 Standards 1.3 Emerging Technologies 1.4 OSI Basics 1.5 LAN Basics 1.6 LAN & WAN Protocols 1.7 Internet Protocol **Unit 2: Wireless LAN Technologies, Implementation and Layers** 2.1 Frequency Hopping Spread Spectrum 2.2 Direct Sequence Spread Spectrum (DSSS) 2.3 Interference 2.4 RF Math 2.5 Service Sets 2.6 Mobile IP 2.7 Appropriate use and design of wireless NetworkingMultipath 2.8 Co-location 2.9 Power-over-Ethernet (PoE) 2.10 Modulation and Bit Coding 2.11 Fragmentation 2.12 SIFS / PIFS / DIFS / EIFS **Unit 3: Hardware Configuration, Implementation and Protocols** 3.1 Access Points 3.2 Bridges 3.3 Workgroup bridges 3.4 Wireless Residential Gateways 3.5 Host Connectivity 3.6 Antennas, Cables, & Connectors 3.7 MAC and Routing Protocols for IEEE 802.11 3.8 Wireless Mesh Networks **Unit 4: MANET** 4.1. Various applications of MANET 4.2. Destination- Sequenced Distance Vector protocol 4.3. Dynamic Source Routing protocol 4.4. Ad Hoc On-Demand Distance-Vector protocol 4.5. Link Reversal Routing a. Gafni-Bertsekas algorithm b. Lightweight mobile routing algorithm.

	4.6. Temporally ordered routing algorithm **Unit 5: Introduction to Mobile Computing, GSM, GPRS & WAP** 5.1 Mobility, Nomadic, Mobile and Ubiquitous computing 5.2 Mobile Computing Architecture 5.3 Mobile Computing Technologies (Hardware, Software, Communication) 5.4 Introduction to GSM 5.5 GSM Architecture, Mobility Management, Network Signaling 5.6 GPRS Architecture 5.7 Network Nodes 5.8 Mobile Internet Standards, WAP Gateway and Protocols 5.9 WML
Reference Books	1) Wireless Local Area Network Fundamentals - Pejman Roshan, Jonathan Leary 2) Wireless Networks First Step (First-step series) - Jim Geier 3) 802.11 wireless network site surveying and installation - Bruce Alexander 4) Introduction to Wireless and Mobile Systems by Cengage Learning (Thompson) 5) J. Schiller, Mobile Communications, Addison –Wesley, 2003 6) Wi-Fi Security - Stewart Miller 7) Wireless and Mobile Network - Architecture Yi-Bing Lin & Imrich Chlamtac - John Wiley & Sons, 2001 8) Mobile and Wireless Design Essentials by Martyn Mallick, John Wiley & Sons 9) Guide to Designing and Implementing wireless LANs - Mark Ciampa - Thomson learning , Vikas Publishing House, 2001 10) Wireless Web Development - Ray Rischapter - Springer publishing, 2000
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: **Programming Skills VIII**

Course Code	306
Course Title	**Programming Skills VIII**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: **Programming Skills IX**

Course Code	307
Course Title	**Programming Skills IX**
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand the Networking and its security practically
Course Objective	Learning to implement Network and its security practically.
Pre-requisite	Network fundamentals
Course Outcome	After studying the course, students will be able to practically implement network and its security
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: **Programming Skills X**

Course Code	308
Course Title	**Programming Skills X**
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to learn network administration
Course Objective	Students will learn administration of network practically
Pre-requisite	Networking fundamentals
Course Outcome	After studying the course, students will be able to practically perform administrative tasks of networks practically
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: **Programming Skills XI**

Course Code	309
Course Title	**Programming Skills XI**
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the basic and advanced concepts of wireless network and mobile computing
Course Objective	Learning wireless protocols and its implementation practically
Pre-requisite	Computer Network, C/C++ programming
Course Outcome	After studying the course, students will be able to practically develop/enhance wireless protocols and find better solutions application to the various industries dependent upon them
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

MCA 3rd Sem. (General Group)

Course: 301: **Internet of Things (IoT)**

(Elective)

Course Code	301
Course Title	**Internet of Things (IoT)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 13. To make student understand IoT 14. To understand the working of Micro-Controller & Micro-Computer 15. To explain various types of sensors 16. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	**Unit 1: Introduction to IoT** 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet **Unit 2: Networking and Communication** 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS **Unit 3: Sensors** 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network **Unit 4: Micro-Controller: Arduino, NodeMCU** 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture

	4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU 4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout **Unit 5: IoT App Interaction & Introduction to Raspberry Pi** 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madisetti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: **Machine Learning**
(Elective)

Course Code	301
Course Title	**Machine Learning (ML)**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	**Unit 1 : Introduction** 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance **Unit 2 : Data Wrangling** 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization **Unit 3 : Supervised Learning** 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour

	3.3.2 Support Vector Machines 3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine **Unit 4 : Neural Network** 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network **Unit 5 : Unsupervised Learning** 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: **Design Patterns**

Course Code	302
Course Title	**Design Patterns**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 7. To study various Design Patterns 8. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	**Unit -1 Creational Patterns** 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern **Unit-2 Structural Patterns** 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern **Unit-3 Behavioural Pattern** 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern **Unit-4 Additional Design Patterns** 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern **Unit-5 Pattern Applicability** 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore

	5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud **Self-Study :** Pattern Languages
Reference Books	19. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addision Wesley 20. Head First Design Patterns, Eric Freeman, O'Reilly 21. Design Patterns in C#, Vaskaran Sarcar, Apress 22. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 23. Modern C++ design: generic Programming and design patterns applied, Alexendrescu, Andrei, Addison-Wesley 24. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: **Network Essentials and its Security**

Course Code	303
Course Title	**Network Essentials and its Security**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	To make students learn Network essentials and various security measures for the challenges to which the IT industry is exposed
Course Objective	To understand Network Management and its security
Pre-requisite	Computer Network, TCP/IP
Course Outcome	Students will be able to solve and determine best solutions for the challenging area of Network Security
Course Content	**Unit 1: Network Essentials** 1.1 Repeaters & Bridges 1.1.1 LAN Expansion 1.1.2 Repeaters 1.1.3 Bridges 1.1.4 How Bridges Work 1.1.5 Creating the routing table 1.1.6 Segmenting Network Traffic 1.1.7 Remote Bridges 1.1.8 Differentiating between bridges and repeaters 1.2 Routers & Gateways 1.2.1 Routers 1.2.2 How routers work 1.2.3 Routing benefits 1.2.4 Routing protocols 1.2.5 Routing V/S Bridging 1.2.6 B Routers 1.2.7 Gateways 1.2.8 How Gateways work 1.3 Network Administration 1.3.1 Bottlenecks 1.3.2 Simple Network Management Protocol 1.3.3 Data Protection 1.3.4 Backup Methods 1.3.5 Testing and Storage 1.3.6 Implementing a Backup System 1.3.7 Uninterruptible Power Suppliers 1.3.8 How Gateways work 1.3.9 Implementing Fault Tolerant Systems 1.3.10 RAID 1.3.11 Sector Sparing 1.4 Advance WAN Transmission 1.4.1 Overview 1.4.2 Multiplexing, Packet and Circuit Switching Networks 1.4.3 X.25 1.4.4 Asynchronous Transfer Mode (ATM) 1.4.5 ISDN 1.4.6 SONET 1.4.7 SMDS **Unit 2: Introduction to Network Security** **Unit 3: Cryptography Techniques** 3.1 Classical Cryptography

	3.2 Conventional Cryptography 3.2.1 DES 3.3 Public – key Cryptography 3.3.1 RSA 3.4 Digital Signatures 3.4.1 DSA **Unit 4: Security Services** 16.1 Message Integrity 16.2 Confidentiality and Authentication 16.3 Certification and Key Management 4.3.1 PKI **Unit 5: Network Security Applications** 5.1 IP Security 5.1.1 IPsec 5.2 Web Security 5.2.1 SSL, TLS, SET 5.3 Electronic Mail Security 5.3.1 PGP, S/MIME 5.4 SNMP Security **Unit 6: Access Control in Computer Networks** 6.1 Authentication Protocols and Services 6.1.1 Kerberos and X.309 6.2 Firewalls 6.3 Virtual Private Networks (VPNs) **Unit 7: System Security** 7.1 Intrusion detection 7.2 Viruses **Unit 8: Mobile System & E-Commerce Securities** 8.1 3G Security 8.2 E-Payment Systems 8.3 Fair Data Exchange
Reference Books	1. Cryptography and Network Security, 2/e, ISBN: 0-13-869017-0 - W. Stallings - Pearson Education, 1999 2. Network Security Essentials: Applications and Standards, 1/e, ISBN: 0-13-016093-8 - W. Stallings - Pearson Education, 2000 3. SSL and TLS: designing and building secure systems, ISBN: 0-201-61598-3 - E. Rescorla - Addison-Wesley, 2001 4. Implementing Secure Intranets and Extranets, ISBN: 0-89006-447-4 - K M Phaltankar - Artech House Publishers, 2000 5. Secure Electronic Commerce: Building the Infrastructure for Digital Signature and Encryption, ISBN: 0-13-027276-0 - W. Ford, and M. Baum - Prentice Hall, 2001 6. Security in Computing, ISBN: 0-13-185794-0, 2/e - C. P. Pfleeger - Prentice Hall, 1997 7. Building Internet Firewalls, 2/e, ISBN: 1-56592-871-7 - E. D. Zwicky, et al - O'Reilly, 2000 8. CDMA Cellular Mobile Communications & Network Security, ISBN: 0-13-598418-1 - M. Y. Rhee, - Prentice Hall, 1998 9. Journal of Computer Security 10. ACM Transactions on Information and System Security 11. ACM Conference on Computer and Communications Security 12. IEEE Symposium on Security and Privacy

	13. Internet documents - RFCs (Request for Comments) 14. Guide to Networking Essentials, Fourth Edition - Greg Tomsho, et al 15. Computer Networking Essentials - Debra Littlejohn Shinder 16. Networking Essentials: Hands-On, Self-Paced Training for Supporting Local and Wide Area Networks - Microsoft Corporation (Corporate Author) 17. Computer Network - A. S. Tanenbaum
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: **Advanced Database Administration**

Course Code	304
Course Title	**Advanced Database Administration**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding advanced database administration
Course Objective	To learn advanced database administration, database tuning and maintenance
Pre-requisite	RDBMS
Course Out come	After studying the course, students will be able to perform Database Administration
Course Content	**Unit 1. Oracle10g Instance creation and management** 1.1 Oracle Instance 1.2 Installing Oracle 1.3 Oracle Optimal Flexible Architecture (OFA) 1.4 Locating initialization, listener.ora & sqlnet.ora files 1.5 Finding the alert log 1.6 Common environment variables 1.7 Structures in an Oracle Instance 1.8 Oracle Memory Structures, SGA and PGA 1.9 Oracle Processes and their purposes 1.10 Startup, nomount, mount and open database commands **Unit 2. Oracle10g Database Architecture** 2.1 Oraclde10g management framework 2.1 Using the Database Creation Assistant (DBA) 2.3 Creating and dropping a database 2.4 Tablespaces 2.5 Tables and Indexes 2.6 Clusters 2.7 Partitioning of Tables and Indexes 2.8 Gathering and applying patches **Unit 3. Concurrency Management** 3.1 Transactions, serialization, locks and latches 3.2 Lock modes 3.3 Detecting and resolving lock conflicts 3.4 Managing deadlocks **Unit 4. Interfacing with Oracle** 4.1 Oracle transaction management 4.2 Using SQL*Plus and iSQL*Plus 4.3 Using embedded Oracle with Pro*C & Java 4.4 PL/SQL & Triggers 4.5 Pining PL/SQL packages & compiling PL/SQL 4.6 System-level triggers – startup trigger, logon trigger, PL/SQL error trigger **Unit 5. Oracle*Net** 5.1 Basic Network structure 5.2 Oracle*Net Files 5.3 Multi-threaded server 5.4 Create additional listeners 5.5 Create Oracle Net service aliases

5.6 Configure connect time failover
5.7 Oracle*Net names resolution

Unit 6. Tablespace Management Overview
6.1 Dictionary Managed Tablespaces
6.2 Locally Managed Tablespaces
6.3 Automatic Segment Space Management
6.4 Moving tablespaces online and offline

Unit 7. UNDO Tablespace Management
7.1 Use of undo segments
7.2 Creating an undo tablespace
7.3 User managed undo tablespaces
7.4 Automatic undo management
7.5 Monitor & Configure undo retention
7.6 Use the Undo Advisor
7.7 Size the undo tablespace

Unit 8. Oracle Utilities
8.1 Datapump - Import/export
8.2 SQL*Loader
8.3 Oracle Streams
8.4 Automatic Database Diagnostic Monitor
8.5 Automatic Tuning Optimizer
8.6 Automatic Shared Memory Tuning

Unit 9. Oracle Performance Tuning
9.1 Locate invalid and unusable objects
9.2 Gather SQL optimizer statistics with dbms_stats
9.3 Basic Oracle performance metrics
9.4 Use OEM and dbms_alert to set warning and critical alert thresholds
9.5 The SQL Tuning Advisor
9.6 The SQL Access Advisor
9.6 Interpreting server generated alerts
9.7 Oracle advisory utilities vdb_cache_advice, vshared pool_advice, v$pga_aggregate_target_advice
9.8 Using OEM performance screens
9.9 Fixing performance issues

Unit 10. User Management
10.1 Creating Users
10.2 Altering users
10.3 User Profiles
10.4 User resource groups
10.5 Granting privileges & roles
10.6 Auditing user activity with dbms_audit

Unit 11. Oracle Security
11.1 Password use in Oracle, Password encryption and password aging, External authentication, Using Single sign-on (SSO)
11.2 Object security
11.3 Virtual Private Databases (VPD) in Oracle
11.4 Oracle “grant execute” security
11.5 Use of Roles in Oracle
11.6 Register for security updates

Unit 12. Backup & Recovery

	12.1 Oracle backup & recovery planning 12.2 Parallel instance recovery 12.3 Basics of checkpoints, redo log files, and archived log files 12.4 Using ARCHIVELOG mode 12.5 Creating consistent Oracle backups 12.6 Online hot backups 12.7 Incremental Oracle backups 12.8 Automating database backups with dbms_scheduler 12.9 Monitor the flash recovery area 12.10 Recovering from loss of a Control file 12.11 Recovering from loss of a Redo log file 12.12 Recovering from loss of a system-critical data file 12.13 Recovering from loss of a non system-critical data file
Reference Books	1. Essentials : Oracle Database 10g by Rick Greenwald, Robert Stackowiak, Jonathan Stern, O'Reilly 2. Oracle High Performance Tuning for 9i and 10g by Gavin Powell, Digital Press 3. Oracle Database 10g, DBA Handbook by Loney, Kevin, Bryla, Bob, Oracle Press 4. Oracle Database 10g - The Complete Reference by Loney, Kevin, Oracle Press 5. Oracle Database 10g: A Beginner's Guide by Micheal Abbey, Ian Abramson Osborne, Oracle Press Series
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Open Source Web Based Programming**

Course Code	305
Course Title	**Open Source Web Based Programming**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand fundamentals of Open Source web based Programming. The course also imparts students learning about Open source web based scripting language PHP and Mysql database. It also includes MVC or Three tier architecture of web based programming and Javascript technology like ReactJS.
Course Objective	Student will learn fundamentals and advance topics of Open source Web technology
Pre-requisite	Knowledge of HTML, Javascript and SQL
Course Out come	After studying the course, students will be able to understand how Open source web technology works. They will also be able to create database driven Websites.
Course Content	**Unit 1 : Introduction to Open source Web based Programming** 1.1 Introduction to PHP & MySql 1.2 Installation of PHP and MySql 1.3 Language Characteristics & Features 1.4 Operators and Variables, Control Structures, Looping and Error handling 1.5 PHP functions 1.5.1 String Functions 1.5.2 Array Functions 1.5.3 Mathematical Functions 1.5.4 Graphics Library (GD Support) 1.5.6 Date and Time Functions 2.5.7 Misc. Function 1.6 State management Techniques 1.7 Object Oriented Features of PHP 1.7.1 Classes and Objects 1.7.2 Use of constructors 1.7.3 Serialization 1.7.4 Inheritance **Unit 2 : MySQL database server** 2.1 Configuring the MySQL Server 2.2 MySQL Tables, Displaying MySQL Database , Adding and removing user access 1.3 Database connection and data processing functions **Unit 3 : Advance PHP** 3.1 Ajax Basics 3.1.1HTTP Request and Response Fundamentals 3.1.2 The XMLHttpRequest Object XMLHttpRequest Methods 3.1.3 XMLHttpRequest Properties 3.1.4 Cross-Browser Usage Sending a Request to the Server 3.1.5 PHP and Ajax Client-Driven Communication 3.1.6 Server-Side Processing Expanding and Contracting Content 3.1.7 Form Validation 3.1.8 Ajax-Based Database Querying 3.2 XML 3.3 Web services

	Unit 4 : MVC 4.1 Introduction to MVC 4.2 CodeIgniter: Introduction, Features and Application Flow Chart 4.3 Controller 4.4 Views 4.5 Models 4.6 Helpers 4.7 Creating and Usage of Libraries and Helpers 4.8 URL Routing 4.9 Error Handling 4.10 Profiling Application **Unit 5 : Introduction to React JS** 5.1 What is React JS 5.2 Environment Setup 5.3 JSX and ES6 5.4 Components 5.5 Props and State 5.6 Components API and Lifecycle 5.7 Forms and Events 5.8 Difference between React JS and React Native
Reference Books	1. Beginning PHP, Apache, MySQL Web Development - Elizabeth Naramore, Jason Gerner , Yann Le Scouarnec,Jeremy Stolz,Michael K. Glass, Gary Mailer – Wrox Publication 2. Professional PHP Programming - Jesus Castagnetto ,Wrox Press Ltd 3. Beginning PHP and MySQL: From Novice to Professional - W. Jason Gilmore, Apress 4. Php: The Complete Reference - Steven Holzner, Tata Mcgraw Hill Education Private Limited 5. AJAX and PHP: Building Responsive Web Applications - Bogdan Brinzarea, Cristian Darie packtpub 6. CodeIgniter for Rapid PHP Application Development - David Upton ,packtpub 7. Professional CodeIgniter- Thomas Myer, Wrox Press Ltd 8. Learning React - Kirupa Chinnathambi , Paperback – 2018 9. Mastering React- Adam Horton and Ryan Vice, packtpub 10. Php manual – www. Php.com
Teaching Methodology	Class work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: **Programming Skills VIII**

Course Code	306
Course Title	**Programming Skills VIII**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: **Programming Skills IX**

Course Code	307
Course Title	**Programming Skills IX**
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand the Networking and its security practically
Course Objective	Learning to implement Network and its security practically.
Pre-requisite	Network fundamentals
Course Outcome	After studying the course, students will be able to practically implement network and its security
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: **Programming Skills X**

Course Code	308
Course Title	**Programming Skills X**
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to learn network administration
Course Objective	Students will learn administration of network practically
Pre-requisite	Networking fundamentals
Course Outcome	After studying the course, students will be able to practically perform administrative tasks of networks practically
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: **Programming Skills XI**

Course Code	309
Course Title	**Programming Skills XI**
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the basic and advanced concepts of PHP/MySql practically.
Course Objective	Learning to develop and deploy websites using PHP/MySql practically.
Pre-requisite	Basic scripting, programming, html.
Course Outcome	After studying the course, students will be able to practically develop dynamic websites using PHP/MySql.
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject based on 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

MCA

4th Sem.

Course: 401: **Seminar**

Course Code	401
Course Title	**Seminar**
Credit	6
Review / Revision	June 2021

- The students are required to prepare a seminar on a relevant topic concerning the subject of interest of the student; as well as latest technology.
- The students must prepare documentation of the seminar.
- At the end of the semester, the students have to submit the seminar reports in spiral bounded form to the institution.
- Seminar Completion Certificate issued by the institute is mandatory for appearing in Seminar Presentations.
- The Seminar Presentation will be conducted as per the University exam schedule.

The students have to submit the following reports at the institution:

1. Seminar Topic Chosen
2. Institution Certificate for Seminar

Course: 402: **Project**

Course Code	402
Course Title	**Project**
Credit	24

- The students are required to carry out full time software development project in a company.
- The students must prepare documentation of the project completed as per the guidelines given by the institute.
- At the end of the semester, the students have to submit the project reports in bounded form to the institution.
- Project Completion Certificate issued by the institute is mandatory for appearing in Project Presentation and Viva – Voce.
- The Project Presentation and Viva – Voce will be conducted as per the University exam schedule.

The students have to submit the following reports at the institution:

1. Project Joining Report
2. Progress Reports
3. Project Completion Certificate from the company
4. Institution Certificate for Project
5. Non-disclosure of Source Code Certificate (In case the student is unable to submit project source code)

Course : 103 : Fundamentals of Computer

Course Code	103
Course Title	Fundamentals of Computer
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	This course helps students to understand basics of computer and office tools
Course Objective	The students would be able to understand the basic uses and applications of computer, to know different components of computer, to get familiar with various computer codes, basics of operating system, configuration and maintenance of open source operating system, its commands. The student would also learn open source office tools.
Pre-requisite	NIL
Course Out come	Students will be able to understand better use of computer and its operations.
Course Content	**Unit : 1 : Introduction to Computers and its components** 1.1 Computer 1.1.1. Introduction to Computer 1.1.2. The Components of Computer 1.1.3. Advantages and Disadvantages of Computer 1.1.4. Generations of Computer 1.1.5. Computer Software 1.1.6. Categories of Computers 1.1.6.1 Personal Computers 1.1.6.2 Mobile Computers 1.1.6.3 Servers 1.1.6.4 Mainframes 1.1.6.5 Super Computers 1.1.6.6 ATM 1.1.6.7 POS 1.1.7. Usage and Applications of Computer in Society 1.2. Components of Computer 1.2.1 Block Diagram of Computer 1.2.2 The System Unit 1.2.3 Processor 1.2.4 Motherboard 1.2.5 Memory - Register, RAM, ROM 1.2.6 Expansion Slots and Adaptor Cards 1.2.7 Ports and Connectors 1.2.8 Buses 1.2.9 Power Supply 1.2.10 Input Output Systems 1.2.11 Storage Systems 1.2.12 BIOS 1.2.13 Interrupt 1.2.14 Device Driver **Unit : 2 : Computer Codes and Conversions** 2.1 Computer Codes 2.1.1 Introduction to Computer Codes 2.1.2 Decimal System 2.1.3 Binary System

	2.1.4 Hexadecimal System 2.1.5 Octal System 2.1.6 4-bit BCD System 2.1.7 8-bit BCD System 2.1.8 ASCII code 2.1.9 16-bit Unicode 2.2 Conversion of Numbers (from one Number System to another - includes fixed and fractional numbers) **Unit : 3 : Operating System and Usage** 3.1 Types of OS 3.1.1 Single User 3.1.2 Multi - User 3.1.3 Uni - Processor 3.1.4 Multi - Processor 3.1.5 Batch Processing 3.1.6 Time - Sharing 3.1.7 Real Time 3.2 Booting Process of Computer 3.7 Need of OS 3.6 Functions of OS 3.3 Types of File System - FAT, NTFS, APFS, EXT 3.4 Partition of Disk 3.5 Installation of OS **Unit : 4 : Introduction to Open Source OS : Linux** 4.1 Features and Components of Linux 4.2 Components of Linux 4.3 Installation and Configuration of Open Source Software 4.3 Basic Commands – cat, cmp, diff, wc, sort, mkdir, rmdir, cd, ls, cp, mv, pwd, passwd, who, whoami, chmod, date, more, sudo, apt-get, install, update, upgrade. **Unit : 5 : Open Office** 5.1 Open Office – Writer 5.1.1 Working with Documents 5.1.2 Formatting Documents 5.1.3 Setting Page style 5.1.4 Creating Tables 5.1.5 Drawing- Tools 5.1.6 Printing Documents 5.2 Open Office – Calc 5.2.1 Introduction to Spreadsheets 5.2.2 Overview of a Worksheet 5.2.3 Creating Worksheet & Workbooks 5.2.4 Organizing files, Managing files & workbooks 5.2.5 Functions & Formulas 5.2.6 Working with Multiple sheets 5.2.7 Creating Charts & Printing Charts 5.3 Open Office – Impress 5.3.1 Creating Presentation, Saving Presentation Files 5.3.2 Master Templates & Re-usability 5.3.3 Slide Transition 5.3.4 Making Presentation CDs

	5.3.5 Printing Handouts
Reference Book	1. Fundamentals of Computer : E Balagurusamy - McGraw-Hill 2. Computer Fundamentals : P.K. Sinha - BPB Publications 3. OpenOffice.org for Dummies : Gurdy Leete - Wiley-India 4. Computer Fundamentals : Anita Goel - Pearson 5. Fundamentals of Computer : Rajaraman V. - PHI 6. Fundamentals of Computers : Reema Thareja - Oxford University Press
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 104 : Fundamentals of Programming Using C-I

Course Code	104
Course Title	Fundamental of Programming using C-I
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To provide fundamental knowledge of programming using C language.
Course Objective	To make students aware of problem solving methodology to solve problems and design solutions.
Pre-requisite	NIL
Course Out come	Students will be able to solve problems, to write algorithms of solutions and translate solutions into programs.
Course Content	**Unit : 1 : Phases of Problem Solving Methodology** 1.1 Problem Analysis Gathering available data, Identifying relevant facts, Defining the problem, Generating alternative methods of solution, Selecting the optimum approach 1.2 Problem solving techniques Simplification, Divide and conquer: break down a large, complex problem into smaller solvable problems, Constraint examination 1.3 Algorithm 1.4 Flowchart **Unit : 2 : Introduction to Computer Programming** 2.1 Introduction to Computer Programming Language and Program 2.2 Programming languages and Levels 2.3 Language Translators 2.3.1 Compiler 2.3.2 Interpreter 2.3.3 Assembler 2.4 Program Verification 2.4.1 Program Correctness 2.4.2 Program Bugs & Testing **Unit : 3 : Introduction to C language** 3.1 Overview of C 3.2 Constants, Variables and Data types 3.3 Operators and expressions 3.4 Simple Assignment statement 3.5 Basic Input/Output Statements 3.6 Decision Making Statements 3.7 Looping 3.8 Nested Control Structures **Unit : 4 : Array** 4.1 One dimensional Array 4.2 Declaration & Initialization of Array 4.3 Two dimensional array 4.3.1 Declaration 4.3.2 Accessing Matrix Elements 4.3.3 Operations on matrix elements and entire matrices 4.4 Array manipulation 4.4.1 Searching 4.4.2 Insertion

	4.4.3 Deletion 4.4.4 Modification 4.4.5 Sorting 4. 5 Multidimensional Array **Unit : 5 : Character Array & String** 5.1 Declaration & Initialization of String 5.2 Input/Output functions for String 5.3 Arithmetic operations on String 5.4 In built Functions for handling String 5.5 Array of String
Reference Book	1. Programming in ANSI C : E. Balagurusamy - Tata McGraw Hill 2. Let us C : Yashwant Kanetkar - BPB Publications 3. Programming with C : R S Bichkar - Universities Press 4. The complete Reference C : Herbert Schildt - McGrawHill 5. Schaums outline of Theory and Problems of programming with C : Byron Gottfried - McGrawHill 6. C Programming Language : Karnighan & Ritchie - TMH
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 105 : Internet and Web Technology

Course Code	105
Course Title	Internet and Web Technology
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To Provide basic knowledge about Internet and Web Designing.
Course Objective	To make the students aware of Internet and website designing using HTML, CSS and CSS Framework
Pre-requisite	NIL
Course Out come	Students will be able to understand the basics of Internet and develop static websites
Course Content	**Unit : 1 : Introduction to Internet** 1.1 History of Internet 1.2 Working of Internet 1.3 Internet Applications 1.4 Advantages of Internet 1.5 WWW 1.6 Uniform Resource Locator 1.7 W3C Standards 1.8 Web Pages 1.9 Web Server 1.10 Web Browsers 1.11 Domain Name Service 1.12 Applications of Internet 1.13 Internet Service Providers 1.14 DSL, Broadband and ISDN 1.15 Dedicated Connections 1.16 Wireless Connections 1.17 IP Addresses - IPv4 and IPv6 1.18 DHCP 1.19 Static IP and Dynamic IP **Unit : 2 : HTML** 2.1 Structure 2.2 Open Source HTML Editors 2.3 Links 2.4 Images and ImageMaps 2.5 Tables 2.6 Forms 2.7 Frames **Unit : 3 : Advanced HTML** 3.1 Semantic Elements and Non-Semantic Elements 3.2 HTML5 Elements 3.3 HTML5 Input Types and Attributes 3.4 Graphics - Canvas and SVG 3.5 Media - audio, embed, source, track and video **Unit : 4 : Advanced Cascading Style Sheet (CSS)** 4.1 Style Sheet Types 4.1.1 Linked 4.1.2 Embedded

	4.1.3 Inline 4.2 Style Sheet Precedence 4.3 Style Sheet Syntax 4.4 Using Classes 4.5 Font Control 4.6 Text Control 4.7 Color and Background 4.8 List Box Control 4.9 Miscellaneous Properties 4.9.1 Margin and Padding Properties 4.9.2 Border Properties 4.9.3 Tables 4.10 Multi-Column Layouts 4.11 Gradients 4.12 Drop Shadows 4.13 2D Transforms 4.13.1 Translate 4.13.2 rotate 4.13.3 scale 4.13.4 skew 4.14 3D Transforms 4.15 Transitions 4.16 Animations 4.17 Paged Media 4.18 Using Ready made Templates 4.19 Bootstrap framework 4.19.1 Introduction to Responsive Design, Using Bootstrap in a Web page 4.19.2 Typography, Color management, Jumbotron, Images, Alerts, Buttons 4.19.3 Tables,Forms, Drop downs, Navigation bar, Grid Basics, Pagination 4.19.4 Testing responsiveness using Browser Developer Tools **Unit : 5 : Web Designing Fundamentals** 5.1 Role and Tasks of a Web Designer 5.2 Characteristics of User Friendly Websites with Improved UI/UX 5.3 Basic Search Engine Optimization (SEO) Techniques 5.4 Case Study
Reference Book	1. How the Internet Works : Preston Gralla - Que PUB. 2. HTML 5.0 Black Book : Kogent - Dreamtech Press 3. HTML & CSS: The Complete Reference : Thomas - TMH 4. The Book of CSS3 - A Developer's Guide to the Future of Web Design : Peter Gasston - No Starch Press 5. The Internet : K.L. James - PHI 6. Internet Technology and Web Design : ISRD Group - TMH 7. Bootstrap: Jake Spurlock - O'Relly 8. Search Engine Optimization: Harold Davis - O'Relly
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 106 : Practical 1

Course Code	106
Course Title	Practical 1
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2021
Purpose of Course	To impart practical knowledge of programming
Course Objective	To give practical knowledge of C programming
Prerequisite	Nil
Course Outcome	Students will be able to solve problems using C language
Course Content	Practical based on Paper No. 104 - Fundamentals of Programming using C-I
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course : 107 : Practical 2

Course Code	107
Course Title	Practical 2
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2021
Purpose of Course	To impart practical knowledge of static website development
Course Objective	To give practical knowledge of HTML
Prerequisite	Nil
Course Outcome	Students will be able to develop static website using HTML
Course Content	Practical based on 105 - Internet and Web Technology
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course: 203 : Fundamentals of Programming using C - II

Course Code	203
Course Title	Fundamentals of Programming using C - II
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To teach advance concepts of C language
Course Objective	To develop better understanding of advanced features of C programming language.
Pre-requisite	Basic knowledge of problem solving and C programming.
Course Outcome	Students will be able to write programs using advanced programming concepts using C language.
Course Content	**Unit : 1 : Structure and Union** 1.1 Structure 1.1.1 Declaring and Defining Structure elements 1.1.2 Structure Initialization 1.1.3 Structure assignment 1.1.4 Array of Structure, Array within a structure 1.1.5 Nested Structure 1.1.6 Size of Structure 1.2 Union **Unit : 2 : User Defined Functions** 2.1 Introduction 2.2 Declaration and Definition 2.3 Methods of parameter passing 2.4 Scope of variables and storage classes 2.5 Recursion 2.6 Passing array to functions 2.7 Passing Structure, union to function **Unit : 3 : Pointer** 3.1 Pointer Basics 3.2 Pointers and arrays 3.3 Chain of pointers 3.4 Pointer and character strings 3.5 Array of pointers, pointer to array 3.6 Pointer and functions 3.6.1 Call by value & call by reference 3.6.2 Passing array to a function using pointer 3.7 Pointer to structures 3.8 Issues with pointers 3.9 Dynamic memory allocation 3.9.1 Allocating a memory block 3.9.2 Allocating multiple blocks of memory 3.9.3 Altering the size of a block 3.9.4 Releasing used Space **Unit : 4 : File Management in C** 4.1 Introduction : Definition, File structure, concept of Record 4.2 File access modes: Sequential, random, binary, 4.3 File Operations 4.2.1 Creating a new file 4.2.2 Opening a file 4.2.3 Reading from a file 4.2.4 Writing to a file

	4.2.5 Moving to a specific location in a file (Seek) 4.2.6 Closing a file 4.4 Error handling during I/O operations 4.5 Command Line Arguments **Unit : 5 : The Pre-processor** 5.1 Features of C Preprocessor 5.2 Macro 5.3.1 Macro Expansion 5.3.2 Macro with arguments 5.3.3 Nested Macro 5.3 File Inclusion 5.4 Conditional compilation 5.5 Compiler Control Directives
Reference Book	1 Programming in ANSI C : E. Balagurusamy - Tata McGraw Hill 2 Let us C : Yashwant Kanetkar - BPB Publications 3 Pointers in C : Yashwant Kanetkar - BPB 4 The complete Reference C : Herbert Schildt - McGrawHill 5 Programming with C : R S Bichkar - Universities Press 6 C Programming Language : Karnighan & Ritchie - TMH 7 Mastering Turbo C : Stan Kelly - BPB
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 204 : E Business and Cyber Laws

Course Code	204
Course Title	E Business and Cyber Laws
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	March 2021
Purpose of Course	To provide fundamental knowledge of E Business and Cyber Laws
Course Objective	To Impart fundamental Knowledge of E Business and Cyber Laws
Pre-requisite	Knowledge of Fundamental of Computers, Computer Networks
Course Out come	Students will be able to understand E Business , Cryptocurrency, Blockchain, Cyber Security and Cyber Laws
Course Content	**Unit 1 : E Commerce** 1.1 E Business 1.2 E Business Models 1.3 The Technologies and Infrastructural requirements of E-Commerce 1.4 Advantages and Disadvantages of E-Commerce 1.5 International issues of Electronic Commerce 1.6 Types of business transactions (B2B), (B2C), (B2G),Business Processes 1.7 Digital India Services, DigiLocker and other tools **Unit 2 : Introduction to E Payments** 2.1 Digital payments requirements 2.2 Digital Token based E payment systems 2.3 Classification of new payment system 2.4 E Wallet 2.5 Online Internet Banking 2.6 Unified payment Interface – BHIM and other tools 2.7 Online financial services in India **Unit 3 : Cryptocurrency ,Bitcoin and Blockchain** 3.1 Introduction to Crytocurrency 3.2 How Cryptocurrency Works , Ewallet Services and Personal Cryptosecurity 3.3 Introduction to Bitcoin , Merchants acceptance of Bitcoin 3.4 How Bitcoin Works overview, Transaction ,Blocks , Mining 3.5 Blockchain – Technology Stack :Protocol, Currency 3.6 Financial Services 3.7 Crowd Funding 3.8 Bitcoin Prediction Markets, 3.9 Smart Property 3.10 Smart Contracts 3.11 Decentralized Governance Services. 3.12 The Blockchain is an Information Technology **Unit 4 : Cyber Security** 4.1 Introduction 4.2 Network and website Security Risks 4.3 Hacking 4.4 Privacy Risk 4.5 Cyber Defamation 4.6 Identity Theft & Fraud

	4.7 Digital Forgery 4.8 Cyber terrorism 4.9 Cyber Pornography 4.10 Digital Forgery 4.11 Digital Signature 4.12 E- business Risk management issues 4.13 Firewall, Security framework **Unit 5 : Cyber Laws** 5.1 Cyber Crimes against Individuals, Institution and State 5.2 Computer and mobile as target for crime 5.3 Introduction to Cyber Laws 5.4 Limitation of India's Cyber Laws 5.5 Types of Civil Wrongs under the IT Act, 2000 5.6 Punishments under the IT Act 5.7 Intellectual Property Rights
Reference Book	1. E-Commerce An Indian Perspective P.T. Joseph ,S. J. - PHI publication 2. IT Encyclopedia.Com : Parag Diwan & Sunil Sharma - E-commerce - Pentagon Press. 3. E-Commerce Strategies : Charles Trepper – PHI 4. Information Technology Act : S. R. Bhansali - University Book House Pvt. Ltd. 5. Cyber Crimes and Law Enforcement : Vasu Deva - Commonwealth Publishers 6. Decentralized Applications , Harnessing Bitcoin's Blockchain Technology: Siraj Raval – O'Reilly 7. Blockchain, Blueprint for a new Economy : Melanie Swan – O'Reilly 8. Mastering Bitcoin, Programming the open Blockchain : Andreas M. Antonopoulos – O'Reilly 9. Essential CyberSecurity Science : Josiah Dykstra – O'Reilly
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 205 : Introduction to DBMS

Course Code	205
Course Title	Introduction to DBMS
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To introduce the basic concepts of database management system that includes data models, database design and basic practical of open source DBMS.
Course Objective	To teach fundamental concepts of DBMS including data models, ER diagram, different types of databases. This course also entails practical aspect of open source database.
Pre-requisite	Fundamentals of Computer, Programming Language
Course Out come	Students will be able to understand and implement basic database design principles, learn overview of different types of database. Students will also be able to perform practical on database through source database.
Course Content	**Unit : 1 : Basic Concepts of DBMS** 1.1 File Organization and Traditional File based System 1.2 Database and Need for DBMS 1.3 Characteristics of DBMS 1.4 Applications of DBMS 1.5 Views of Data - Schema and instances 1.6 Data Independence 1.7 Database Languages 1.8 Transaction Management 1.9 ACID Properties of Transaction 1.10 Database Administrator and Database Users 1.11 Overall System Architecture **Unit : 2 : Data Models** 2.1 Data Models 2.1.1 Network Model 2.1.2 Hierarchical Model 2.1.3 Relational Model 2.1.4 Object Model 2.1.5 Object-Relational Model 2.2 Entity Relationship Model 2.2.1 DB Design using ER Model 2.2.2 Entities 2.2.3 Relationships 2.2.4 Attributes 2.2.5 Entities and Relationship Set 2.2.6 Constraints and Design Issues 2.2.7 Weak Entity Set 2.2.8 Cardinality Ratio **Unit : 3 : Types of Databases and Recent Trends in DBMS** 3.1 Types of Databases 3.1.1 Object Oriented Database 3.1.2 Centralized Database

	3.1.3 Distributed Database 3.1.4 Parallel Database 3.1.5 Multimedia Database 3.1.6 NoSQL Database 3.1.7 Temporal Database 3.1.8 XML Database 3.2 Recent Trends in DBMS 3.2.1 Overview of Various Databases - MySQL, PostgreSQL, SQLite, MongoDB, MariaDB, Oracle, DB2and SQL Server 3.3 Big Data **Unit : 4 : Introduction to Open Source Database - MySQL** 4.1 Getting Started with MySQL 4.2 Installing MySQL 4.3 Data Types 4.4 Creating and Using Database 4.5 DDL Statements 4.5.1 Create Table 4.5.1.1 Constraints 4.5.1.2 Primary Key and Foreign Key Constraint 4.5.2 Alter Table 4.5.3 Delete Table **Unit : 5 : DML Statements and Other Functions of MySQL** 5.1 DML Statements 5.1.1 Insert Statement 5.1.2 SQL 5.1.3 Select Statement 5.1.4 Update Statement 5.1.5 Delete Statement 5.2 Aggregate Functions 5.3 Numerical Functions 5.4 String and Character Functions
Reference Book	1. Database System Concepts : Silberschatz, Korth and Sudarshan - McGraw Hill 2. An introduction to database systems : C. J. Date - Addison Welsley 3. Fundamentals of Database Systems : Elamsri, Navathe, Somayajulu and Gupta - Pearson Education 4. PHP and MySQL Web Development (Developer's Library) : Luke Welling - Addison - Wesley Professional 5. The Compete Reference MySQL : Vikram Vaswani - McGraw Hill 6. Murach's MySQL : Joel Murach - Mike Murach & Associates, Inc.
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars, Case Study and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 206 : Practical 3

Course Code	206
Course Title	Practical 3
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2021
Purpose of Course	To impart practical knowledge of advance features of programming
Course Objective	To give practical knowledge of advance C programming
Prerequisite	Basic knowledge of C programming language
Course Outcome	Students will be able to solve problems using advance features of C language
Course Content	Practical based on Paper No 203 - Fundamentals of Programming using C-II
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course : 207 : Practical 4

Course Code	207
Course Title	Practical 4
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2021
Purpose of Course	The course provides practical knowledge of open source database – MySQL.
Course Objective	The course prepares students to execute basic database statements using MySQL.
Prerequisite	Basic Programming Concepts
Course Outcome	After completion of this course, students will be able to perform basic DDL, DML commands including SQL queries using MySQL.
Course Content	Practical based on Paper No. 205 - Introduction to DBMS
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Master of Science (Information Technology)

Name of Program	Master of Science (Information Technology)
Abbreviation	M.Sc. (I.T.)
Duration	5 Years Integrated Course B.Sc.(I. T.) – 3 years – Semester 1 to 6 M.Sc.(I. T.) – 2 years – Semester 7 to 10
Eligibility	H S C / Equivalent Examination from Science Stream (A / B / AB Group) or Vocational Stream or General Stream (Commerce) with English as one of the subject.
Objective of Program	The objective of the program is to transform students into professionals by indoctrinating advanced technical knowledge, enhancing technical skills, communication skills and provide outstanding placement in reputed I.T. companies.
Program Outcome	After the completion of the course, students will be able to develop and manage various types of software based on technologies learnt throughout the course and emerging technologies in IT industry which will give them excellent career prospects.
Effective From	June 2021

Program Structure		**B.Sc. (I.T.) – Semester 1 (M.Sc. (I.T.) 5 years Integrated Course)**						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
101	Communication Skills in English	4	0	4	3 Hrs	70	30	100
102	Mathematics – I	4	0	4	3 Hrs	70	30	100
103	Fundamentals of Computer	4	0	4	3 Hrs	70	30	100
104	Fundamentals of Programming using C- I	4	0	4	3 Hrs	70	30	100
105	Internet and Web Technologies	4	0	4	3 Hrs	70	30	100
106	Practical 1	0	6	3	2 Hrs	70	30	100
107	Practical 2	0	4	2	2 Hrs	70	30	100
108	NSS/Sports/Saptdhara	-	-	2	-	-	-	-
	Total	20	10	27	-	490	210	700

Program Structure		**B.Sc. (I.T.) – Semester 2 (M.Sc. (I.T.) 5 years Integrated Course)**						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
201	Business Communication Skills in English	4	0	4	3 Hrs	70	30	100
202	Mathematics- II	4	0	4	3 Hrs	70	30	100
203	Fundamentals of Programming using C- II	4	0	4	3 Hrs	70	30	100
204	E Business and Cyber Laws	4	0	4	3 Hrs	70	30	100
205	Introduction to DBMS	4	0	4	3 Hrs	70	30	100
206	Practical 3	0	6	3	2 Hrs	70	30	100
207	Practical 4	0	4	2	2 Hrs	70	30	100
208	NSS/Sports/Saptdhara	-	-	2	-	-	-	-
	Total	20	10	27	-	490	210	700

Program Passing Rules	**As per University rules**