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 Criteria	5 Years (Integrated): 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	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** The program trains students for designing and conceptualizing the software architecture, planning and managing the product development process of complex and live software projects. It also makes students understand the decision making for selection of an appropriate project management capabilities. **PO6 : Real World Problem / Project Development** Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Students will learn to develop and strengthen the fundamental concepts that are required to solve complex programming problems.

	PSO2 : Students will develop the ability to identify, formulate and design solutions to face computational challenges. PSO3 : Students will be able to apply software engineering concepts to solve real world problems. PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile application, Desktop application, etc. PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.T domain.
Mapping between POs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
PO1					
PO2					
PO3					
PO4					
PO5					
PO6					
PO7					

Medium of Instruction	English

Program Structure		B.Sc. (I.T.) – Semester 1 (M.Sc. (I.T.) 5 years Integrated Course)						
Course Code	Title	Teaching per week		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		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	Introduction to DBMS	4	0	4	3 Hrs	70	30	100
205	Fundamentals of Electronics	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

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	5 Years (Integrated): 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 2016

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	Introduction to Database Management Systems	4	0	4	3 Hrs	70	30	100
205	Fundamentals of Electronics	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**						

...labus for English for B.Sc. IT, Semester 1, for the academic years 2016-17, 2017-18 & 2018-19.

Paper No.101

Communication Skills in English.

B.Sc.IT- 1st Semester.

Course Duration	Implementation from Academic year June 2016-2019	
Purpose of Course	This course helps to enhance the LSRW Skills of the students.	
Course Objective	The objective of the course is to develop the 4 language skills of the students with special reference to the needs of IT Industry and their future placement.	
Pre-requisite	Knowledge of Basic English	
Course Out Come	Students will be able to enhance their skills and further implement to enrich their communication.	
Course Content	**Unit : 1 :Essentials of Communication** 1.1 Fundamentals of Communication 1.2 Importance of Feedback in communication 1.3 Features of Successful Professional Communication 1.4 Verbal and Non-Verbal Communication	**Unit 1 : Text :** Communication Skills – Sanjay Kumar, PushpLata, Oxford Higher Education **Reference Books:** 1. Effective Communication- John Adair , PAN Books 2. Communication skills – Sen Leena, Paperback 3. Basic Business Communication: Skills for Empowering the Internet Generation - by Raymond Vincent Lesikar and Marie Elizabeth Flatley
	Unit : 2 :Listening Skills 2.1 Process of Listening 2.2 Hearing and Listening 2.3 Purpose of Listening 2.4 Barriers to Listening 2.5 Types of Listening 2.6 Listening for Specific purpose, information 2.7 Implications of Effective Listening	**Unit 2 : Text:** Communication Skills – Sanjay Kumar, PushpLata, Oxford Higher Education **Reference Books:** **1.** English Language Skills- ArunaKoneru, Mc.Graw Hill **2.** Developing Communication Skills- Krishna Mohan, MeeraBanerji, Macmillan 3.Study Listening-Tony Lynch, Cambridge

	Unit : 3 :Reading Skills 3.1 Purpose of Reading 3.2 Reading Comprehension 3.3 Types of Texts 3.4 Reading and Interpreting Graphics	**Unit 3 : Text:** English Language Sk... ArunaKoneru,Mc.Graw... **Reference Books:** 1. Communication Skills-Sanjay Kumar,PushpLata,Oxford. 2. Study Reading- Eric Glendinning, Cambridge. 3. Developing Communication Skills-Krishna Mohan, MeeraBanerji, Macmillan 4. Oxford Guide to Effective Writing & Speaking, John Seely, Oxford
	Unit : 4 :Speaking Skills 4.1 Effective speaking Skills 4.2 Public Speaking 4.3 Group Discussion 4.4 Telephonic Communication 4.5 Professional Presentation 4.6 Conversation and Dialogues	**Unit 4: Text:** Communication Skills-Sanjay Kumar, PushpLata,Oxford Higher Skills **Reference Books:** 1. Listening and Speaking-V.Sasikumar 2. Basics of Communication in English- Francis Soundaraj 3. Oxford guide effective writing and speaking-John Seely 4. Developing Communication Skills-Krishna Mohan, MeeraBanerji, Macmillan 5. The Basics of Communication-Steve Duck, David McMahan, Sage 6. English Language Skills-ArunaKoneru,Mc.Graw Hill
	Unit : 5 :Writing Skills and Essential and Applied Usage of Grammar 5.1 Essentials of good writing 5.2 Expand the Idea 5.3 Paragraph Development 5.4 The Art of Condensation 5.5 Synonyms and Antonyms 5.6 Effective Use of Words 5.7 Verbal Ability and Reasoning 5.8 Common Errors and Correct Usage	**Unit 5: Text:** English Language Skills-ArunaKoneru,Mc.Graw Hill **Reference Books:** 1. Basic Business Communication: Skills for Empowering the Internet Generation - by Raymond Vincent Lesikar and Marie Elizabeth Flatley 2. Developing Communication Skills-Krishna Mohan, Meera Banerjee

		3. Basics of Communication in English- Francis Soundararaj, Macmillan. 4. NTC Vocabulary Builders Level 5, Peter Fisher ,Viva 5. Oxford guide effective writing and speaking- John Seely,Oxford 6. The Basics of Communication- Steve Duck,Sage 7. Effective English Communication for you, V.Syamala, Emerald. 8. English Vocabulary in Use-Michael McCarthy,Cambridge.
Paper Style & Distribution of Marks:	**Q.1 Answer in Detail:** 1 out of 2, from Unit 1 & 2.**13 Marks** **Q.2 Answer in Brief:** 4 out of 6, from Unit 1 & 2.**12 Marks** **Q.3** (A)**Read the paragraph & answer the questions** Reading Comprehension 1 out of 2 from Unit 3.**05 Marks** (B) **Interpret the following figures:** Interpretation of graphics 1 out of 2 from Unit 3.**05 Marks** (C)**Expand the idea** 1 out of 2 from Unit5. **05 Marks** **Q.4** (A)**Draft Public speech or group discussion:**1 Out of 2, from Unit 4.**5marks** (B) **Designing Presentation on a given topic**1 Out of 2, from Unit 4.**5 Marks** (C)**Drafting Dialogues on given topics**1 out of 2 from Unit **405 Marks** **Q.5 Vocabulary:** **Do as directed:** (A) Synonyms and Antonyms 5/7 Unit 5. **05 Marks** (B)Verbal Ability &Listening 5/7 Unit 5. **05 Marks** (C) Correct the sentences 5/7 Unit 5. **05 Marks** **Total 70 Marks**	
Teaching Methodology:	Class room Discussion, Individual Exercises, Independent Study, Seminars and Assignment, group Exercise , Guest Sessions, Language Lab Sessions	
Evaluation Method:	30% Internal assessment 70% External assessment	

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

SYLLABUS FOR M.Sc. (I.T.) (UG)

SEMESTER - I

Course: 102 : Mathematics - I

Effective from June 2016

(4 Hours / Week, Credits : 4)

Minimum weeks per Semester: 15 (Including Class work, examination, preparation, holidays etc.)

Purpose of Course : Students will be able to explain and apply the basic methods of Mathematics.

Course Objective : To develop logical sequence in the design and analysis of algorithms, Computability theory, software engineering and computer systems.

Pre-requisite : Basics of Mathematics

Course outcome : Students will be equipped with logic to develop design and analysis of algorithms, computability theory, software engineering, and computer systems.

Teaching Methodology: Lectures, Discussion, Independent Study, Seminars and Assignment.

Evaluation Method: 30% Internal assessment and 70% External assessment.

Course Content:

Unit 1: Relations, functions, sequence and series:

1.1 Cartesian Product of sets
1.2 Relations as sets of ordered pairs
1.3 Types of relations
1.4 Properties of relations
1.5 Congruence relations
1.6 Equivalent classes
1.7 Composition of relations
1.8 Algebra of relations
1.9 Functions as sets of ordered pairs
1.10 Types of functions
1.11 Equality of functions
1.12 Algebra of functions
1.13 Composition of two functions
1.14 Inverse functions, Characteristics functions
1.15 Sequence and series

Unit 2: Theory of Matrices:

2.1 Matrices
2.2 Types of matrices
2.3 Equality of matrices
2.4 Operations on matrices
2.5 Properties of Operations Singular Matrices
2.6 Inverse of Matrix, Adjoint of Matrix
2.7 Rank of Matrices
2.8 Elementary Row/Column transformations
2.9 Row/Column equivalent canonical forms
2.10 Inverse using elementary transformations
2.11 Solution of a system of linear equations using elementary transformations.

Unit 3: Basic Statistics:

3.1 Introductions: Definitions Merits and demerits
3.2 Frequency distributions and frequency charts
3.3 Measures of Central tendency:
3.3.1 Arithmetic mean
3.3.2 Geometric mean
3.3.3 Harmonic mean
3.4 Median
3.5 Mode
3.6 Quartiles, Deciles and Percentiles
3.7 Measures of Dispersion:
3.7.1 Range
3.7.2 Quartile deviation
3.7.3 Mean deviation
3.7.4 Standard deviation
3.7.5 Skewness and Kurtosis.

Unit 4: Probability Theory:

4.1 Introduction: Definitions
4.2 Sample spaces
4.3 Events:
4.3.1 Types of events
4.3.2 Algebra of events
4.4 Conditional Probability
4.5 theorems on probability
4.6 Baye's theorem.

(3)

Unit 5: Random variables and distributions:

5.1 Random variables (discrete and continuous)
5.2 Mathematical expectations and Variance
5.3 Discrete Probability Distributions:
5.3.1 Binomial Distribution:
5.3.1.1 Density function
5.3.1.2 Mean and variance of the Distribution Properties and uses
5.3.2 Poisson Distribution:
5.3.2.1 Density function
5.3.2.2 Mean and Variance of the distribution
5.3.2.3 Properties and uses.

Reference Books:

1. C. L. Liu: Elements of Discrete Mathematics: McGraw Hill: 2008.
2. B. S. Vatsa: Discrete Mathematics: Vishwa Prakashan.: 3rd Ed.: 2000.
3. Suddhendu Biswas: A Text Book of Matrix Algebra: New age International Publishers, New Delhi: 3rd Ed.: 2004.
4. Robert A. Beezer: A First Course in Linear Algebra, University of Puget Sound, 3rd Edition.
5. J. J. Gareth, Mark Lemmon: Mathematics for Computer Scientists, bookboon.com, 2nd Edition, ISBN: 978-87-7681-426-7.

B.Sc. (I.T.) 1st Semester

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 2016
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 computers, to know different components of computers, to get familiar with various computer codes, basics of operating systems and commands. The student would also learn open-source office tools.
Course Out comes	CO1 : Student will be able to learn about computer hardware components and its working CO2 : Students will be able to work with different types of number systems ,and able to perform numerical of Binary, Octal and Hexa-decimal numbers CO3 : Student will be able to learn various type of operating system, working of Linux operating system and work on features of openoffice open source software
Mapping between COs with PSOs	
Pre-requisite	NIL
Course Outcome	Students will be able to understand better use of computer and its operations

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

P. M. Desai

Course : 103 : Fundamentals of Computers

Course Code	103
Course Title	Fundamentals of Computers
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2016
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.
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 and Mobile Devices 1.1.6.3 Consoles Servers 1.1.6.4 Mainframes 1.1.6.5 Super Computers 1.1.6.6 Embedded Computers 1.1.7. Examples of Computer Usage 1.1.8. Applications of Computer in Society 1.2. Components of Computer 1.2.1 The System Unit 1.2.2 Processor 1.2.3 Data Representation 1.2.4 Memory 1.2.5 Expansion Slots and Adaptor Cards 1.2.6 Ports and Connectors 1.2.7 Buses 1.2.8 Bays 1.2.9 Power Supply 1.2.10 Mobile Computers and Devices **Unit : 2 : Input, Output and Storage Units** 2.1 Input Devices 2.1.1 Introduction to Input Devices 2.1.2 Keyboard 2.1.3 Pointing Devices 2.1.3.1 Mouse 2.1.3.1 Trackball 2.1.3.2 Touchpad 2.1.3.3 Pointing Stick 2.1.3.4 Light Pen

2.1.3.5 Touch Screen
2.1.3.6 Pen Input
2.1.4 Controllers for Gaming and Media Players
2.1.4.1 Gamepads
2.1.4.2 Joysticks and Wheels
2.1.4.3 Light Guns
2.1.4.4 Dance Pads
2.1.4.5 Motion-Sensing Game Controllers
2.1.4.6 Touch-Sensitive Pads
2.1.5 Voice Input
2.1.6 Input for PDAs, Smart Phones and Tablet PCs
2.1.7 Digital Camera
2.1.8 Video Input
2.1.8.1PC Video Cameras
2.1.8.2 Web Cams
2.1.8.3Video Conferencing
2.1.9 Scanners and Reading Devices
2.1.9.1 Optical Scanners
2.1.9.2 Optical Readers (OCR, OMR, BCR, RFID Reader, MICR, Magnetic Stripe Card Reader, Data Collection Devices)
2.1.9.3 Terminals (Point-of-Sale Terminal, Automated Teller Machine)
2.1.9.4 Biometric Input
2.2 Output Devices
2.2.1 Introduction to Output Devices
2.2.2 Display Devices
2.2.3 Flat-Panel Displays
2.2.4 CRT Monitors
2.2.5 Printers
2.2.5.1 Non-Impact Printers (Ink-Jet, Photo, Laser, Thermal, Mobile, Label and Postage, Plotters and Large-format Printers) *f*
2.2.5.2 Impact Printers (Dot-matrix, Line)
2.2.6 Speakers
2.2.7 Headphones and Earphones
2.2.8 Fax Machines and Fax Modems
2.2.9 Multifunction Peripherals
2.2.10 Data Projectors
2.2.11 Force-Feedback Joysticks, Wheels and Gamepads
2.3 Storage
2.3.1 Introduction to Storage
2.3.2 Magnetic Disks
2.3.4 Optical Disks
2.3.5 Tape
2.3.6 PC Cards and Express Card Modules
2.3.7 Miniature Mobile Storage Media
2.3.8 Microfilm and Microfiche
2.3.9 Enterprise Storage
2.4 Files
2.4.1 Introduction to Files
2.4.2 Types of Files

Unit : 3 : Computer Codes and Conversions

3.1 Computer Codes
- 3.1.1 Introduction to Computer Codes
- 3.1.2 Decimal System
- 3.1.3 Binary System
- 3.1.4 Hexadecimal System
- 3.1.5 Octal System
- 3.1.6 4-bit BCD System
- 3.1.7 8-bit BCD System
- 3.1.8 ASCII code
- 3.1.9 16-bit Unicode

3.2 Conversion of Numbers (includes fixed and fractional numbers)
- 3.2.1 Non-Decimal to Decimal
- 3.2.2 Binary to Decimal, Octal, Hexadecimal
- 3.2.3 Octal to Binary, Decimal, Hexadecimal
- 3.2.4 Decimal to Binary, Octal, Hexadecimal
- 3.2.5 Hexadecimal to Binary, Octal, Decimal

Unit : 4 : Operating System and Usage

4.1 Introduction to Open Source OS : Linux
- 4.1.1 Features of Linux
- 4.1.2 Components of Linux
- 4.1.3 File Management System
- 4.1.4 Linux Commands and Utilities – cat, tail, cmp, diff, wc, sort, mkdir, cd, rmdir, pwd, cp, more, passwd, who, whoami, mv, chmod, kill, write, wall, merge, mail, news – pipes, filters and redirection utilities;

4.2 System Administration
- 4.2.1 Installing Linux
- 4.2.2 Booting the system
- 4.2.3 Installation of Open Source Software
- 4.2.4 Configuration of Open Source Software
- 4.2.5 Maintaining user accounts
- 4.2.6 File systems and special files
- 4.2.7 Backups and restoration.

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

B.Sc. (I.T.) 1st Semester

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 2016
Purpose of Course	To provide fundamental knowledge of programming using the C language.
Course Objective	To impart knowledge of basic programming concepts using C language.
Course Out comes	CO1: Students will be able to learn various Problem-solving techniques CO2 : Students will be able to learn basics of c programming language and perform practical programs CO3 : Students will be able to do string manipulation and array task
Mapping between COs with PSOs	
Pre-requisite	NIL
Course Outcome	Students will be able to write simple programs using C language

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 104 : Fundamentals of Programming using C - I

Course Code	104
Course Title	Fundamentals 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 2016
Purpose of Course	To teach students fundamental of programming using C language.
Course Objective	To develop logical and analytical skill of programming using C language.
Pre-requisite	-
Course Out come	Students will be able to analyze and solve problems using C language.
Course Content	**Unit : 1 : Phases of Problem Solving Methodology** 1.1 Problem Analysis 1.1.1 Gathering available data, Identifying relevant facts, 1.1.2 Defining the problem, generating alternative methods of solution, Selecting the optimum approach 1.2 Problem solving techniques 1.2.1 Simplification, Divide and conquer: break down a large, complex problem into smaller, solvable problems 1.2.2 Constraint examination 1.3 Algorithm 1.3.1 What is an algorithm, How to design an algorithm 1.3.2 Algorithm efficiency Considerations 1.4 Flowchart 1.4.1 Definition and purpose, Conventions to be used 1.4.2 Branching and looping **Unit : 2 : Introduction to Computer Programming** 2.1 Computer Programming Language and Program 2.2 Programming as a Goal Oriented Activity 2.3 Programming languages and Levels 2.4 Language Translators 2.4.1 Compiler 2.4.2 Interpreter 2.4.3 Assembler **Unit : 3 : Introduction to C language** 3.1 Character Set 3.2 Variables and Identifiers 3.3 Built in data types 3.4 Variable Definition 3.5 Arithmetic operators and expressions 3.6 Constants & Literals 3.7 Simple Assignment statement 3.8 Basic Input/ Output Statements 3.9 Conditional Control 3.10 Logical Connectives 3.11 Looping Control 3.12 Nested Control Structures **Unit : 4 : Array**

P. P. Desai

	4.1 One dimensional Array 4.2 Array manipulation 4.2.1 Searching 4.2.2 Insertion 4.2.3 Deletion 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 4.3.4 Matrices as function parameters 4.4 Multi dimensional array 4.5 Const, static and extern arrays 4.6 Character array, strings and string built-in functions **Unit : 5 : Program Verification and Optimization** 5.1 Program correctness 5.2 Program bugs & testing 5.3 Optimal programming approach 5.4 Program efficiency consideration
Reference Book	1. David Gries: The Science of Programming : Narosa Publications 2. E. Balagurusamy :C – programming : Tata McGraw Hill 3. Gottfried : Schaums outline of Theory and Problems of programming with C 4. R S Bichkar : Programming with C : Universities Press 5. Yashwant Kanitkar: Let Us C: BPB
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. V. Desai

B.Sc. (I.T.) 1st Semester

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 2016
Purpose of Course	To Provide basic knowledge about Internet and Web Designing using HTML.
Course Objective	To make the students aware of Internet and website designing using HTML, CSS and CSS Framework
Course Out comes	CO1 : Students will be able to get knowledge of internet technologies and services CO2 : Students will be able to learn HTML structure and various tags CO3 : Students will have the ability to design and develop web application, and also perform animations with CSS and JavaScript
Mapping between COs with PSOs	
Pre-requisite	NIL
Course Outcome	Students will be able to understand the basics of Internet and develop static websites

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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 2016
Purpose of Course	To Provide basic knowledge about Internet and HTML
Course Objective	To make the students aware of Internet Students will be able to make websites using HTML and CSS
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 Web Pages 1.8 Web Server 1.9 Web Browsers 1.10 Domain Name Service 1.11 Applications of Internet **Unit : 2 : Internet Connection Techniques** 2.1 Internet Service Providers 2.2 Digital Subscriber Line (DSL) 2.3 Broadband 2.4 ISDN 2.5 Dedicated Connections 2.6 Wireless Connections 2.7 IP Addresses 2.7.1 IPV4 Address 2.7.2 IPV6 Address 2.7.3 DHCP 2.7.4 Static IP 2.7.5 Dynamic IP **Unit : 3 : HTML** 3.1 Structure 3.2 Open Source HTML Editors 3.3 Links 3.4 Images and ImageMaps 3.5 Tables 3.6 Forms 3.7 Frames **Unit : 4 : Advanced HTML** 4.1 Semantic Elements 4.1.1 article, aside, details, dialog, figcaption, figure, footer, header, main, mark, meter, nav, progress, section, summary, time 4.2 New Elements 4.2.1 New Input Types

	4.2.2 New Input Attributes 4.3 Graphics 4.3.1 Canvas 4.3.2 SVG 4.4 Media 4.4.1 audio, embed, source, track, video Unit : 5 : Advanced Cascading Style Sheet (CSS) 5.1 Style Sheet Types 5.1.1 Linked 5.1.2 Embedded 5 1.3 Inline 5.2 Style Sheet Precedence 5.3 Style Sheet Syntax 5.4 Using Classes 5.5 Font Control 5.6 Text Control 5.7 Color and Background 5.8 List Box Control 5.9 Miscellaneous Properties 5.9.1 Margin and Padding Properties 5.9.2 Border Properties 5.9.3 Tables 5.10 Multi-Column Layouts 5.11 gradients 5.12 Drop Shadows 5.13 2D Transforms 5.13.1Translate 5.13.2 rotate 5.13.3 scale 5.13.4 skew 5.14 3D Transforms 5.15 Transitions 5.16 Animations 5.17 Pages Media 5.18 Using Readymade Templates
Reference Book	1. Preston Gralla: How the Internet Works 8th Ed.: Que PUB.: 2007 2. Kogent: HTML 5.0 Black Book: Dreamtech Press: 2011 3. Thomas: HTML & CSS: The Complete Reference, Fifth Edition : TMH: 2010 4. Peter Gaston: The Book of CSS3- A Developer's Guide to future of web design 2nd Ed.: 2015 5. K.L. James : The Internet: PHI: 2nd Ed.: 2010 6. Internet Technology and Web Design :TMH: 2011
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

B.Sc. (I.T.) 1st Semester

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 2016
Purpose of Course	To impart practical knowledge of programming
Course Objective	To give practical knowledge of C programming
Prerequisite	Nil
Course Out comes	CO1 : Students will be able to solve and program complex problem using c language CO2 : Students will be able work on c programming conditional and looping concepts CO3 : Student will be able to work with array and strings
Mapping between COs with PSOs	
Course Outcome	Students will be able to solve problems using C language

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

P. V. Desai

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 2016
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
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. P. Desai

B.Sc. (I.T.) 1st Semester

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 2016
Purpose of Course	To impart practical knowledge of static website development
Course Objective	To give practical knowledge of HTML
Prerequisite	Nil
Course Out comes	CO1 : Students will be able to learn web page designing using html tags. CO2 : Students will be able to learn and apply CSS in web pages. CO3 : Students will be able to make static website.
Mapping between COs with PSOs	
Course Outcome	Students will be able to develop static website using HTML

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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 2016
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
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Syllabus for English for B.Sc. IT, Semester 2, for the academic years 2016-17, 2017-2018-19.

Paper No-201.

Business Communication Skills in English

B.Sc.IT -2nd Semester

Course Duration	Implementation from Academic year December 2016 2019	
Purpose of Course	This course helps to enhance the Business Communication Skills of the B.Sc.IT students.	
Course Objective	The objective of the course is to develop the Business language skills of the students with special reference to the needs of IT Industry and their future placement as IT Professionals.	
Pre-requisite	Knowledge of Basic English	
Course Out Come	Students will be able to enhance their skills and further implement to enrich their communication at workplace.	
Course Content	**Unit : 1 : Communication at Workplace** 1.1 The role of Communication in Business 1.2 Business Communication Process 1.3 Communication within Organization: Formal and Informal Network Flow 1.4 Intrapersonal Communication 1.5 Interpersonal Communication 1.6 Group Communication 1.7 Organizational Communication 1.8 Public Communication	**Unit 1 : Text :** Business Communication- Lesikar, Flatley, Rentz, Pande (Mc Graw Hill) **Reference Books:** 1. Business Correspondence- R.C.Sharma, Krishna Mohan (MC.GrawHlill) 1. Technical Communication Principles and Practice- Meenakshi Raman,S.Sharma (Oxford) 2. Fifty ways to Improve Business English- Ken Taylor – Orient Blackswan 3. Business Communications skills and application P.D. Chaturvedi, Paperback 4. Professional Communications Skills- Praveen S.R. Bhatia and A.K. Jain–Paperback

	Unit : 2 : Communication Competence: Verbal and Nonverbal skills 2.1 Choosing the setting for Communication 2.2 Chronemics 2.3 Using Language Effectively 2.4 Paralanguage 2.5 Interpreting Non-verbal Cues Accurately	**Unit 2 : Text :** Business Communication- Meenakshi Raman, Prakash Singh, Oxford **Reference Books:** 1. Business Communication- Lesikar, Flatley, Rentz,Pande(Mc Graw Hill) 2. Business Correspondence- R.C.Sharma, Krishna Mohan (MC.GrawHlill
	Unit : 3 : Business Correspondence 3.1 Structure and Style of Business Correspondence 3.2 Enquiry Letters 3.3 Quotations 3.4 Order and Acknowledgement 3.5 Complaint and Adjustment 3.6 E-Mail: Importance, Structure, Procedure, Style, Security and Precautions 3.7 Memos 3.8 Report Writing 3.9 Notice, Agendas, Minutes	**Unit 3 : Text :** Business Communication- Meenakshi Raman, Prakash Singh, Oxford **Reference Books:** 1.Business Correspondence- R.C.Sharma, Krishna Mohan (MC.Graw Hill) 2. Strategic Communication in Business and Professions- Dan O'Hair. 3.Business Correspondence & Report Writing - R.C.Sharma, Krishna Mohan 4.E-Writing-21st Century Tools for Effective Writing- Dianna Booher- Macmillan
	Unit : 4 : Business Skills 4.1 Business Etiquettes 4.2 Table Manners 4.3 Managing data Using Graphics 4.4 Writing for Website	**Unit 4 : Text:** Business Communication- Meenakshi Raman, Prakash Singh (Oxford) **Reference Books:** 1. Business Correspondence- R.C.Sharma, Krishna Mohan (MC.GrawHlill) 2. Oxford Guide to Effective Writing and Speaking- John Seely (Oxford) 3. E-Wriitng- Diana Boother (Macmillan) 4. BCOM- Lehman/Dufrenc/Sinha- CENAGE Learning 5. English Online- Communication for Information Technology- JayshreeMohanraj, S.

		Mohanraj, Orient Longman 6. English for Engineers and Technologists, Humanities and Social Science Division of Anna University, Orient Longman
	Unit : 5 : Vocabulary and Grammar 5.1 Business Terms 5.2 Business Idioms 5.3 IT based business vocabulary and usage 5.4 Words often confused 5.5 Abbreviations	**Unit 5 : Text:** Business Communication- Lesikar, Flatley, Rentz,Pande(Mc Graw Hill) **Reference Books:** 1. English Vocabulary in Use- Michael Mc. Carthy(Cambridge University Press) 2. English Language Skills- ArunaKoneru (Mc. Graw Hill) 3. Technical Communication- Meenakshi Raman, Sangeeta Sharma- Oxford
Paper Style & Distribution of Marks:	**Q.1 Answer in Detail:** 1 out of 2 from unit 1 and 2 13 Marks **Q.2 Answer in short:** 4 out of 6 from unit 1 and 2 12 Marks **Q.3 Questions based on Unit 3** a. Letter 1 out of 2 05 Marks b. E-Mail 1 out of 2 05 Marks c. Memo 1 out of 2 05 Marks **Q.4 Do as Directed:Unit 3 and Unit 4** a. Report 1 out of 2 05 Marks b. Notice, Agenda, Minutes: 1 out of 2 05 Marks c. Content for Website: 1 out of 2 05 Marks **Q.5 Vocabulary Development: Unit:5** a. Business Terms: 5 out of 7 05 Marks b. Business Idioms: 5 out of 7 05 Marks c. Abbreviations: 5 out of 7 05 Marks TOTAL 70 Marks	
Teaching Methodology:	Class room Discussion, Individual Exercises, Independent Study, Seminars and Assignment, group Exercise, Guest Sessions.	
Evaluation Method:	30% Internal assessment 70% External assessment	

(4)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

SYLLABUS FOR M.Sc. (I.T.) (UG)

SEMESTER - II

Course: 202 : Mathematics - II

Effective from June 2016

(4 Hours / Week, Credits : 4)

Minimum weeks per Semester: 15 (Including Class work, examination, preparation, holidays etc.)

Purpose of Course : To introduce ideas and techniques of discrete mathematics to students that are widely used in Computer Science.

Course Objective : Learn the fundamental algorithms used by computer programmers.

Pre-requisite : Basics of Mathematics

Course outcome : To understand the purpose of the techniques as well as learn about them.

Teaching Methodology: Lectures, Discussion, Independent Study, Seminars and Assignment.

Evaluation Method: 30% Internal assessment and 70% External assessment.

Course Content:

Unit 1: Basic concept of Graph Theory:

1.1 What is Graph?
1.2 Application of graphs
1.3 Directed graph
1.4 Finite and Infinite graphs
1.5 Incidence and Degree
1.6 Isolated vertex, Pendent vertex and Null graph.

Unit 2: Paths and Circuits:

2.1 Isomorphism
2.2 Subgraphs
2.3 A puzzle with Multicolored cubes
2.4 Walks, Paths and Circuits
2.5 Connected graphs, disconnected graphs and Components
2.6 Euler graphs
2.7 Operations on graphs
2.8 More on Euler graphs
2.9 Hamiltonian paths and Circuits
2.10 The travelling salesman problem.

Unit 3: Trees and Fundamental Circuits:

3.1 Trees
3.2 Some properties of trees
3.3 Pendent vertices in a tree
3.4 Distance and centers in a tree
3.5 Rooted and Binary trees
3.6 On counting trees
3.7 Spanning trees
3.8 Fundamental circuits
3.9 Finding all spanning trees of a graph
3.10 Spanning tree in a weighted graph.

Unit 4: Planar graphs:

4.1 Combinatorial vs. Geometric graphs
4.2 Planar graphs
4.3 Kuratowski's two graphs
4.4 Different representation of a planar graph.

Unit 5: Matrix representation of graphs:

5.1 Incidence matrix
5.2 Submatrices of A(G)
5.3 Circuit matrix
5.4 Path matrix
5.5 Adjacency matrix.

Reference Books:

1. Narsinh Deo: Graph Theory with applications to engineering and computer science; Prentice – Hall Inc. (2005).
2. B. Satyanarayan, K. S. Prasad : Discrete Mathematics & Graph Theory, PHI (2009).
3. R. Manohar, Trembley J. P.: Discrete Mathematical Structure with application to Computer Science, TMH, 1999.
4. Wilson R. J.: Introduction to G.T. (3rd ed.) Longmann, 1984.
5. Gibbons A.: Algorithmic Graph Theory, Cambridge University Press, 1984.
6. Harry F.: Graph Theory, Narosa Publication, 1995.
7. Richard J.: Discrete Mathematics, Pearson Educations, Asia, 2001.

B.Sc. (I.T.) 2nd Semester

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 2016
Purpose of Course	To teach advance concepts of C language
Course Objective	To impart knowledge of structures, union, pointers, user defined functions, preprocessor directives and file management features of C language.
Course Outcomes	CO1 : Students will be able to learn advanced concepts of c programming like pointer , structure,union CO2 : Students will be able to have the knowledge of file system and file management concepts with c language CO3 : Students will be have ability to work on pre-processor
Mapping between COs with PSOs	
Pre-requisite	Basic knowledge of problem solving and C programming.
Course Outcome	Students will be able to write programs using structures, union, pointers, user defined functions, pre-processor directives and file management in C language.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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 2016
Purpose of Course	To teach advance concepts of C lanaguge
Course Objective	To develop better understanding of advanced features of C programming language.
Pre-requisite	Basic knowledge of problem solving and C programming.
Course Out come	Students will be able to write programs using advanced programming concepts using C language.
Course Content	**Unit : 1 : User Defined Functions** 1.1 Introduction 1.2 declaration and definition 1.3 Methods of parameter passing 1.4 Scope of variables and storage classes 1.5 Recursion 1.6 Passing array to functions **Unit : 2 : Structure and Union** 2.1 Structure 2.1.1 declaring and defining Structure elements 2.1.2 Structure Initialization 2.1.3 Structure assignment 2.1.4 Structure & Functions 2.1.5 Nested Structure 2.2 Union **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 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 Releasing used Space **Unit : 4 : File Management in C** 4.1 File Structure 4.1.1 Definitions, Concept of record 4.1.2 File operations: store, create, update, retrieve 4.1.3 File access modes: Sequential, random, binary, relative, indexed 4.1.4 Performance of sequential files

	4.1.5 Direct mapping techniques: absolute, relative, indexed 4.1.6 Levels of index 4.2 File Handling 4.2.1 File operations: create, copy, delete, update 4.2.2 Error handling during I/O operations 4.2.3 Command line arguments **Unit : 5 : The Pre-processor and Language Processing** 5.1 Pre-processors, compilers, interpreter, linkers and loaders 5.2 Structure of a compiler, phases of compiler 5.3 Macro 5.2 File Inclusion 5.3 Compiler Control Directives 5.4 Macro substitution, nested macro, conditional compilation
Reference Book	1. E. Balagurusamy : C – programming : Tata McGraw Hill 2. Gottfried : Schaums outline of Theory and Problems of programming with C 3. R S Bichkar : Programming with C : Universities Press 4. Yashwant Kanetkar: Pointers in C: BPB: 2001 5. Karnighan & Ritchie: C Programming Language: TMH 6. Stan Kelly: Mastering Turbo C: BPB 7. Yashwant Kanetkar: Let Us C: BPB
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

B.Sc. (I.T.) 2nd Semester

Course : 204 : Introduction to DBMS

Course Code	204
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 2016
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 diagrams, different types of databases. This course also entails practical aspects of open-source databases.
Course Out comes	CO1 : Student will be able to learn basic concept of database management system and data models CO2 : Students will be have the knowledge of various data models CO3 : Student will be able work on database management system and perform practical like creating database , tables and manipulating records
Mapping between COs with PSOs	
Pre-requisite	Fundamentals of Computer, Programming Language
Course Outcome	Students will be able to understand and implement basic database design principles, and learn overview of different types of databases. Students will also be able to perform practical databases.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course:204:Introduction to DBMS

Course Code	204
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 2016
Purpose of Course	To introduce the basic concepts of database management system that includes data models, database design and basic practical.
Course Objective	To teach fundamental concepts of DBMS including data models, ER diagram, different types of databases. This course also entail practical aspect of open source database IDE.
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 Traditional File based System 1.2 File Organization 1.3 Limitations of File bases System 1.4 Database and Need for DBMS 1.5 Characteristics of DBMS 1.6 Applications of DBMS 1.7 Views of Data-Schemas and instances 1.8 Data Independence 1.9 Database Languages 1.10 Transaction Management 1.11 ACID Properties of Transaction 1.12 Database Administrator 1.13 Database Users 1.14 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 Document Model 2.1.5 Object Model 2.1.6 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 3.1 Object-based Database 3.2 Object Oriented Database 3.3 Centralized Database 3.4 Parallel Database 3.5 Multimedia Database 3.6 Temporal Database 3.7 XML Database **Unit : 4 : Recent Trends in DBMS** 4.1 Overview of Open Source DBMS 4.1.1 MySQL 4.1.2 PostgreSQL 4.1.3 SQLite 4.1.4 Berkeley DB 4.2 Overview of Proprietary DBMS 4.2.1 Oracle 4.2.2 DB2 4.2.3 SQL Server 4.3 Overview of NoSQL Database 4.4 Big Data **Unit : 5 : Introduction to open source Database IDE** 5.1 Getting Started with open source database IDE 5.2 Creating a Database 5.3 Creating database tables in Design View 5.4 Relation between tables using GUI 5.5 Entry into tables using GUI 5.6 Creating and Modifying Database Form 5.7 Form Properties 5.8 Creating Queries using Wizard 5.9 Creating Reports using Report Builder 5.10 Functions in the Report Builder 5.11 Linking to Databases 5.12 Database Tasks
Reference Book	1. Database System Concepts, Silberschatz, Korth and Sudarshan, 6th Edition, McGraw Hill 2. An introduction to database systems, C.J date, Addison Welsley 3. Fundamentals of Database Systems, Elamsri, Navathe, Somayajulu and Gupta, 6th Edition, Pearson Education 4. LibreOffice Base 4.0 Paperback, JochenSchiffers, Robert Grokopf, Jost Lange, Hazel Russman, Samurai Media Limited 5. Use LibreOffice Base: The Beginners Guide, Thomas Ecclestone, Kindle Edition
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars, Case Study and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 205 : Fundamental of Electronics

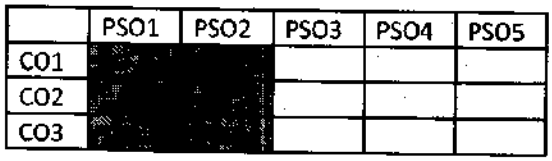
Course Code	205
Course Title	Fundamental of Electronics
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2016
Purpose of Course	To impart knowledge of electronics devices in Information technology
Course Objective	Developing of proficiency in basic electronics and digital circuits.
Pre-requisite	Nil
Course Out come	Developing of proficiency in basic electronics and digital circuits.
Course Content	**Unit : 1 : fundamental of electrical engineering** 1.1 Introduction of Voltage, Current, Power, Phase and Frequency 1.2 Ideal Volt source & Ideal current source, , 1.3 Ohm's Law & Kirchhoff's laws 1.4 Electromagnetism 1.4.1 Magnetic Flux, Flux density, Magnetic force and permeability 1.4.2 B-H curve, 1.4.3 Electromagnetic Induction and transformer **Unit : 2 : fundamental of electronics components and semiconductor physics** 2.1 Passive components and circuits 2.1.1 Introduction of Resistor, capacitor, Inductor 2.1.2 Series & parallel connection of resistors & capacitors 2.1.3 simple RLC circuits 2.2 Active components operational concept, configuration and applications 2.2.1 different type of Diodes 2.2.2 Transistors 2.2.3 FET and MOSFETs 2.2.4 SCR **Unit : 3 : introduction of electronics circuit** 3.1 Power supply: 3.1.1 Half wave rectifier 3.1.2 full wave rectifier 3.1.3 simple filter circuits 3.2 Resonance tank circuits and oscillator 3.3 voltage regulator 3.4 Amplifier 3.5 switches and relay

	Unit : 4 : fundamental of Digital Electronics 4.1 Introduction of different Logic gates, 4.2 Interchangeability bubbled gates, 4.3 D"morgan's theorem & Duality theorem, 4.4 Universal gates 4.5 product of sum and sum of product method 4.6 Karnaugh map & it's simplification. 4.7 NAND-NAND ckts and NOR - NOR circuits **Unit : 5 : Data processing circuits** 5.1 Combinational logic circuits 5.1.1 Multiplexers and De-multiplexers 5.1.2 Decoders and Encoders 5.1.3 parity generator and checkers 5.1.4 Half adder, full adder , adder – sub tractor circuits 5.2 Sequential logic circuits and its applications 5.2.1 Construction of RS, D,J-K flip-flop 5.2.2 JK master slave concept. 5.2.3 study of shift Registers 5.2.4 Synchronous counter, Asynchronous counter and Mod counters.
Reference Book	1. Basic Electronics solid state, author: B.L.Theraja, publication : S.Chand & company,New delhi, MULTICOLOUR EDITION-2010 2. Principal of Electrical and Electonics by V.K. Mehta and rohit mehta, S.Chand & company ,New delhi,2010 3. Basic Elecrical and Electronics engineering, Author D. P. Kothari, and Nagrath, Publication : Tata Macgraw Hill,2014 4. Fundamental of Electronic Engineering Author Rajendra Prasad, Publication: CENGAGE, 2011 5. Electronics Devices and circuits, author: S. L. Kalani, K. C. Bhandari, publication: viva books pvt. Ltd.,New delhi, second edition-2016 6. Basic Electronics and Linear Circuits, Author: N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, Publication : Tata Macgraw Hill,2013 7. Digital principals and applications, Author: Albert Paul Malvino and donald P. Leach, Publication: Tata Macgraw Hill, Edition : 2011 8. Digital Design, Author: M. Morris Mano and Michael D. Ciletti, Publication: Pearson,2008 9. Digital Electronics, Author: Roger L Tokheim, Publication : Tata Macgraw Hill 10. Digital Electronics: Principles and Applications, Author: S K Mandal, Publication : Tata Macgraw Hill.2010 11. Modern Digital Electronics, Author: R. P. Jain, Publication : Tata Macgraw Hill,2009
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 2nd Semester

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 2016
Purpose of Course	To impart practical knowledge of structures, union, pointers, user defined functions, pre-processor directives and file management features of programming.
Course Objective	To give practical knowledge of structures, union, pointers, user defined functions, pre-processor directives and file management using C language.
Prerequisite	Basic knowledge of C language
Course Out comes	CO1 : Students will be able to solve problems using advanced features of c language. CO2 : Students will be able to do practicals on structure , union, pointer and user defined functions. CO3 : Students will be able to do file management operations in c.
Mapping between COs with PSOs	
Course Outcome	Students will be able to solve problems using advance features of C language

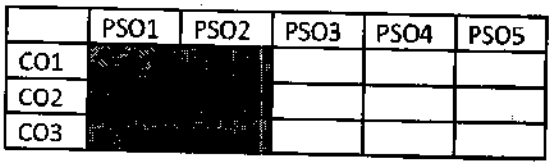
Course : 206 : Practical 3

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 2016
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
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Desai

B.Sc. (I.T.) 2nd Semester

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 2016
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 Out comes	CO1 : Students will be able to create database and tables. CO2 : Students will be able to perform various data definition operations on database CO3 : Students will be able to manipulate data using data manipulation statements
Mapping between COs with PSOs	
Course Outcome	After completion of this course, students will be able to perform basic DDL, DML commands including SQL queries using MySQL.

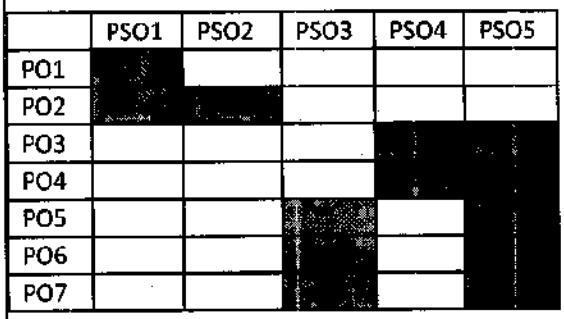
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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.)
Last Review/Revision	June 2016
Purpose of Course	To impart practical knowledge of database
Course Objective	To give practical knowledge of basic concepts of DBMS
Prerequisite	Nil
Course Outcome	Students will be able to perform basic database operations using GUI
Course Content	Practical based on Paper No 204
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 Criteria	5 Years (Integrated): 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	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** The program trains students for designing and conceptualizing the software architecture, planning and managing the product development process of complex and live software projects. It also makes students understand the decision making for selection of an appropriate project management capabilities. **PO6 : Real World Problem / Project Development** Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Students will learn to develop and strengthen the fundamental concepts that are required to solve complex programming problems.

	PSO2 : Students will develop the ability to identify, formulate and design solutions to face computational challenges. PSO3 : Students will be able to apply software engineering concepts to solve real world problems. PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile application, Desktop application, etc. PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.T domain.
Mapping between POs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
PO1					
PO2					
PO3					
PO4					
PO5					
PO6					
PO7					

Medium of Instruction	English

Program Structure		B.Sc. (I.T.) – Semester 3 (M.Sc. (I.T.) 5 years Integrated Course)						
Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
301	Soft Skills	4	0	4	3 Hrs	70	30	100
302	Microprocessor and Assembly Language	4	0	4	3 Hrs	70	30	100
303	Data Structures	4	0	4	3 Hrs	70	30	100
304	Object Oriented Programming	4	0	4	3 Hrs	70	30	100
305	Computer Network	4	0	4	3 Hrs	70	30	100
306	Practical 5	0	4	2	2 Hrs	70	30	100
307	Practical 6	0	6	3	2 Hrs	70	30	100
	Total	20	10	25	-	490	210	700

Program Structure		B.Sc. (I.T.) – Semester 4 (M.Sc. (I.T.) 5 years Integrated Course)						
Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
401	Environmental Science	4	0	4	3 Hrs	70	30	100
402	Fundamental of Embedded System and IoT	4	0	4	3 Hrs	70	30	100
403	VB .NET	4	0	4	3 Hrs	70	30	100
404	Relational Database Management System-I	4	0	4	3 Hrs	70	30	100
405	Web Development-I	4	0	4	3 Hrs	70	30	100
406	Practical 7	0	2	1	2 Hrs	70	30	100
407	Practical 8	0	6	3	4 Hrs	70	30	100
408	Practical 9	0	2	1	2 Hrs	70	30	100
	Total	20	10	25	-	560	240	800

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	5 Years (Integrated): 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 2017

Program Structure		B.Sc. (I.T.) – Semester 3 (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		
301	Soft Skills	4	0	4	3 Hrs	70	30	100
302	Microprocessor and Assembly Language	4	0	4	3 Hrs	70	30	100
303	Data Structures	4	0	4	3 Hrs	70	30	100
304	Object Oriented Programming	4	0	4	3 Hrs	70	30	100
305	Computer Network	4	0	4	3 Hrs	70	30	100
306	Practical 5	0	4	2	2 Hrs	70	30	100
307	Practical 6	0	6	3	2 Hrs	70	30	100
	Total	20	10	25	-	490	210	700

Program Structure		B.Sc. (I.T.) – Semester 4 (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		
401	Environmental Science	4	0	4	3 Hrs	70	30	100
402	Fundamental of Embedded System and IoT	4	0	4	3 Hrs	70	30	100
403	VB .NET	4	0	4	3 Hrs	70	30	100
404	Relational Database Management System-I	4	0	4	3 Hrs	70	30	100
405	Web Development-I	4	0	4	3 Hrs	70	30	100
406	Practical 7	0	2	1	2 Hrs	70	30	100
407	Practical 8	0	6	3	3 Hrs	70	30	100
408	Practical 9	0	2	1	2 Hrs	70	30	100
	Total	20	10	25	-	560	240	800
Program Passing Rules		As per University rules						

Paper No. 301

SOFT- SKILLS

B.Sc.IT- 3rd Semester

Course Duration	Implementation from Academic year December 2017-18, 2018-19, 2019-20.	
Purpose of Course	This course helps to enhance the Soft Skills of the B.Sc.IT students.	
Course Objective	To enable the students to master and enhance Soft skills necessary for industry and become successful IT Professionals	
Pre-requisite	Knowledge of Basic English	
Course Out Come	Students will be able to enhance their soft skills and further implement to enrich their communication at workplace.	
Course Content	**Unit : 1 : Introduction to Soft – skills** 1.1 Meaning 1.2 Importance of Soft Skills for First Job and Future Career Advancement 1.3 Scenario of Soft skills in Indian IT Companies 1.4 Soft skills required by IT Professionals	**Unit 1 : Text :** 1. Soft skills for Everyone –Jett Butterfield 2. The Ace of Soft Skills – Gopalaswanny Ramesh 3. Enhancing Soft skills- Dipali Biswas 4. Placement and Personality Development- KVSG Murali Krishna
	Unit : 2 Business Ethics and Etiquettes 2.1 Etiquette Advantage in Business Communication – Introduction, Greetings, dressing and grooming, Norms of Business dressing, and Table Manners 2.2 Body Language during Professional Interactions 2.3 Developing a Professional Work Ethics 2.4 Developing Professional Telephonic Skills	**Unit 2 : Text :** 1. Enhancing Soft skills- Dipali Biswas 2. Soft skills for Everyone –Jett Butterfield
	Unit : 3 : Skills for Personality Development 3.1 Self Esteem 3.2 Building Self Confidence 3.3 Presenting Yourself Professionally 3.4 Team Work and Team Building 3.5 Managing Meetings 3.6 Negotiation Skills	**Unit 3 : Text :** 1. The Ace of Soft Skills – Gopalaswanny Ramesh 2. Soft –skills for Managers-Dr. T.Kalyana Chakravarti 3. Communication Skills for Engineers- Sunita Mishra
	Unit : 4 : Writing Skills 4.1 Managing data Using Graphics 4.2 Writing for Website 4.3 Drafting Effective Objective Statements 4.4 Content writing 4.5 Business vocabulary	**Unit 4 : Text:** 1. BCOM- Lehman/Duferene/Sinha 2. Personality Development and Soft-skills-Barun Mitra

	Unit : 5 : Interpersonal Skills 5.1 Understanding Professional Relationships 5.2 Respecting Social Protocols 5.3 Networking Professionally 5.4 Socializing professionally	**Unit 5 : Text:** 1. Personality Development and Soft-skills-Barun Mitra 2. Soft skills for Everyone –Jett Butterfield
Paper Style & Distribution of Marks:	**Q.1 Answer in Detail: (2 out of 3) 14** **Q.2 Answer the following: (2 out of 3) 14** **Q.3A Write Short notes on:(1 out of 2) 07** **3B Drafting presentations & dialogues Based on unit 3. (1 out of 2) 07** **Q.4 All questions are compulsory.** **Q.4 A. Draft E- Content for the given web-Site. 06** **B. Business vocabulary & Idioms 05** **c. Draft effective objective statements for the given posts. 05** **Q.5 Answer the following: (2 out of 3) 12** TOTAL 70 Marks	
Teaching Methodology:	Class room Discussion, Individual Exercises, Independent Study, Seminars and Assignment, group Exercise, Guest Sessions.	
Evaluation Method:	30% Internal assessment 70% External assessment	

B.Sc. (I.T.) 3rd Semester

Course : 302 : Microprocessor and Assembly Language

Course Code	302
Course Title	Microprocessor and Assembly Language
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	To understand importance and role of micro processor in computer organized system.
Course Objective	This course gives concepts about interfacing of devices with microprocessor and develops logic with assembly language at machine level.
Course Outcomes	CO1: students will be able to get knowledge of microprocessor 8086 with its operations and architecture CO2 : Students will be able to learn assembly language programming and can implement of logical programs for 8086 microprocessor CO3 : students will be able to learn interfacing concept of microprocessors and programmable Peripherals Devices
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Fundamentals of Digital Logic Design and Computer Organization
Course Out come	Students will understand 8086 microprocessor, addressing modes and Assembly language instructions to implement logical programs for 8086 microprocessor based computer system.

Course : 302 : Microprocessor and Assembly Language

Course Code	302
Course Title	Microprocessor and Assembly Language
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	To understand importance and role of micro processor in computer organized system.
Course Objective	This course gives concepts about interfacing of devices with microprocessor and develops logic with assembly language at machine level.
Pre-requisite	Fundamentals of Digital Logic Design and Computer Organization
Course Out come	Students will understand 8086 microprocessor, addressing modes and Assembly language instructions to implement logical programs for 8086 microprocessor based computer system.
Course Content	**Unit : 1 : Introduction to Microprocessors** 1.1 Intel 8086 architecture and Internal Operations 1.2 8086 microprocessor pin-diagram 1.3 Addressing Modes of 8086 1.4 Intel 8086 circuit Configurations and operation for Minimum and Maximum Mode 1.5 Intel 8086 System Connections and System Bus Timing diagram for minimum and maximum mode configuration **Unit : 2 : Intel 8086 Family assembly Language Programming** 2.1 Program Development Stage 2.2 ,Assemble Instruction Format 2.3 8086 microprocessor Assembly language Instruction set 2.4 Writing & Using Procedures, Macros & Debugging of Assembly Language Programs, 2.5 Programming with the use of Assembler and other Development Tools like Loader , Compiler , Locator , debugger 2.6 Practice with Simple sequence Programs, Flags, jumps , etc . 2.7 Implementation of Decision making, Multiple Branching and Iterative Looping Controls with Assembly Language instructions 2.8 Understand String Instructions, Stack manipulation instruction. 2.9 Assembly Directives and DOS / BIOS interrupt implementation Using C with Assembly language Programming. **Unit : 3 : Interrupts Management** 3.1 Study of Different Types of Intel 8086 interrupts generation process acknowledgment and typical 8086 response cycle. 3.2 Interrupt Vector Table (IVT) 3.3 Study of soft interrupts 3.4 Interrupt Service Routines

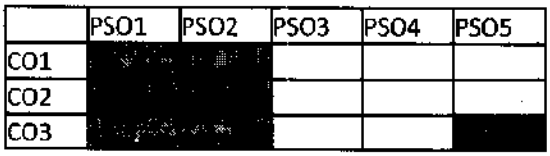
12 M Desai

	Unit : 4 : Programmable Peripherals Devices 4.1 Programmable Peripheral Interface Intel 8255 4.2 Programmable keyboard/Display 8279 4.3 Programmable Interrupt Controller 8259 4.4 Programmable interval timer8253 4.5 USART-8251 4.6 Overview of I/O buses. 4.7 Programming and interfacing concept of programmable devices with 8086 microprocessor **Unit : 5 : Advanced Microprocessors** 5.1 Overview of co-processor 5.2 Overview of 80186 5.3 Overview of 80286 5.4 Overview of 80386 5.5 Overview of 80486 5.6 Overview of Pentium architectures
Reference Book	1 MICROPROCESSORS AND MICROCONTROLLERS, PABLO MARY ,Panda Jeebananda,PHI,2016 2 The x86 Microprocessors: 8086 to Pentium, Multicores, Atom and the 8051 Microcontroller Architecture, Programming and Interfacing, Lyla B. Das, Second Edition, Pearson Education,2014 3 The Intel Microprocessors: Pearson New International Edition, Barry B. Brey, Pearson Education,2013 4 Microprocessor& Interfacing (programming and hardware),Douglas Hall, Tata McGraw Hill,2012 5 Microprocessors and Interfacing Techniques, Swapneel Chandrakant Mhatre,, Jaico Publishing House.2012 6 Microprocessors and Interfacing, N Senthil Kumar, M Saravanan, S Jeevananthan, Satish Shah, Pearson, 2012 7 MICROPROCESSORS & MICROCONTROLLERS, NAGOORKANI, Tata McGraw-Hill Education,2012 8 MICROPROCESSORS AND MICROCONTROLLERS: ARCHITECTURE, PROGRAMMING AND SYSTEM, KRISHNA KANT,PHI,2011 9 Microprocessor & Microcontroller, A.P.Godse, D.A.Godse, Technical Publications, Pune, 2010 10 The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions, 8/e, Barry B. Brey, Pearson Education, 2009 11 Microprocessors And Interfacing, D.A.Godse, A.P.Godse, Technical publications,Pune,2009 12 Microprocessor 8085, 8086, Abhishek Yadav, University science press, 2008
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 3rd Semester

Course : 303 : Data Structures

Course Code	303
Course Title	Data Structures
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	To introduce the basic concepts of data structures and algorithms involving linear and non-linear data structures and their logical implementation.
Course Objective	To teach fundamental concepts of data structures including stack, queue, linked list, tree and various sorting, searching techniques. This course also entails practical aspect of applications of data structures.
Course Outcomes	CO1 : Students will be able to learn data structure techniques and algorithms used for solving complex problems CO2 : Students will be able to learn linear data structure and non-linear data structure algorithms CO3 : Students will be able to learn working of various sorting and searching algorithms
Mapping between COs with PSOs	
Pre-requisite	Fundamentals of Computer, C Programming Language
Course Out come	After studying the course, students will be able to use and implement data structures and their applications. Students will also be able to learn complex data structure like binary tree, AVL tree and various sorting algorithms.

Course:303: Data Structures

Course Code	303
Course Title	Data Structures
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	To introduce the basic concepts of data structures and algorithms involving linear and non linear data structures and their logical implementation.
Course Objective	To teach fundamental concepts of data structures including stack, queue, linked list, tree and various sorting, searching techniques. This course also entails practical aspect of applications of data structures.
Pre-requisite	Fundamentals of Computer, C Programming Language
Course Out come	After studying the course, students will be able to use and implement data structures and their applications. Students will also able to learn complex data structure like binary tree, AVL tree and various sorting algorithms.
Course Content	**Unit : 1 : Introduction** 1.1 Definition and Classification 1.2 Importance of data structures 1.3 Data Structure Operations 1.4 Analysis of Algorithms, Algorithm Complexity 1.5 Time-Space Trade off, Big-O and theta Notation **Unit : 2 : Linear Data Structures** 2.1 Array: Storage, mapping and applications 2.2 Stack 2.2.1 Concept and Definition 2.2.2 Operations 2.2.3 Applications of stack 2.2.4 Polish Expression 2.2.5 Infix, Prefix and Postfix Notation 2.2.6 Converting Infix to Postfix Notation 2.2.7 Expression Evaluation 2.2.8 Recursion and Tower of Hanoi Problem 2.3 Queue 2.3.1 Concept and Definition 2.3.2 Types of Queue 2.3.3 Simple Queue 2.3.4 Circular Queue 2.3.5 Double ended Queue 2.3.6 Priority Queue 2.3.7 Operations on all queue 2.3.8 Application of queue 2.3.9 Job Scheduling 2.4 Linked List 2.4.1 Concept and Definition 2.4.2 Types of Linked list 2.4.3 Singly Linked List 2.4.4 Circular Linked List 2.4.5 Doubly Linked List

	2.4.6 Circular Doubly Linked List 2.4.7 Operations on linked list 2.4.8 Applications 2.4.9 Polynomial Manipulation **Unit : 3 : Non Linear Data Structures** 3.1 Graph 3.1.1 Definition and Introduction 3.2 Tree 3.2.1 Introduction and Representation 3.2.2 General Tree 3.2.3 Binary Tree 3.2.4 Threaded and linked storage representation of Binary Tree 3.2.5 Operations on Binary Tree 3.2.6 Binary Tree Traversal 3.2.7 Binary Search Tree 3.2.8 Forest 3.2.9 Height-Balanced Tree: AVL tree 3.2.10 Splay Tree 3.2.11 Applications of tree: Expression Tree 3.2.12 Symbol table and Syntax Analysis **Unit : 4 : Basic Techniques and Example Algorithms for** 4.1 Divide and Conquer Method 4.2 Greedy Method 4.3 Backtracking **Unit : 5 : Searching and Sorting** 5.1 Searching 5.1.1 Linear Search 5.1.2 Binary Search 5.1.3 Hashing 5.1.3.1 Hash Tables 5.1.3.2 Hash Functions and Hash Keys 5.1.3.3 Collision and Collision Resolution 5.1.3.4 Rehashing 5.2 Sorting 5.2.1 Bubble sort 5.2.2 Selection sort 5.2.3 Insertion sort 5.2.4 Shell sort 5.2.5 Merge sort 5.2.6 Quick sort 5.2.7 Radix sort 5.2.8 Heap Sort

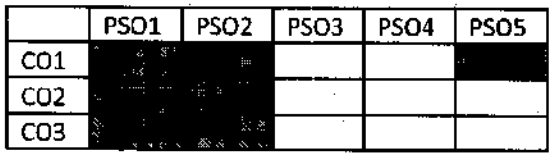
P. M. Desai

Reference Book	1. An Introduction to Data Structures with applications – Trembley, Sorenson – TMH 2. Theory and problems of data structures – Seymour Lipschutz – TMH 3. Data Structures and Algorithms in C++ - Michael T. Goodrich, Roberto Tamassai, David M. Mount – Wiley 4. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson-Freed - W. H. Freeman & Co. New York, NY, USA 5. Data Structures & Algorithms, A V Aho, J E Hopcroft, J D Ullman - Addison-Wesley Publishing 6. Data Structure & "C" Programming - Vanwyte C J - Addison Wesley. 7. Data Structures, Algorithms And Object Oriented Programming – TMH edition Geogory L. Heileman. 8. Data Structures using C & C++ - Y. Langsam Moshe J. Angensterin & A.M. Terenbanm
Teaching Methodology	Lectures, Discussion, Self Study, Seminars, Case Study and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. Y. Desai

B.Sc. (I.T.) 3rd Semester

Course : 304 : Object Oriented Programming

Course Code	304
Course Title	Object Oriented Programming
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	To impart knowledge of object-oriented programming concepts
Course Objective	To make student learn the concepts of Object-Oriented Programming
Course Outcomes	CO1 : Students will be able to learn Object Oriented programming concepts. CO2 : Students will be able to able to learn object oriented programming concepts like data abstraction, inheritance, polymorphism using C++ CO3 : Students will be able to learn I/O operation on files using IO streams and exception handling using C++.
Mapping between COs with PSOs	
Pre-requisite	C Programming
Course Out come	Students will be able to understand OOP concepts with implementation in C++.

Course : 304 : Object Oriented Programming

Course Code	304
Course Title	Object Oriented Programming
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	To impart knowledge of object oriented programming concepts
Course Objective	To make student learn the concepts of Object Oriented Programming
Pre-requisite	C Programming
Course Out come	Student will be able to understand OOP concepts with implementation in C++.
Course Content	**Unit : 1 : Basic concepts of object oriented of programming** 1.1 Background 1.1.1 Procedure Oriented Programming Vs Object Oriented Programming 1.1.2 Basic Concepts of Object Oriented Programming 1.1.3 Benefits of Object Oriented Programming 1.2 Classes & Objects 1.2.1 Specifying a class 1.2.2 Defining member functions 1.2.3 Inline function 1.2.4 Nesting of member functions 1.2.5 Private member function 1.2.6 Static data members 1.2.7 Static member functions 1.2.8 Friend functions 1.2.9 Returning objects 1.2.10 Pointers to members 1.3 Constructors & Destructors 1.3.1 Constructors 1.3.2 Parameterized constructors 1.3.3 Multiple constructors in a class 1.3.4 Constructors with default arguments 1.3.5 Copy constructors 1.3.6 Dynamic constructors 1.3.7 Const objects 1.3.8 Destructors. **Unit : 2: Inheritance & Polymorphism** 2.1 Inheritance 2.1.1 Defining derived class using single base class 2.1.2 Derivation using public 2.1.3 Private and protected access modifiers 2.1.4 The implementation of inheritance in the C++ object model 2.1.5 The multiple-inheritance, Abstract classes 2.1.6 Composite objects (container objects) 2.2 Compile Time Polymorphism 2.2.1 Function Overloading 2.2.2 Unary Operators 2.2.3 Binary Operators 2.2.4 Using Friends as operator functions

P. M. Desai

	2.2.5 Overloading other Operators 2.2.6 User defined conversion 2.2.7 Four different cases of user defined conversions 2.2.8 Comparison of both the methods of conversion 2.3 Run Time Polymorphism 2.3.1 Pointers to objects 2.3.2 this pointer 2.3.3 Pointers to derived classes 2.3.4 Virtual functions 2.3.5 Pure virtual functions. **Unit : 3: I/O Streams and Files** 3.1 I/O Streams 3.1.1 Introduction to stream 3.1.2 Advantages of using C++ I/O over C I/O 3.1.3 The C++ Predefined streams 3.2.4 Formatting I/O 3.1.5 Formatting using I/Os members 3.1.6 Manipulators, Creating our own manipulator 3.2 Data Files 3.2.1 Introduction to File I/O 3.2.2 Text and binary streams 3.2.3 Opening and closing files 3.2.4 Text files 3.2.5 Binary files 3.2.6 Providing Random Access using seek 3.3 I/O Modes Handling Errors **Unit 4: Exception Handling** 4.1 Introduction 4.2 Basics of Exception Handling 4.3 Exception Handling Mechanism 4.4 Throwing Mechanism 4.5 Catching Mechanism 4.6 Rethrowing an Exception **Unit : 5 Templates** 5.1 Function Templates 5.2 Non Generic (Non Type) Parameters in Template functions 5.3 Template function and specialization 5.4 Overloading a template function 5.5 Using Default Arguments 5.6 Class Templates 5.7 Classes with multiple generic data types 5.8 Static data members 5.9 Primary and Partial Specialization 5.10 The Export Keyword.
Reference Book	1. Object Oriented Programming with C++: Balagurusamy - TMH 2. OOP in Turbo C++: Robert Lafore - Galgotia Publication 3. C++ Primer :Lippman - Addison Wesley 4. Object Oriented Programming Fundamentals & Applications: Probal Sengupta - PHI

	5. The Complete Reference: Schildt - Osborne 6. The C++ Programming Language: Stroustrup - Addison Wesley
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 3rd Semester

Course : 305 : Computer Network

Course Code	305
Course Title	Computer Network
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	To provide fundamental knowledge of Computer Network
Course Objective	To Impart fundamental Knowledge of Computer Network
Course Outcomes	CO1 : Students will be able to learn network components and technologies CO2 : Students will be able to learn layered network models and protocols CO3 : Students will be able to learn various network security techniques.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Fundamental of Computers
Course Out come	Students will be able understand computer networking and fundamental of network security

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: 305 Computer Network

Course Code	305
Course Title	Computer Network
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	To provide fundamental knowledge of Computer Network
Course Objective	To Impart fundamental Knowledge of Computer Network
Pre-requisite	Knowledge of Fundamental of Computers
Course Out come	Students will be able understand computer networking , Knowledge about Computer Network Security
Course Content	**Unit : 1 : Introduction to Networks** 1.1 Data Communications: components 1.2 Direction of data flow, 1.3 Networking – Concepts, 1.4 Need, Uses and advantages of Network, 1.5 Categories of networks , 1.6 Client, Servers and Peers based and Hybrid Networks, 1.7 Topologies, 1.8 Review of protocols, 1.9 Models and implementations, 1.10Transport and Internet protocols. **Unit : 2 : The OSI Model** 2.1 Layer architecture, 2.2 OSI Model, 2.3 The OSI Model layer functions **Unit : 3 : Introduction to Physical Layer** 3.1.1 Data and Signals, 3.1.2 Digital Transmission, 3.1.3 Analog transmission, 3.1.4 Bandwidth, 3.1.5 Transmission Media, 3.1.6 Switching, 3.1.7 IEEE 8.2 Standards 3.2.1 Functions of Data link layer, 3.2.2 Error detection and correction, 3.2.3 Error detection and correction codes, 3.2.4 Data link control and protocols, 3.2.5 Multiple access protocol: CSMA/CD, LAN: Ethernet, 3.2.6 Introduction : Wireless LAN, Connecting devices: Repeaters, Hubs, Bridges, switches, Concept of VLAN 3.3.1 Introduction to Network Layer 3.3.2 Connectionless service, 3.3.3 Connection oriented service, 3.3.4 Internetworking, addressing, 3.3.5 Routing algorithms (Distance vector, Link state), 3.3.6 Introduction to Network layer in internet: Logical addressing, 3.3.7 IP protocol, IP address, 3.3.8 Classes of IP addresses, 3.3.9 Routers, Brouters, Gateways 3.4.1 Transport Service Primitives, 3.4.2 Addressing, connection establishment, flow control,

P. M. Desai

	3.4.3 Multiplexing, 3.4.4 Introduction to transport layer protocols and their features. 3.5.1 Introduction to : Establishing Session, 3.5.2 Presentation with Content Encoding and Decoding 3.5.3 Introduction to application layer protocols. **Unit : 4 : Network Configuration and Administration** 4.1 Installing and configuring network adapters, 4.2 Managing network bindings, 4.3 Sharing files and printers User profiles, 4.4 Folder security, Account policies, 4.5 Trust relationship between domains, 4.6 Computer Management 4.7 Workstation management 4.8 Network Management commands **Unit : 5 : Network Security** 5.1 Various Types of security, 5.2 Security with certificates, 5.3 Planning a security approach, 5.4 Security problems and their consequences, 5.5 Introduction to firewalls, 5.6 Encryption and decryption standards, 5.7 Secure Socket Layer, 5.8 Virtual Private Networks
Reference Book	1. Data Communications and Networking, 4/e Behrouz A. Forouzan - DeAnza College 2. Computer Networks by A.S. Tanenbaum - PHI Publications 3. Computer Networks : A pragmatic Approach, C R Sharma, Jaico, 2005 4. Data and computer Communication, William stallings - Pearson Education, 5. MCSE: Networking Essentials Study Guide – TMH 6. Mastering Local Area Networks by Christa Anderson & Mark Minasi – BPB
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 3rd Semester

Course : 306 : Practical 5

Course Code	306
Course Title	Practical 5
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart practical knowledge of various data structures
Course Objective	To give practical knowledge on applications of data structures
Prerequisite	Basic knowledge of C programming language
Course Out comes	CO1 : Students will be able to develop programs of linear and nonlinear data structures. CO2 : Students will be able to practically implement data structures like stack, queue , linked list etc.. CO3 :Students will be able to write programs of searching and sorting techniques.
Mapping between COs with PSOs	
Course Outcome	Students will be able to perform practical on various linear and nonlinear data structures

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 306 : Practical 5

Course Code	306
Course Title	Practical 5
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart practical knowledge of various data structures
Course Objective	To give practical knowledge on applications of data structures
Prerequisite	Basic knowledge of C programming language
Course Outcome	Students will be able to perform practical on various linear and non linear data structures
Course Content	Practical based on Paper No 303
Reference Books	NIL
Teaching Methodology	Lab Work, Assignment
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Desai

B.Sc. (I.T.) 3rd Semester

Course : 307: Practical 6

Course Code	307
Course Title	Practical6
Credit	3
Teaching Per Week	6Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart practical knowledge of object oriented programming
Course Objective	To give practical knowledge of object oriented programming
Prerequisite	Basic knowledge of C programming language
Course Out comes	CO1 : Students will be able to solve problems using object oriented programming with C++. CO2 : Students will be able to implement programs using object oriented concepts like inheritance ,polymorphisms and data abstraction in C++. CO3 :Students will be able to do practical programs of I/O operation on files using IO streams and exception handling using C++
Mapping between COs with PSOs	
Course Outcome	Students will be able to solve problems using object oriented programming methodologies

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	[redacted]				
CO2					
CO3					

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Course : 307 : Practical 6

Course Code	307
Course Title	Practical 6
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart practical knowledge of object oriented programming
Course Objective	To give practical knowledge of object oriented programming
Prerequisite	Basic knowledge of C programming language
Course Outcome	Students will be able to solve problems using object oriented programming methodologies
Course Content	Practical based on Paper No 304
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Desai

B.Sc. (I.T.) 4th Semester

Course: 401: Environmental Science

Course Code	**401**
Course Title	**Environmental Science**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2016
Purpose of Course	To make students aware of the environment and related issues.
Course Objective	To sensitize the students towards the environment and inculcate environmental values and ethics in them.
Course Outcomes	CO1 : Students will be able to understand the natural environment as a system and how human activities affect the system. CO2 : Students will be able to interpret environmental resource management and sustainability conflicts from multiple perspectives. CO3 : Students will be able to effectively analyze and integrate the social and natural sciences to understand diverse environmental and sustainability challenges ranging from local issues to global environments.
Mapping between COs with PSOs	
Pre-requisite	Basic knowledge about the environment.
Course Outcome	To bring an environmental awareness and change in their attitude towards nature and environment.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: Environmental Science

Course Code	401
Course Title	Environmental Science
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2016
Purpose of Course	To make students aware of the environment and related issues.
Course Objective	To sensitize the students towards the environment and inculcate environmental values and ethics in them.
Pre-requisite	Basic knowledge about the environment.
Course Out come	To bring an environmental awareness and change in their attitude towards nature and environment.
Course Content	**Unit : 1 : The Multidisciplinary Nature of Environmental Studies** 1.1 Definition 1.2 Scope 1.3 Importance 1.4 Need for Public Awareness 1.5 Institutions in Environment 1.6 People in Environment **Unit : 2 : Natural Resources** 2.1 Introduction 2.2 Renewable and non-renewable 2.3 Natural Resources and associated problems 2.4 Non-renewable Resources 2.5 Renewable Resources 2.6 Role of an individual in conservation of natural resources 2.7 Equitable use of resources for sustainable lifestyles **Unit : 3 : Ecosystems and Biodiversity** 3.1 Concept of Ecosystem 3.2 Understanding Ecosystems 3.3 Ecosystem degradation 3.4 Resource Utilization 3.5 Structure and functions of an ecosystem 3.6 Producers, consumers and decomposers 3.7 Energy flow in the ecosystem 3.8 Introduction, types, characteristic features, structure and functions 3.9 Forest Ecosystems 3.10Grassland Ecosystems 3.11Desert Ecosystems 3.12Aquatic Ecosystems 3.13 Genetic diversity 3.14 Species diversity 3.15 Ecosystem diversity 3.16 Bio geographic classification of India 3.17 Value of Biodiversity 3.17.1 Consumptive use value 3.17.2 Productive use value 3.17.3 Social values 3.17.4 Ethical and moral values

P. M. Desai

	3.17.5 Aesthetic value 3.17.6 Option value **Unit : 4 : E-Waste and Green Computing** 4.1 Introduction 4.2 Major types of E-Waste 4.3 Management of E-Waste 4.3.1 Personal Computers 4.3.2 Laptop Computer 4.3.3 Mobile Telephones 4.4 Hazards of E-Waste 4.5 Barriers to recycling E-Wastes 4.6 Green Computing 4.7 Advantages of Green Computing 4. 8 Steps to Green computing 4.9 Green Computing in IT **Unit : 5 : Pollution** 5.1 Definition 5.2 Causes, effects and control measures of pollution 5.3 Air pollution 5.4 Water pollution 5.5 Soil pollution 5.6 Marine pollution 5.7 Noise pollution 5.8 Thermal pollution 5.9 Nuclear hazards 5.10 Solid waste management: Causes, effects and control measures of urban and industrial waste 5.11 Role of an individual in the prevention of pollution 5.12 Disaster management: Floods, Earthquakes, cyclones, landslides 5.13 Social Issues and Environment 5.13.1 From unsustainable to sustainable development 5.13.2 Urban problems related to energy 5.13.3 The conservation ethic and traditional value systems of India 5.13.4 Climate Change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust 5.14 Environment and Human Health: 5.14.1 Environmental health 5.14.2 Climate and Health 5.14.3 Infectious diseases 5.14.4 Water related diseases 5.14.5 Risks due to chemical in food 5.14.6 Cancer and the environment
Reference Book	1. Textbook of Environmental Studies For Undergraduate Studies- Erach Bharucha 2. Environmental Studies- Dr. R.J.Ranjit Daniels,Dr.Jagdish Krishnaswamy 3. Environmental Science- Botkin and Keller 4. Waste Management Practices-John Pichtel 5. Green computing: Tools and techniques for saving, energy, money and resources-Bud Smith CRC Press.

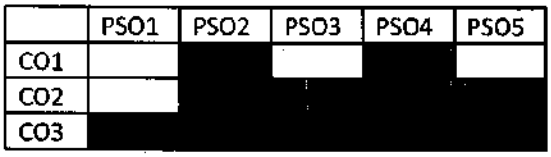
P. M. Desai

	6. Green computing and IT Best Practices on Regulations and Industry Initiative, virtualization, power management, materials recycling, telcommuting-Jason Haris 7. Sustainable ICTs and Management Systems for Green computing- Naima Kaabouch ,IGI Global 8 E-Waste: Implications, regulations and management in India and current global practices-Rakesh Johri
Teaching Methodology	Class room Discussion, Individual Exercises, Independent Study, Seminars and Assignment, group Exercise , Guest Sessions, Language Lab Sessions
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 4th Semester

Course: 402: Fundamental of Embedded System and IOT

Course Code	**402**
Course Title	**Fundamental of Embedded System and IOT**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2017
Purpose of Course	To understand importance and role of embedded system in Real world applications
Course Objective	This course gives concepts about interfacing of devices with microcontroller and develops logic with assembly and 'C' language at machine level.
Course Outcomes	CO1 : Students will be able to learn about Microcontrollers. CO2 : Students will be able to learn about the Embedded System Development Process. CO3 : Students will be able to learn about the Embedded System Application in IOT.
Mapping between COs with PSOs	
Pre-requisite	Fundamentals of Digital Logic Design, 'C' language, microprocessor and Computer system
Course Outcome	Students will understand 8 bit and 32 bit microcontroller architecture, addressing modes and device interfacing.. Student can implement logical programs for 8051 controller based embedded system and understand its applicability in IOT.

Course : 402 : Fundamental of Embedded System and IOT

Course Code	402
Course Title	Fundamental of Embedded System and IOT
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	To understand importance and role of embedded system in Real world applications
Course Objective	This course gives concepts about interfacing of devices with microcontroller and develops logic with assembly and 'C' language at machine level.
Pre-requisite	Fundamentals of Digital Logic Design, 'C' language, microprocessor and Computer system
Course Out come	Students will understand 8 bit and 32 bit microcontroller architecture, addressing modes and device interfacing. Student can implement logical programs for 8051 controller based embedded system and understand its applicability in IOT.
Course Content	**Unit : 1 : Introduction of Embedded System** 1.1 Trends in Embedded Systems 1.2 Challenges and Design Issues in Embedded Systems 1.3 Applications of embedded system 1.4 Embedded system development process **Unit : 2 : Introduction of 8-bit and 32 bit Microcontrollers** 2.1 Introduction to 8-bit 8051 core Microcontroller Architecture and Organization 2.2 Introduction of 32-bit ARM Microcontroller Architecture 2.3 input / Output Ports 2.4 interrupt handling 2.5 Timers and Counters **Unit : 3 : Microcontroller and Interfacing** 3.1 Introduction of Sensors and Analog to digital converter(ADC) 3.2 Introduction of UART 3.3 Introduction of I2C 3.4 Introduction of SPIS **Unit : 4 : Programming Concepts for Embedded system** 4.1 Overview of different programming language for embedded system 4.2 Introduction to RTOS 4.3 system programming using C-language for 8-bit microcontroller 4.4 8051 microcontroller interfacing with different devices

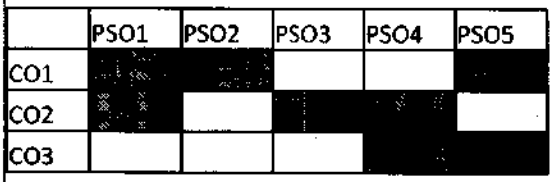
P. M. Desai

	Unit : 5 : Introduction of the Internet of the Things (IOT) 5.1 Embedded system platforms and utilities in IOT 5.2 Ethics requirements in internet of the things 5.3 Wired and Wireless distributed embedded system applications in IOT 5.4 Overview of Near Field Communication (NFC- Bluetooth, RFID). and its applications for IOT 5.5 Overview of development Tools for embedded system and IOT
Reference Book	1 MICROPROCESSORS AND MICROCONTROLLERS, PABLO MARY ,Panda Jeebananda,PHI,2016 2 The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black, Donald Norris, McGraw-Hill Education, 2015 3 Embedded Systems: Concepts, Design and Programming, Himanshu B. Dave, Pearson, 2015 4 Designing The Internet of Things, Hakin Cassimally Adrian Mcewen,Willey, 2015 5 The Internet of Things: Key Applications and Protocols, David Boswarthick, Omar Elloumi Olivier Hersent,Wiley,2015 6 The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World,Michael Miller,pearson, 2015 7 The x86 Microprocessors: 8086 to Pentium, Multicores, Atom and the 8051 Microcontroller Architecture, Programming and Interfacing, Lyla B. Das, Second Edition, Pearson Education,2014 8 The 8051 Microcontroller Based Embedded Systems, Manish K Patel,Tata McGraw-Hill,2014 9 AVR Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi,Pearson, 2013 10 MICROPROCESSORS & MICROCONTROLLERS, NAGOORKANI, Tata McGraw-Hill Education,2012 11 Embedded Systems: Hardware, Design and Implementation, Krzysztof Iniewski, Willey,2012 12 MICROPROCESSORS AND MICROCONTROLLERS: ARCHITECTURE, PROGRAMMING AND SYSTEM, KRISHNA KANT,PHI,2011 13 Getting Started with the Internet of Things, Cuno P fister, Shroff, 2011 14 Microcontrollers - Architecture, Programming, Interfacing and System, Raj Kamal,pearson, 2011 15 Microprocessor & Microcontroller, A.P.Godse, D.A.Godse, Technical Publications, Pune, 2010 16 introduction to Embedded Systems, K. Shibu, Tata McGraw-Hill Education,2009 17 ARM Assembly Language,William Hohl,CRC press,2009 18 C and the 8051, Thomas W Schultz, Wood Island Prints,2008 19 Embedded C, Michael Pont, pearson, 2007 20 The 8051 microcontroller, kennith j. ayala,Thomson,2004
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment, 70% External assessment

P. M. Desai

B.Sc. (I.T.) 4th Semester

Course: 403: VB.NET

Course Code	**403**
Course Title	**VB.NET**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2017
Purpose of Course	This course helps to learn basics programming of windows forms applications using Visual Basic .NET.
Course Objective	The objective of the course is to impart basic introduction to Microsoft .NET technology and concepts of GUI applications.
Course Outcomes	CO1 : Students will be able to learn about Microsoft .NET Framework Technology and the importance of Object Oriented Programming. CO2 : Students will be able to learn about how to connect database by using ADO.NET and perform CRUD operations on database. CO3 : Students will be able to develop windows form based applications using VB.NET.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Programming, Object Oriented Programming and Database Management System
Course Outcome	Students will be able to develop windows forms basic applications using VB.NET.

Course: 403 VB.NET

Course Code	403
Course Title	VB.NET
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	This course helps to learn basics programming of windows forms applications using Visual Basic .NET.
Course Objective	The objective of the course is to impart basic introduction to Microsoft .NET technology and concepts of GUI applications.
Pre-requisite	Knowledge of Programming, Object Oriented Programming and Database Management System
Course Out come	Students will be able to develop windows forms basic applications using VB.NET.
Course Content	**Unit : 1 : Visual Basic .NET and the .NET Framework** 1.1 Microsoft .NET Framework architecture 1.2 Common Language Runtime 1.3 Common Type System 1.4 Common Language Specification 1.5 Microsoft Intermediate Language 1.6 Assemblies – Private, Shared and Satellite 1.7 Namespaces 1.8 Class Libraries 1.9 Introduction of Visual Studio.Net – IDE 1.10 App.config – Application Settings and Connection String **Unit : 2 : Programming in Visual basic .net** 2.1 Data Type 2.2 Variables 2.3 Constants 2.4 Arrays 2.5 Control Array 2.6 Collections 2.7 Subroutines 2.8 Functions 2.9 Control Flow statements 2.10 Messagebox and Inputbox **Unit : 3 : VB.NET Standard Controls with Properties, Events and Methods** 3.1 Form 3.2 Textbox 3.3 Label 3.4 Button 3.5 Listbox 3.6 Combobox 3.7 Checkbox 3.8 Picturebox 3.9 Radiobutton 3.10 Linklabel 3.11 Scrollbar 3.12 Timer 3.13 Panel 3.14 Listview 3.15 Treeview 3.16 Toolbar

	3.17 StatusBar 3.18 Implementation of User Controls **Unit : 4 : Built-In Dialog Boxes, Containers and Menus** 4.1 OpenFileDialog 4.2 SaveFileDialog 4.3 FontDialog 4.4 ColorDialog 4.5 PrintDialog 4.6 MenuStrip 4.7 ToolStrip 4.8 StatusStrip 4.9 FlowLayoutPanel 4.10 GroupBoxPanel 4.11 SplitContainer 4.12 TabControl 4.13 TableLayoutPanel **Unit : 5 : Database Programming with ADO.NET** 5.1 ADO.NET Architecture 5.2 ADO.NET Components 5.3 Connection Object 5.4 Command Object 5.5 DataReader Object 5.6 DataAdepter Object 5.7 SQL Server .NET Data Provider 5.8 OLEDB .NET Data Provider 5.9 DataSet Object 5.10 DataGrid Object 5.11 Design time data binding 5.12 Runtime data binding 5.13 Working with Stored Procedures
Reference Book	1. Professional VB.NET by Fred Barwell : Wrox Publication 2. Visual Basic .NET Programming – Black Book by Stevan Holzner : Dreamtech Press 3. Introduction to .NET framework : Worx publication 4. The Complete Reference Visual Basic .NET by Jeffery R. Shapiro : Tata McGraw Hills 5. Murach's Beginning Visual basic .Net By Anne Bohem : Murach 6. Mastering VB.NET by Evangelos petroutsos : BPB publications
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

B.Sc. (I.T.) 4th Semester

Course: 404: Relational Database Management System-I

Course Code	404
Course Title	Relational Database Management System-I
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2017
Purpose of Course	To introduce the concepts of Relational Database design, relational algebra, functional dependency and normalization of relation.
Course Objective	1. To acquaint the students with fundamental concepts of RDBMS 2. To make student understand process of normalization, functional dependency with case study. 3. To entail practical aspect of Structure Query Language (SQL)
Course Outcomes	CO1 : Students will be able to learn about Introduction to RDBMS, data models, E-R diagram, relational database. CO2 : Students will be able to design a good database using normalization, decomposition and functional dependency. CO3 : Students will be able to perform practical on database through DDL statements, DML statements and Structure Query Language.
Mapping between COs with PSOs	
Pre-requisite	Basic Concepts of DBMS
Course Outcome	Students will be able to understand and implement relational database design principles, learn the process of normalizing the relation. Students will also be able to perform practical on database through DDL, DML statement of SQL

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 404 : Relational Database Management System-I

Course Code	404
Course Title	Relational Database Management System-I
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	To introduce the concepts of Relational Database design, relational algebra, functional dependency and normalization of relation.
Course Objective	1. To acquaint the students with fundamental concepts of RDBMS 2. To make student understand process of normalization, functional dependency with case study. 3. To entail practical aspect of Structure Query Language (SQL)
Pre-requisite	Basic Concepts of DBMS
Course Out come	Students will be able to understand and implement relational database design principles, learn the process of normalizing the relation. Students will also be able to perform practical on database through DDL, DML statement of SQL
Course Content	**Unit : 1 : Relational Model** 1.1 Structure of relational databases 1.2 Codd's rules 1.3 The relational algebra 1.3.1 Fundamental operations 1.3.1.1 Selection, projection, 1.3.1.2 Set Operations Union, intersection, difference, Cartesian Product **Unit : 2: Relational Database Design** 2.1 Functional Dependency 2.1.1 Definition 2.1.2 Trivial and non trivial FD 2.1.3 Inference Rules for FDs 2.1.4 Closure of FD set 2.2 Database Normalization 2.2 Definitions of Keys and Attributes Participating in Keys 2.3 First Normal Form 2.4 Pitfalls in Relational-Database Design 2.5 Second Normal Form 2.6 Third Normal Form 2.7 Boyce Codd Normal Form 2.8.De-normalization 2.9 Database Normalization with Case Study **Unit : 3 : Structured Query Language** 3.1. Creating database structure 3.2 Creating table structure 3.3 DDL commands 3.4 DML commands 3.5 Queries 3.5.1 Simple queries 3.5.2 Search conditions

	3.5.3 Defining constraints 3.5.3.1 Table level constraints 3.5.3.2 Column level constrains 3.5.3.3 Primary Key, Foreign key constraints 3.5.4 Operators 3.5.4.1 Logical operators: AND, OR, NOT 3.5.4.2 Special Operators: BETWEEN, IS NULL, LIKE, IN, EXISTS 3.5.5 Range searching and pattern matching 3.5.6 Aggregate functions 3.5.7 In built functions 3.5.7.1 Date functions 3.5.7.2 String functions 3.5.7.3 Conversion functions 3.5.8 Grouping 3.5.9 Sub Queries 3.5.10 Joins 3.5.10.1 Structure of Joins 3.5.10.2 types of joins 3.5.10.3 Using UNION, INTESECT, MINUS clause 3.5.11 Views 3.5.11.1 Definition 3.5.11.2 Creating view 3.5.11.3 Updating view 3.5.11.4 Destroying view **Unit : 4 : Query Processing and Optimization** 4.1 Introduction 4.2 Query Parsing 4.3 Measures of query cost **Unit : 5 : Practical Relational Database Design** 5.1 ER and EER to Relational Mapping 5.2 Relational Database Design Case Study
Reference Book	1. Database System Concepts - Henry F. Korth & AbrahamSilberschatz – TMH 2. SQL, PL/SQL – The programming Language Oracle-by Ivan Bayross – BPB 3. Principles of Database Systems - Jeffery Ullman - Galgotia Publication 4. An introduction to Database Systems - C.J.Date - Addison- Wesley 5. Introduction to Database Management - Navin Prakash – TMH 6. Introduction to Database System - Bipin C. Desai – Galgotia 7. Fundamental of Database Systems – Elmasri, Navathe – Pearson-Addison Wesley
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 4th Semester

Course: 405: Web Development - I

Course Code	**405**
Course Title	**Web Development - I**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2017
Purpose of Course	To provide knowledge of client side programming, XML and jQuery
Course Objective	To teach client side programming using Java Script, core concepts of XML and jQuery
Course Outcomes	CO1 : Students will be able to learn about client side technology using JavaScript. CO2 : Students will be able to learn jQuery to manipulate HTML elements & CSS properties, showing effects and handle events. CO3 : Students will be able to learn about XML and parse XML data using JavaScript.
Mapping between COs with PSOs	
Pre-requisite	NIL
Course Outcome	Students will be able to do client side validation using Java Script, understand basic concepts of XML and jQuery

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 405 : Web Development - I

Course Code	405
Course Title	Web Development – I
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	To provide knowledge of client side programming, XML and jQuery
Course Objective	To teach client side programming using Java Script, core concepts of XML and jQuery
Pre-requisite	NIL
Course Out come	Students will be able to do client side validation using Java Script, understand basic concepts of XML and jQuery
Course Content	**Client-Side Web Scripting** **Unit : 1 : JavaScript Basics and Object Model** 1.1. HTML to XHTML 1.2. Basic of JavaScript Programming 1.3. The <script> tag – Basic Syntax 1.4. Variables 1.4.1. Expressions 1.4.2. Data Types 1.4.3. Operators 1.5. Arrays 1.6. Working with Text Converting Strings 1.7. Conditional Loops 1.8. Functions 1.9. Entities 1.10. Advanced Math Operations 1.11. Date Object 1.12. Timeout 1.13. Cookies 1.14. Object Model and Event Handling 1.14.1. Programming Using Objects 1.14.2. Navigator Object 1.14.3. Document Object Model 1.14.3.1. Object Hierarchy 1.14.3.2. Properties 1.14.3.3. Methods 1.14.3.4. Events 1.14.4. Events 1.14.5. Event Listeners and Handlers 1.14.6. Window Object 1.14.7. Writing New Windows Dynamically 1.14.8. Alert 1.14.9. Confirm 1.14.10. Prompt Windows 1.14.11. Frames Navigation **Unit : 2 : Manipulating Components** 2.1. The Keyword this 2.2. Forms 2.3. Names vs. IDs 2.4. Arrays of Elements

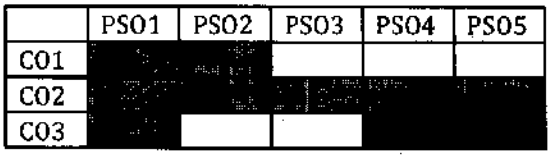
	2.5. Manipulating the Value of a Text Field 2.6. Text Field Events 2.7. Form Handlers 2.8. Checkboxes 2.9. Radio Buttons 2.10. Selects on Change in Various Form Elements 2.11. Hidden Text Field values 2.12. Dynamically Modifying Select Lists 2.13. Validating Form Entries 2.14. Processing Forms **Unit : 3 : Image Handling and Browser Capabilities** 3.1. Image Swaps 3.2. Graphical Navigational Bar 3.2.1. Rollovers 3.2.2. Pre Caching 3.2.3. Changing Buttons 3.3. Interactive Image Maps Using JavaScript 3.4. Browser detection 3.5. Browser compatibility 3.6. The Location and History Objects 3.7. Screen Object **Unit : 4 : Handling Layers and Introduction to jQuery** 4.1. Using JavaScript to Manipulate the Layer Object 4.1.1. Hide and Show Content 4.1.2. Positioning 4.2. Intoduction to jQuery 4.2.1. Features of jQuery 4.2.2. jQuery Syntax and Selectors 4.2.2.1. Using the $() function 4.2.2.2. CSS, Attribute and custom **Unit : 5 : Extensible Markup Language(XML)** 5.1. XML Fundamentals 5.1.1. XML Syntax 5.1.2. Need of XML in Application Development 5.2. Document Type Definition 5.2.1. DTD, Data Types 5.2.2. Validations 5.2.3. Writing XML using a DTD 5.3. XML Schemas 5.3.1. XML Schemas 5.3.2. Complex Data Types 5.3.3. Sequences 5.3.4. Binary Data Types 5.3.5. Primitive Data Types 5.3.6. Namespaces 5.3.7. Data Validation 5.4. Parsing XML DOM using JavaScript
Reference Book	1. JavaScript Bible, 6th Edition – by Danny Goodman, Michael Morrison, Paul Novitski, Tia Gustaff Rayl 2. JavaScript The Complete Reference 3rd Edition - by Thomas A. Powell , Fritz

	Schneider 3. JavaScript Quick Syntax Reference By Mikael Olsson 4. JavaScript: The Definitive Guide, 6th Edition By David Flanagan - O'Reilly Media 5. Xml: The Complete Reference By Heather Williamson – Tata McGraw-Hill Edition 6. Learning jQuery 4th edition, By Jonathan Chaffer, Karl Swedberg 7. Web Development with jQuery, By Richard York – WROX Publication
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 4th Semester

Course: 406: Practical 7

Course Code	406
Course Title	**Practical 7**
Credit	1
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2017
Purpose of Course	To impart basic practical knowledge of embedded system and its applications in IoT
Course Objective	To give practical knowledge to develop basic programming on microcontroller for embedded system
Course Outcomes	CO1 : Students will be able to develop programs for microcontroller peripheral setup using C Language. CO2 : Students will be able to implement sensors and actuators in embedded system. CO3 : Students will be able to understand communication between Embedded System.
Mapping between COs with PSOs	
Pre-requisite	Basic knowledge of digital logic design, C programming language, microprocessor and computer system.
Course Outcome	Students will be able to develop programs to interface devices with embedded system and process control logics using c- language.

Course : 406 : Practical 7

Course Code	406
Course Title	Practical 7
Credit	1
Teaching Per Week	2 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart basic practical knowledge of embedded system and its applications in IoT
Course Objective	To give practical knowledge to develop basic programming on microcontroller for embedded system
Prerequisite	Basic knowledge of digital logic design, C programming language, microprocessor and computer system,
Course Outcome	Students will be able to develop programs to interface devices with embedded system and process control logics using c- language.
Course Content	Practical based on Paper No 402
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Desai

B.Sc. (I.T.) 4th Semester

Course: 407: Practical 8

Course Code	**407**
Course Title	**Practical 8**
Credit	3
Teaching per Week	6 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2017
Purpose of Course	To impart practical knowledge of database driven windows form application
Course Objective	To give practical knowledge of visual basic .net window forms application and SQL
Course Outcomes	CO1 : Students will be able to develop applications using Microsoft .NET Framework Technology. CO2 : Students will be able to create databases in Oracle and perform DDL and DML operations using Structure Query Language. CO3 : Students will be able to develop windows form based applications using VB.NET and integrate databases in it.
Mapping between COs with PSOs	
Pre-requisite	Basic knowledge of DBMS and Object Oriented Programming.
Course Outcome	Students will be able to develop GUI based application using .NET framework and SQL

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 407 : Practical 8

Course Code	407
Course Title	Practical 8
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart practical knowledge of database driven windows form application
Course Objective	To give practical knowledge of visual basic .net window forms application and SQL
Prerequisite	Basic knowledge of DBMS and Object Oriented Programming
Course Outcome	Students will be able to develop GUI based application using .NET framework and SQL
Course Content	Practical based on Paper No 403 and 404
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

B.Sc. (I.T.) 4th Semester

Course: 408: Practical 9

Course Code	**408**
Course Title	**Practical 9**
Credit	1
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2017
Purpose of Course	To impart practical knowledge of client side programming
Course Objective	To give practical knowledge of client side programming
Course Outcomes	CO1 : Students will be able to develop client side script programs using JavaScript. CO2 : Students will be able to develop interactive web applications using jQuery. CO3 : Students will be able to create XML documents and parse it programmatically using JavaScript.
Mapping between COs with PSOs	
Pre-requisite	Nil
Course Outcome	Students will be able to perform client side scripting

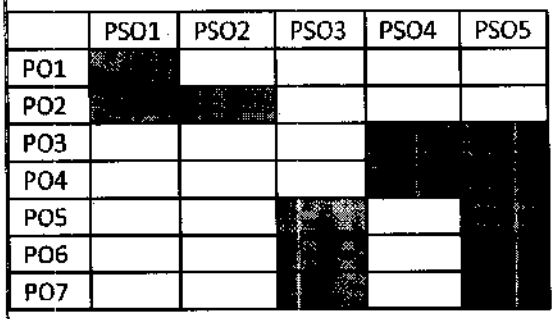
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 408 : Practical 9

Course Code	408
Course Title	Practical 9
Credit	1
Teaching Per Week	2 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2017
Purpose of Course	To impart practical knowledge of client side programming
Course Objective	To give practical knowledge of client side programming
Prerequisite	Nil
Course Outcome	Students will be able to perform client side scripting
Course Content	Practical based on Paper No 405
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 Criteria	5 Years (Integrated): 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	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** The program trains students for designing and conceptualizing the software architecture, planning and managing the product development process of complex and live software projects. It also makes students understand the decision making for selection of an appropriate project management capabilities. **PO6 : Real World Problem / Project Development** Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Students will learn to develop and strengthen the fundamental concepts that are required to solve complex programming problems.

	PSO2 : Students will develop the ability to identify, formulate and design solutions to face computational challenges. PSO3 : Students will be able to apply software engineering concepts to solve real world problems. PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile application, Desktop application, etc. PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.T domain.
Mapping between POs and PSOs	
Medium of Instruction	English
Program Structure	B.Sc. (I.T.) – Semester 5 (M.Sc. (I.T.) 5 years Integrated Course)

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
501	Web Development – II	4	0	4	3 Hrs	70	30	100
502	Relational Database Management System – II	4	0	4	3 Hrs	70	30	100
503	Computer Graphics	4	0	4	3 Hrs	70	30	100
504	System Analysis and Design	4	0	4	3 Hrs	70	30	100
505	Financial Accounting and Taxation	4	0	4	3 Hrs	70	30	100
506	Practical 10	0	4	2	2 Hrs	70	30	100
507	Practical 11	0	4	2	2 Hrs	70	30	100
508	Practical 12	0	2	1	2 Hrs	70	30	100
	Total	20	10	25	-	560	240	800

Program Structure: B.Sc. (I.T.) – Semester 6 (M.Sc. (I.T.) 5 years Integrated Course)

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
601	Java	4	0	4	3 Hrs	70	30	100
602	ASP .NET	4	0	4	3 Hrs	70	30	100
603	Operating System	4	0	4	3 Hrs	70	30	100
604	E Business and Cyber Law	4	0	4	3 Hrs	70	30	100
605	Practical 13	0	4	2	2 Hrs	70	30	100
606	Practical 14	0	6	3	2 Hrs	70	30	100
607	Project	0	0	4		140	60	200
	Total	16	10	25	-	560	240	800

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	5 Years (Integrated): 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 2018

Program Structure		B.Sc. (I.T.) – Semester 5 (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		
501	Web Development – II	4	0	4	3 Hrs	70	30	100
502	Relational Database Management System – II	4	0	4	3 Hrs	70	30	100
503	Computer Graphics	4	0	4	3 Hrs	70	30	100
504	System Analysis and Design	4	0	4	3 Hrs	70	30	100
505	Financial Accounting and Taxation	4	0	4	3 Hrs	70	30	100
506	Practical 10	0	4	2	2 Hrs	70	30	100
507	Practical 11	0	4	2	2 Hrs	70	30	100
508	Practical 12	0	2	1	2 Hrs	70	30	100
	Total	20	10	25	-	560	240	800

Program Structure		B.Sc. (I.T.) – Semester 6 (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		
601	Java	4	0	4	3 Hrs	70	30	100
602	ASP .NET	4	0	4	3 Hrs	70	30	100
603	Operating System	4	0	4	3 Hrs	70	30	100
604	E Business and Cyber Law	4	0	4	3 Hrs	70	30	100
605	Practical 13	0	4	2	2 Hrs	70	30	100
606	Practical 14	0	6	3	2 Hrs	70	30	100
607	Project	0	0	4		140	60	200
	Total	16	10	25	-	560	240	800
Program Passing Rules		As per University rules						

B.Sc. (I.T.) 5th Semester

Course: 501: Web Development - II

Course Code	501
Course Title	**Web Development - II**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	This course provides practical approach for web application development using open source web technologies and language like PHP and frameworks available as open source.
Course Objective	To make student understand significance of open source technology, MVC architecture, and develop web applications using open source language and framework.
Course Outcomes	CO1 : Students will be able to learn about Open Source Technology. CO2 : Students will be able to design and develop dynamic , database driven web applications using PHP. CO3 : Students will be able to learn about MVC architecture and Web Application Frameworks.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Object Oriented Fundamentals, Web Technology Fundamentals
Course Outcome	After studying this course, students will be able to understand concept and importance of open source technology and also develop web application using open source languages and framework.

એકેડમિક કાઉન્સિલ તા.૨૬-૪-૨૦૧૯
બાબત ૩ બિડાણ/પરિશિષ્ટ ૩

Course : 501 : Web Development - II

Course Code	501
Course Title	Web Development – II
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	This course provides practical approach for web application development using open source web technologies and language like PHP and frameworks available as open source.
Course Objective	To make student understand significance of open source technology, MVC architecture, and develop web applications using open source language and framework.
Pre-requisite	Object Oriented Fundamentals, Web Technology Fundamentals
Course Out come	After studying this course, students will be able to understand concept and importance of open source technology and also develop web application using open source languages and framework.
Course Content	**Unit : 1 : Open Source Web Technology and PHP Language Basics** 1.1 PHP Language Characteristics, Features and Extensions 1.2 Language Constructs, Variables, Declarations and Types, Constants 1.3 Use of Operators and Control Structures 1.4 Arrays, Functions and References 1.5 PHP Configuration Directives of php.ini file 1.6 Super Global Arrays 1.7 Handling Session, Cookies, Form Data, File Uploads, Server Data, Server Environment 1.8 Handling Form Data Using JavaScript **Unit : 2 : Object Oriented and Advanced Features of PHP** 2.1 Classes and Objects 2.2 Use Of Constructors, Destructors, Inheritance 2.3 Serialization, Magic Methods 2.4 Built-In Library Functions and Library Classes: String, Array, Mathematics, Graphics Library, File System, Date and Time, Files and Directory, XML, PDF, HTTP, Network, PHP Options and Information, ZIP File **Unit : 3 : Security Threats and Remedies** 3.1 Securing Request Data 3.2 Using CAPTCHA 3.3 Session Fixation Attack and Remedy 3.4 SQL Injection Attack and Prevention **Unit : 4 : PHP Integration with Databases** 4.1 MySQL Server and MySQL Client, Databases, Tables 4.2 Working with PhpMyAdmin 4.3 MySQL Functions, Error Handling, PDO 4.4 What is NoSQL Database? 4.5 Types of NoSQL databases 4.6 Advantages, SQL vs NoSQL 4.7 Any one NoSQL Database for Modern Web with PHP

	Unit : 5 : Web Development Add-ons 5.1 Template Systems: PHP itself, Template Engine 5.2 Web application Frameworks and Libraries 5.3 JavaScript Frameworks and Libraries 5.4 Plug-ins 5.5 Introduction to AJAX with PHP and handling JSON data
Reference Book	1. Programming PHP - Rasmus Lerdorf, Kevin Tatroe - O'Reilly 2. PHP Cookbook - David Sklar, Adam Trachtenberg - O'Reilly 3. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5 (Learning Php, Mysql, Javascript, Css & Html5) 4th Edition by Robin Nixon Publisher: O'Reilly Media; 4 edition (December 14, 2014) 4. PHP and MySQL Web Development (5th Edition) (Developer's Library) 5th Edition by Luke Welling Publisher: Addison-Wesley Professional; 5 edition (September 30, 2016) 5. Modern PHP: New Features and Good Practices 1st Edition by Josh Lockhart O'Reilly Media; 1 edition (March 1, 2015) 6. PHP Cookbook: Solutions & Examples for PHP Programmers 3rd Edition by David Sklar (Author),(Author)Adam Trachtenberg Publisher: O'Reilly Media; 3 edition (July 25, 2014) 7. NoSQL For Dummies 1st Edition by Adam Fowler Publisher: For Dummies; 1 edition (February 24, 2015) 8. Learning from jQuery Paperback – 19 Mar 2013 by Callum Macrae Publisher: Shroff/O'Reilly; First edition (19 March 2013) 9. Mastering jQuery Paperback – Import, 30 May 2015 by Alex Libby Publisher: Packt Publishing Limited (30 May 2015) 10. Learning AngularJS Paperback – 1 Jan 2015 by Ken Williamson Publisher: Shroff; First edition (1 January 2015) 11. Angular 2 Cookbook – 23 Jan 2017 by Matt Frisbie Publisher: Packt Publishing Limited; 2nd Revised edition edition (23 January 2017)
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 5th Semester

Course: 502: Relational Database Management System – II

Course Code	**502**
Course Title	**Relational Database Management System – II**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	To impart knowledge of Database Architecture and PL/SQL programming.
Course Objective	This course provides knowledge about Oracle Database Architecture and Oracle PL/SQL programming concepts.
Course Outcomes	CO1 : Students will be able to learn about Oracle Database Architecture. CO2 : Students will be able to write code using PL/SQL programming concepts using cursors, triggers, packages, procedures, functions and transactions. CO3 : Students will be able to learn about indexes, sequences, data integrity, creating and maintaining tables and user privileges.
Mapping between COs with PSOs	
Pre-requisite	DBMS, SQL
Course Outcome	Students will understand Oracle Database Architecture and will be able to write different PL/SQL programs.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: 502: Relational Database Management System – II

Course Code	502
Course Title	Relational Database Management System – II
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	To impart knowledge of Database Architecture and PL/SQL programming.
Course Objective	This course provides knowledge about Oracle Database Architecture and Oracle PL/SQL programming concepts.
Pre-requisite	DBMS, SQL
Course Out come	Students will understand Oracle Database Architecture and will be able to write different PL/SQL programs.
Course Content	**Unit : 1 : Overview of Oracle Architecture** 1.1 Oracle Physical Architecture 1.2 Oracle Instance Architecture **Unit : 2 : Oracle PL/SQL** 2.1 The PL/SQL Block 2.2 Lexical Units: Identifiers, Delimiters, Literals, Comments 2.3 Variables, PL/SQL Types 2.4 Expression, Operators and Control Structures 2.5 Records 2.6 Cursors 2.6.1 Definition of Cursor 2.6.2 Explicit & Implicit Cursors 2.6.3 Cursor for loops 2.6.4 Cursor Variables 2.6.5 Parameterized Cursor 2.7 Sub Program 2.7.1 Procedures 2.7.2 Functions 2.7.3 Subprogram Creation, Parameter Modes 2.7.4 Procedure Versus Functions 2.8 Packages 2.8.1 Package Specification 2.8.2 Package Body 2.8.3 Packages and Scope, Package Objects 2.9 Database Triggers 2.9.1 Use of Database Triggers 2.9.2 Types of Triggers 2.9.3 Creating Triggers 2.9.4 Deleting a Trigger 2.10 Error Handling 2.10.1 Declaring Exception 2.10.2 Raising Exception, Handling Exception 2.10.3 Exception Propagation, Scope of Exception 2.11 Sequences & Pseudo columns 2.11.1 CURRVAL & NEXTVAL 2.11.2 ROWID

	2.11.3 ROWNUM **Unit : 3 : Transaction Control and Locks** 3.1 Transaction Control Statements 3.1.1 Commit 3.1.2 Savepoint 3.1.3 Rollback 3.2 Locks 3.2.1 Types of Locks 3.2.2 Levels of Locks **Unit : 4 : Index, User, Role and Profile** 4.1 Indexes 4.1.1 Simple Index, Composite Index 4.1.2 Bitmap Index, Function Based Index 4.1.3 Key Compressed Index 4.2 User 4.3 Role 4.4 Profile **Unit : 5 : Programming with Objects** 5.1 Object Types 5.2 Nested Tables 5.3 Varying Array 5.4 Large Objects 5.5 References 5.6 Object Views
Reference Book	1 SQL, PL/SQL THE PROGRAMMING LANGUAGE OF ORACLE - 4TH REVISED EDITION - Ivan Bayross - BPB Publications 2 Oracle Database 12c The Complete Reference (Oracle Press) (1st Edition) - Bob Bryla, Kevin Loney - McGraw-Hill Education 3 Oracle Database 12c PL/SQL Programming(Oracle Press) 1st Edition - Michael McLaughlin - McGraw-Hill Education 4 Oracle PL/SQL Language Pocket Reference, 5E - Steven Feurstein, Bill Pribyl, Chip Dawes - O'Reilly 5 Oracle PL/SQL Programming: Covers Versions Through Oracle Database 12c 6th Edition - Steven Feuerstein - O'Reilly Media 6 SQL and PL/SQL for Oracle 11g Black Book - Dr. P.S. Deshpande – Dreamtech Press 7 Oracle for Beginners - Sharanam Shah & Vaishali Shah - SPD
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

B.Sc. (I.T.) 5th Semester

Course: 503: Computer Graphics

Course Code	**503**
Course Title	**Computer Graphics**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	The purpose of the course is to make student capable of implementing the basic theoretical concepts, methodology and tools of Computer Graphics.
Course Objective	The objective of the course is to Introduce the programming principles and theoretical foundations of computer graphics. This course provides depth knowledge of computer graphics environment and tools to develop graphics application.
Course Outcomes	CO1 : Students will be able to understand the basics of computer graphics, different graphics systems and applications of computer graphics. CO2 : Students will be able to write programs that demonstrate 2D and 3D graphic transformations. CO3 : Students will be able to develop programs for coloring and shading.
Mapping between COs with PSOs	
Pre-requisite	Basic knowledge of Programming and basic of Mathematics.
Course Outcome	After completion of this course, the student will be able to develop and manage Computer Graphics applications.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course:503: Computer Graphics

Course Code	503
Course Title	Computer Graphics
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose.of Course	The purpose of the course is to make student capable of implementing the basic theoretical concepts, methodology and tools of Computer Graphics.
Course Objective	The objective of the course is to Introduce the programming principles and theoretical foundations of computer graphics. This course provides depth knowledge of computer graphics environment and tools to develop graphics application.
Pre-requisite	Basic knowledge of Programming and basic of Mathematics.
Course Out come	After completion of this course, the student will be able to develop and manage Computer Graphics applications.
Course Content	**Unit : 1 : Introduction to Computer Graphics** 1.1 Usage of Graphics and their applications 1.1.1. Presentation Graphics 1.1.2. Computer Aided Design 1.1.3. Computer Aided Design- 1.1.4. Computer Art- Entertainment 1.1.5. Education and Training- 1.1.6. Visualization- Image Processing- 1.1.7. Graphical User Interfaces 1.2 Pixel Graphics 1.2.1 File Formats of Pixel Graphics 1.2.1.1 PNG 1.2.1.2 JPEG 1.2.1.3 GIF 1.2.1.4 BMP 1.2.1.5 PSD 1.3 Vector Graphics 1.3.1 File Formats of Vector Graphics 1.3.1.1 SVG 1.3.1.2 PS 1.3.1.3 CDR 1.3.1.4 WMF 1.4 Video Display Devices 1.4.1 CRT 1.4.2 Color CRT 1.4.3 LCD 1.4.4 LED 1.5 Raster Scan Displays 1.6 Random scan Displays 1.7 Input devices and hard copy devices 1.8 Graphics Monitors and Workstations 1.9 Graphics software

P. Z. Desai

Unit : 2 Graphics Output Primitives

2.1 Points and Lines
2.2 Line Drawing Algorithms
2.2.1 VECGEN Algorithm
2.2.2 Bresenham's Line drawing Algorithm
2.3 Circle- Generating Algorithms
2.3.1 Parameteric Circle Drawing Algorithm
2.3.2 Bresenham's Circle Drawing Algorithm
2.4 Ellipse Generating Algorithms
2.5 Other Curves
2.6 Line and Curve Attributes
2.7 Pixel Addressing
2.8 Character Generation
2.9 Color and Gray scale levels
2.10Polygon
2.10.1 Types of Polygon
2.10.2 Polygon Inside-Otuside Test
2.10.2.1 Even-Odd Method
2.10.2.2 Winding Number Method
2.10.3 Polygon Area Filling
2.10.3.1 Flood Fill Method
2.10.3.2 Scan-line Fill Method
2.10.3.3 Boundary Fill Method
2.10.3.4 Filling Polygon with Pattern
2.11Anti-aliasing

Unit : 3 : 2D Transformations and Viewing

3.1 Transformations
3.1.1 Basic Transformations
3.1.1.1 Scaling
3.1.1.2 Tanslation
3.1.1.3 Rotation
3.1.2 Homogeneous Coordinates
3.1.3 Composite Transformations
3.1.4 Other Transformations
3.1.5 Transformations between Coordinate Systems
3.1.6 Affine Transformations
3.1.7 Raster methods for Transformations
3.2 Viewing
3.2.1 The viewing Pipeline
3.2.2 Viewing Coordinate Reference Frame
3.2.3 Window-to-Viewport Coordinate Transformation
3.2.4 Clipping
3.2.4.1 Point Clipping
3.2.4.2 Line Clipping
3.2.4.3 Polygon Clipping
3.2.4.4 Text and Exterior Clipping

Unit : 4 : Introduction to 3D graphics

4.1 3D object representation
4.2 3D object transformation
4.3 3D object viewing
4.3.1 Viewing Parameters

P. Y. Deshmukh

	4.3.2 Projection 4.3.2.1 Parallel Projection 4.3.2.2 Perspective Projection 4.3.2.2.1 One-point Perspective Projection 4.3.2.2.2 Two-point Perspective Projection 4.3.2.2.3 Three-point Perspective Projection **Unit : 5 : Colors and Shading** 5.1 Properties of Light 5.2 Illumination 5.3 Shading 5.3.1 Constant Shading 5.3.2 Gouraud Shading 5.3.3 Phong Shading 5.4 Shadow 5.5 Colours 5.5.1 RGB Model 5.5.2 CMY Model 5.5.3 HSV Model 5.6 Colour Selection and Applications
Reference Book	1) Computer Graphics C Version, Donald Hearn & M. Pauline Baker , Pearson Education, New Delhi, 2004. 2) Computer Graphics: Programming Approach – Harrington S., Tata McGraw Hill, 3) Computer Graphic – Dr. Apurva A. Desai, PHI, 4) Procedural Elements for Computer Graphics, David F. Rogers, Tata McGraw Hill Book Company, New Delhi, 2003 5) Computer Graphics: Principles & Practice in C, J. D. Foley, S. K Feiner, A Van Dam F. H John Pearson Education, 2004 6) Computer Graphics using Open GL, Frans is S Hill Jr, Pearson Education, 2004. 7) Edward Angel, 'Interactive Computer Graphics' – A top down approach using OpenGL, Pearson, Fifth Edition
Teaching Methodology	Lectures, Discussion, Self Study, Seminars, Case Study and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Des

B.Sc. (I.T.) 5th Semester

Course: 504: System Analysis and Design

Course Code	504
Course Title	System Analysis and Design
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	To enable students to understand modeling ,designing, analyzing and testing a system
Course Objective	To give coherent view of design and analysis intended for software development process. The course provides comprehensive concepts of software engineering practice that involves various models, analysis models, design concepts, various testing methods and introduction to UML diagrams.
Course Outcomes	CO1 : Students will be able to select and implement different software development process models. CO2 : Students will be able to develop software architecture/design. CO3 : Students will be able to learn about the importance of Software Testing and different Software Testing methods.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Must have practical knowledge of at least one language for better understanding and relevance
Course Outcome	After finishing with the course, student will be able to choose the right model for a new to be developed system, perform requirement elicitation and prepare documentation for design, analysis and testing of system.

Course : 504 : System Analysis and Design

Course Code	504
Course Title	System Analysis and Design
Credit	4
Minimum weeks per semester	4 Hrs
Minimum weeks per semester	15
Last Review/Revision	June 2018
Purpose of the course	To enable students to understand modeling ,designing, analyzing and testing a system
Course objective	To give coherent view of design and analysis intended for software development process. The course provides comprehensive concepts of software engineering practice that involves various models, analysis models, design concepts, various testing methods and introduction to UML diagrams.
Prerequisites	Must have practical knowledge of at least one language for better understanding and relevance
Course Outcome	After finishing with the course, student will be able to choose the right model for a new to be developed system, perform requirement elicitation and prepare documentation for design, analysis and testing of system.
Course Content	**Unit : 1 : Fundamentals of SE** 1.1 Software Process 1.1.1 Software, software characteristics 1.1.2 Software types 1.1.3 Management, Customers' and practitioners' myths 1.2 Structured Analysis and design 1.2.1 Roles and responsibilities 1.2.2 Process , Methods and tools 1.2.3 Generic phases of SE 1.3 Process Models 1.3.1 Waterfall Model 1.3.2 Incremental Model 1.3.3 RAD Model 1.3.4 Prototyping model 1.3.5 Spiral Model 1.3.6 Concurrent Development Model 1.3.7 Component Based Models 1.3.8 Formal Methods model 1.3.9 Aspect – Oriented Software Development 1.3.10 Unified Process **Unit : 2 : Requirement Gathering and Analysis** 2.1 Requirement Engineering 2.1.1 Inception, elicitation specification, validation, elaboration, negotiation 2.1.2 Quality Function Deployment 2.1.3 Functional and Non- Functional requirements 2.1.4 FAST 2.1.5 SRS- descriptive and scenario based 2.2 Analysis Modeling 2.2.1 Analysis Modeling Approaches 2.2.2 Elements of Analysis Modeling 2.2.3 Data Modeling 2.2.4 Data Object, types, attributes and relationships 2.2.5 E-R D 2.2.6 Introduction to DFD 2.2.7 Data Dictionary 2.2.8 Process specification 2.2.9 Structures English 2.2.10 Decision tables 2.2.11 Decision trees

	Unit : 3 : Designing 3.1 Design Concepts and Principles 3.1.1 Relation between analysis and design 3.1.2 Design model 3.1.3 design Principles 3.1.4 Design concepts 3.1.4.1 Abstraction 3.1.4.2 Refinement 3.1.4.3 Modularity 3.1.4.4 Structural diagrams 3.1.4.5 Structural patterns 3.2 Cohesion and Coupling 3.2.1 Information hiding, Functional independence 3.2.2 Coupling 3.2.3 Cohesion **Unit : 4 : Object Oriented Model** 4.1 Agile View of Process 4.1.1 Extreme Programming Adaptive Software Development 4.1.2 Dynamic systems Development Method 4.1.3 Scrum 4.1.4 Crystal 4.1.5 Feature Driven Development 4.2 Unified Modeling model 4.2.1 UML Diagrams 4.2.2 Use Case Diagrams 4.2.3 Class Diagrams 4.2.4 Interaction Diagrams 4.2.4.1 Sequence Diagrams 4.2.4.2 Collaboration Diagrams 4.2.5 Activity diagrams 4.2.5.1 Activity Diagram 4.2.5.2 Swim lane activity diagrams 4.2.6 State chart diagrams **Unit : 5 : Testing** 5.1 Principles of testing 5.1.1 Equivalence Partitioning testing 5.1.2 Boundary Value Analysis 5.1.3 Comparison testing 5.1.4 Orthogonal testing 5.1.5 Integration Testing- big bang, top bottom, bottom up, mixed 5.1.6 System testing – Alpha , Beta, Acceptance 5.1.7 Performance testing- Stess testing, regression, Smoke 5.2 Debugging 5.2.1 Debugging Approaches
Reference Books	1. Software Engineering Practitioner's Approach ,Roger Pressman, 6th edition,TMH 2. Fundamentals of software engineering ,Rajib mall, Third edition, PHI 3. An Integrated Approach to Software Engineering, Pankaj Jalote, Narosa 4. Software engineering concepts, Fairley RE, TMH
Teaching Methodology	Black Board Teaching, power point presentation for theory, practical shown in projector for various documents on various topics ,Assignments
Evaluation Method	30% Internal Exam 70% External Exam

Veer Narmad South Gujarat University

Proposed syllabus for

FINANCIAL ACCOUNTING& TAXATION

T.Y. B.Sc. IT (Semester ~~VI~~ (V)

Effective from Academic year 2018-2019

Objectives: The basic purpose of this course is to develop an insight of principles and techniques of accounting and taxation.

UNIT–I	**INTRODUCTION TO ACCOUNTING** • Meaning, objective and functions of Accounting • Importance of accounting • Branches of accounting • Book keeping V/S financial Accounting • Uses of Accounting Information • Accounting concepts and Conventions • Accounting Terms.	20%
UNIT II	**ACCOUNTING CYCLE** • Accounting Equation • Classification of Accounting Transactions and Accounts • Rules of Debit and Credit as Per Double Entry System • Journal Entries • Ledger posting • Subsidiary Books • Preparation of Trial Balance	30%
UNIT III	**ACCOUNTING FOR DEPRECIATION** • Meaning • Causes and Importance • Factors determining cost, estimated life and scrap value • Methods in general and Straight Line Method and Written Down Value Method in particular	15%
UNIT IV	**FINAL ACCOUNTS OF SOLE PROPRIETORSHIP CONCERN** • Meaning • Preparation of Trading, Manufacturing and Profit and loss account • Preparation of Balance sheet	20%
UNIT V	**TAXATION** • Type of taxes in India: Direct taxes and Indirect taxes • Basic concept and definitions of Income Tax • Basic idea of Corporate Tax • Basic concept and definitions of Goods and Service Tax	15%

Note: Only elementary examples from unit II, III and IV can be asked in examination having weightage of not more than 30%.

References:

- Accounting for Managers – J. Made Gowda – Himalaya Publishing House
- Introduction to Accountancy – T. S. Grewal & S. C. Gupta – S. Chand
- Modern Accountancy – M. Hanif & A. Mukerji – Tata McGraw Hill
- Student's Guide to Income Tax Including GST –V. K. Singhania& Monica Singhania – Taxmann Publication

Chairman

(Mehul Desai) (Dr C.H. Desai) Dr. C.C. Shah (Mrunal Joshi)

B.Sc. (I.T.) 5th Semester

Course: 506: Practical 10

Course Code	**506**
Course Title	**Practical 10**
Credit	3
Teaching per Week	6 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2018
Purpose of Course	The course provides practical knowledge of advanced web applications development.
Course Objective	The course prepares students to develop web applications with PHP and frameworks.
Course Outcomes	CO1 : Students will be able to develop web application in PHP. CO2 : Students will be able to implement MVC architecture in web application. CO3 : Students will be able to develop web application using Web Application Frameworks.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming, Web Technology Fundamentals
Course Outcome	After completion of this course, students will be able to develop web applications in PHP and frameworks.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 506 : Practical 10

Course Code	506
Course Title	Practical 10
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2018
Purpose of Course	The course provides practical knowledge of advanced web applications development.
Course Objective	The course prepares students to develop web applications with PHP and frameworks.
Prerequisite	Object Oriented Programming, Web Technology Fundamentals
Course Outcome	After completion of this course, students will be able to develop web applications in PHP and frameworks.
Course Content	Practical based on Paper No. 501 : Web Development-II.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. Y. Desai

B.Sc. (I.T.) 5th Semester

Course: 507: Practical 11

Course Code	507
Course Title	Practical 11
Credit	2
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2018
Purpose of Course	To impart practical knowledge of PL/SQL programming.
Course Objective	To give practical knowledge of PL/SQL programming.
Course Outcomes	CO1 : Students will be able to create PL/SQL programs in RDBMS. CO2 : Students will be able to manage database transactions using PL/SQL . CO3 : Students will be able to write code using PL/SQL programming concepts using cursors, triggers, packages, procedures, functions and transactions.
Mapping between COs with PSOs	
Pre-requisite	knowledge of SQL, DBMS
Course Outcome	Students will be able to create PL/SQL programs.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 507 : Practical 11

Course Code	507
Course Title	Practical 11
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2018
Purpose of Course	To impart practical knowledge of PL/SQL programming.
Course Objective	To give practical knowledge of PL/SQL programming.
Prerequisite	knowledge of SQL, DBMS
Course Outcome	Students will be able to create PL/SQL programs.
Course Content	Practical based on Paper No. 502 : Relational Database Management System – II
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

B.Sc. (I.T.) 5th Semester

Course: 508: Practical 12

Course Code	**508**
Course Title	**Practical 12**
Credit	**1**
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2018
Purpose of Course	To impart practical knowledge of operations on computer graphics primitives. Usage of tool to develop computer graphics applications
Course Objective	To give practical knowledge on applications of computer graphics
Course Outcomes	CO1 : Students will be able to implement algorithms for basic concepts of computer graphics. CO2 : Students will be able to write programs for 2D and 3D transformation and clipping. CO3 : Students will be able to write programs for coloring and shading of graphics.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Basic knowledge of C, C++ programming language
Course Outcome	Students will be able to perform practical on various computer graphics applications

Course : 508 : Practical 12

Course Code	508
Course Title	Practical 12
Credit	1
Teaching Per Week	2 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2018
Purpose of Course	To impart practical knowledge of operations on computer graphics primitives. Usage of tool to develop computer graphics applications
Course Objective	To give practical knowledge on applications of computer graphics
Prerequisite	Basic knowledge of C, C++ programming language
Course Outcome	Students will be able to perform practical on various computer graphics applications
Course Content	Practical based on Unit1, Unit 2, Unit 3 of Paper No 503 – Computer Graphics shall be implemented with OpenGL / C / C++
Reference Books	NIL
Teaching Methodology	Lab Work, Assignment
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Desai

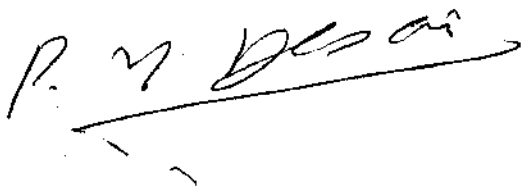
B.Sc. (I.T.) 6th Semester

Course: 601: Java

Course Code	**601**
Course Title	**Java**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	To be learn the concept of OOPs Threads, Graphics, Database operation in java.
Course Objective	To introduce the comprehensive concepts of java programming language that includes OOP concepts using core java, desktop based visual designs using swing and applets. At the end of this course, a student will be able to comprehend the fundamental concepts required for the development and design of software systems.
Course Outcomes	CO1 : Students will be able to learn and use Object Oriented Programming concepts for problem solving using Java programming language. CO2 : Students will be able to write programs using different Java libraries. CO3 : Students will be able to write database programming using java.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Object Oriented Concepts of C++
Course Outcome	Students will be able to use various java concepts and develop a java based system.



Course : 601 : Java

Course Code	601
Course Title	Java
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	To be learn the concept of OOPs Threads, Graphics, Database operation in java.
Course Objective	To introduce the comprehensive concepts of java programming language that includes OOP concepts using core java, desktop based visual designs using swing and applets. At the end of this course, a student will be able to comprehend the fundamental concepts required for the development and design of software systems.
Pre-requisite	Object Oriented Concepts of C++
Course Out come	Students will be able to use various java concepts and develop a java based system
Course Content	**Unit : 1 : Java Concepts** 1.1 Introduction to Java and its tool-chain 1.1.1 History of Java 1.1.2 Java Architecture and its Components 1.1.2.1 JDK,JVM,JRE 1.1.3 Java Platforms 1.1.4 Java SE,ME,EE 1.1.5 Java ClassFile 1.1.6 C++ and Java comparison 1.1.7 Features of java 1.1.8 Installing java development kit 1.1.9 Java compiler and Interpreter 1.1.10 Using CLASSPATH 1.1.11 Use of text editor, IDE 1.2 Basics of Java programming 1.2.1 Understanding main() method 1.3 Fundamentals 1.3.1 Statements 1.3.2 Variables and Datatypes 1.3.3 Primitive datatypes 1.3.4 Object Reference Types 1.3.4.1 Strings 1.3.5. Arrays- single and multi dimension 1.3.6. Primitive Wrapper Classes 1.3.7. Classes 1.3.8. Objects 1.3.9. Array of objects 1.3.10. AutoBoxing and Unboxing 1.4 General Utility Classes 1.4.1 ArrayList 1.4.1.1 Accessing with foreach Loop 1.4.1.2 Accessing with iterator 1.4.2 Vectors 1.4.3 String 1.4.4 Math 1.4.5 Date **Unit : 2: OOPs in JAVA** 2.1 Object Oriented Programming in Java 2.1.1 Inheritance and Polymorphism 2.1.2 Overloading and Overriding 2.1.3 Abstract classes 2.1.4 Static classes 2.1.5 Final Classes

2.1.6 Chaining constructor using this() and Super()
2.1.7 Interfaces
2.1.8 Garbage Collection
2.1.9 Interfaces
2.1.10 Lambda Expressions
2.1.11 Generics

2.2 Packages and Imports
2.2.1 Package levels
2.2.2 Creating package
2.2.3 Importing and Using Packages
2.2.4 Package and inheritance
2.2.5 Package and access specifiers

2.3 Exception Handling
2.3.1 Exception and error classes
2.3.2 Exception Handling
2.3.3 Throw statement and throws clause
2.3.4 Custom exception

2.4 Thread Programming
2.4.1 Overview of Threads
2.4.2 Thread Life Cycle
2.4.3 Creating Thread –Runnable interface
2.4.4 Multithreaded programs
2.4.5 Synchronization
2.4.6 Deadlock
2.4.7 Inter-Thread communication (wait & notify)
2.4.8 Fork and Join
2.4.9 Asynchronous processing

Unit: 3: I/O in JAVA

3.1 Java I/O
3.1.1 Files and directories
3.1.2 Byte and Character Streams
3.1.3 PrintWriter Class
3.1.4 Input and Output Streams
3.1.5 Random access Files
3.1.6 Serialization and Deserialization

3.2 Collections API
3.2.1 Collection
3.2.2 Java Streams
3.2.3 Set-HashSet,TreeSet
3.2.4 List-LinkedList
3.2.5 Map-HashMap,TreeMap

3.3 Annotations

Unit : 4: JAVA SWING and APPLETS

4.1 Java Swing
4.1.1 Java Foundation Classes
4.1.2 Features
4.1.3 Swing Components –
4.1.3.1 Jcomponent
4.1.3.2 JFrame
4.1.3.3 JPanel
4.1.3.4 Basic Containers
4.1.3.4.1 Buttons, lables, text fields etc
4.1.3.5 Event Handling

4.2 Applets
4.3.1 Creating Applets
4.3.2 Passing parameter to applet
4.3.3 Drawing images on Applet

4.3 Sandbox Security Model
4.4 Policy tool

P. M. Desai

	Unit : 5 : JDBC Connections 5.1 Working with JDBC APIs 5.1.2 Connection 2.1.2 Statement 5.1.3 Transaction methods 5.1.4 Optimized Statements with prepare Statement and Callable Statement 5.1.5 Metadata 5.1.6 Rowset, Dettached Rowset
Reference Books	1. Java Complete Reference, Schildt, Herbert,9th edition,TMH 2. Java Platform, Jaworski, Jamie,Techmedia 3. Head First Java, Sierra, Bates,second edition,,SPD O'Relly 4. Core Java for Beginners, S. Shah, V. Shah
Teaching Methodology	Black Board Teaching, power point presentation for theory, practical shown in projector for showing programs
Evaluation Method	30% Internal Exam 70% External Exam

P. V. Rao

B.Sc. (I.T.) 6th Semester

Course: 602: ASP.NET

Course Code	602
Course Title	ASP.NET
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	This course helps to learn basics programming of web forms applications using C#.NET.
Course Objective	The objective of the course is to impart basic introduction to Microsoft C#.NET language and concepts of web application development technology.
Course Outcomes	CO1 : Students will be able to learn c# programming language. CO2 : Students will be able to learn about web servers and web application. CO3 : Students will be able to learn about dynamic web application development and database connectivity.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Knowledge of Programming, Object Oriented Programming, Database Management System and Scripting languages like HTML, JavaScript, etc.
Course Outcome	Students will be able to develop web forms basic applications using C#.NET.

Course: 602 ASP.NET

Course Code	602
Course Title	ASP.NET
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	This course helps to learn basics programming of web forms applications using C#.NET.
Course Objective	The objective of the course is to impart basic introduction to Microsoft C#.NET language and concepts of web application development technology.
Pre-requisite	Knowledge of Programming, Object Oriented Programming, Database Management System and Scripting languages like HTML, JavaScript, etc.
Course Out come	Students will be able to develop web forms basic applications using C#.NET.
Course Content	**Unit : 1 : Introduction to C# .NET** 1.1 Language Constructs 1.2 Data Types 1.3 Classes and Objects 1.4 Structures 1.5 Program Structure 1.6 Preprocessor Directives 1.7 Inheritance 1.8 Polymorphism – Overloading, Overriding, etc. 1.9 Properties 1.10 Indexer 1.11 Collection 1.12 Exception Handling 1.13 Delegates 1.14 Events 1.15 Reflection **Unit : 2 : Introduction to ASP.NET and Web Development Concepts** 2.1 Dynamic web pages 2.2 Introduction to ASP 2.3 Web server – Internet Information Server (IIS) 2.4 Architecture of ASP.NET 2.5 ASP.NET Page Lifecycle 2.6 ASP .NET Page Directives **Unit : 3 : Programming in ASP.NET** 3.1 Controls – HTML Controls and ASP.Net Server Controls 3.2 Control Properties and Events 3.3 PostBack 3.4 Exception Handling 3.5 Validation Controls 3.6 Navigation Controls 3.7 Login Controls 3.8 User Controls 3.9 MasterPages **Unit : 4 : Web Application Management** 4.1 State Management 4.1.1 ViewState 4.1.2 Application 4.1.3 Session 4.1.4 Cookie 4.1.5 QueryString

	4.1.6 Profile 4.2 Response Object, Request Object 4.3 Server Object 4.4 web.config and machine.config 4.5 global.asax 4.6 Authentication Methods 4.7 Caching **Unit : 5 : Database Programming with ADO.NET** 5.1 ADO.NET Architecture 5.2 Connection Object 5.3 Command Object 5.4 DataReader Object 5.5 DataAdepter Object 5.6 DataSet Object 5.7 Working with Data Controls 5.8 Design time data binding 5.9 Runtime data binding 5.10 Working with Stored Procedures
Reference Book	1. C# and the .NET Platform by Andrew Troelsen : APress 2. C# The Basics by Vijay Mukhi : BPB 3. C# Essentials by Ben Albabari : O'Reilly 4. Professional C# by Simon Robinson : Wrox 5. ASP.NET - A Beginner's guide by Dave Mercer : TMH 6. Professional ASP.NET : Wrox. 7. ASP.NET Programmer's Reference : Wrox 8. ADO.NET Programmer's Reference : Wrox. 9. Professional C# 2008 by Christian Nagel : Wrox 10. C# The Nuts & Bolts by Akash Sarat & Sonal Mukhi : BPB 11. C# Made Simple : BPB Publication 12. C# 3.0 Unleashed: With the .NET Framework 3.5 by Joseph Mayo : Sams 13. Special Edition Using ASP.NET by Richard Leinecker : Pearson Education 14. ASP.NET Unleashed. : Sams. 15. ASP.NET for Developers : Amundsen.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

B.Sc. (I.T.) 6th Semester

Course: 603: Operating System

Course Code	603
Course Title	Operating System
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
Purpose of Course	Elaborate understanding of Middle Layer which manages hardware and application software.
Course Objective	To understand detailed working of OS.
Course Outcomes	CO1 : Students will be able to learn about fundamentals of operating system. CO2 : Students will be able to understand the concept of processes, threads and its scheduling algorithms, various memory management schemes, file and device management, I/O management in detail. CO3 : Students will be able to learn about shell scripting.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Basic knowledge of Computer organization, data structures and computer programming
Course Outcome	Students will be able to understand OS internals and learn basic shell scripting

Course : 603 : Operating System

Course Code	603
Course Title	Operating System
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	Elaborate understanding of Middle Layer which manages hardware and application software.
Course Objective	To understand detailed working of OS
Pre-requisite	Basic knowledge of Computer organization, data structures and computer programming
Course Out come	Students will be able to understand OS internals and learn basic shell scripting
Course Content	**Unit : 1: Operating System Concepts** 1.1 Evolution of Operating System 1.2 Needs of an Operating System 1.3 Elements of an Operating System 1.4 Types of O.S.: Single User & Multi-User, Batch, Multi-Programmed, Time-Sharing, Real-Time, Distributed, Parallel, Mobile 1.5 Operating System Structure: Layered System, Microkernel and Virtual Machine 1.6 Booting process of various Operating Systems **Unit : 2 : Process Management** 2.1 Process concept 2.2 Process State Model 2.3 Process Scheduling 2.3.1 Scheduling Criteria 2.3.2 Scheduling algorithms 2.4 Thread and Multithreading 2.5 Inter-process Communication 2.6 Process Coordination 2.6.1 Critical Section problem 2.6.2 Semaphores 2.7 Deadlocks 2.7.1 Deadlock Characteristics 2.7.2 Deadlock Prevention, Avoidance 2.7.3 Deadlock Detection, Recovery **Unit : 3 : Memory Management** 3.1 The notion of physical and logical address space 3.2 Contiguous allocation 3.3 Non-Contiguous allocation 3.3.1 Paging 3.3.2 Segmentation 3.4 Other Memory Management Schemes: Swapping and Overlays 3.5 Demand Paging & Demand Segmentation 3.6 Allocation of frames & Page Replacement policies

	3.7 Implementation in various operating systems **Unit : 4 : File and Device Management** 4.1 File Management 4.1.1 Device Characteristics 4.1.2 I/O Hardware 4.1.3 Application I/O Interface 4.1.4 Kernel I/O Subsystem 4.1.5 STREAMS 4.2 Mass Storage Structure 4.2.1 Disk Structure 4.2.2 Disk scheduling 4.2.3 Disk Management 4.3 File Concept: File Types and File Operation 4.3.1 Directory Structure 4.3.2 Directory Implementation 4.3.3 File-System Implementation 4.3.4 Allocation Methods 4.3.5 Free-Space Management 4.3.6 File-System Mounting, File Sharing and Protection 4.3.7 Implementation in various operating systems **Unit : 5 : Introduction to Shell Scripting** 5.1 User and system variables 5.2 I/O statements 5.3 Escaping, Quoting Redirection and Piping 5.4 Positional Parameters 5.5 Operators – arithmetic, relational, logical, file related, string related 5.6 Conditional & Looping statements 5.7 Arrays 5.8 Functions 5.9 Grep, egrep and fgrep **Case Study: Windows, Linux and Mobile OS**
Reference Book	1. Operating Systems Concepts - Galvin Silberschatz - McGraw Hill-9th Edition 2. Operating Systems - William Stallings – PHI- 9th Edition 3. Modern Operating Systems - Andrew S. Tanenbaum - Pearson Edu./PHI -4th edition 4. Operating System, Dhamdhere, TMH-3rd Edition 5. Understanding Operating System, Ann McIver McHoes ,Ida Flynn, 5th Edition 6. Operating System, P Balakrishna Prasad, Scitech- 2nd Edition 7. Unix Shell Programming : Yashwant Kanetkar: 2003 Edition 8. Mastering Linux shell Scripting: Andrew Mallett:2015 edition Packt Publisher
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment, 70% External assessment

B.Sc. (I.T.) 6th Semester

Course: 604: E Business and Cyber Laws

Course Code	604
Course Title	E Business and Cyber Laws
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2018
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
Course Outcomes	CO1 : Students will be able to learn about E-commerce CO2 : Students will be able to learn about Encryption Techniques and their application in the field of computer science to solve security problems. CO3 : Students will be able to understand Fundamentals of Cyber Law.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Fundamental of Computers, Computer Networks
Course Outcome	Students will be able to understand E Business , Cryptocurrency, Blockchain, Cyber Security and Cyber Laws

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 604 : E Business and Cyber Laws

Course Code	604
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	June 2018
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, Digi Locker 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 – Crytocurrency 3.2 How Cryptocurrency Works , Ewallet Services and Personal Cryptosecurity 3.3 Introduction – 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: Volume 8 : Parag Diwan & Sunil Sharma :E-commerce - Pentagon Press. 3. E-Commerce Strategies : Charles Trepper – PHI 4. S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd., Jaipur. 5. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi. 6. Decentralized Applications , Harnessing Bitcoin's Blockchain Technology, Siraj Raval, 2016 – O'Reilly 7. Blockchain, Blueprint for a new Economy , Melanie Swan, 2017 – O'Reilly 8. Mastering Bitcoin, Programming the open Blockchain , 2nd Edition, Andreas M. Antonopoulos, 2017 – O'Reilly 9. Essential CyberSecurity Science, Josiah Dykstra, 2017 – O'Reilly
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

B.Sc. (I.T.) 6th Semester

Course: 605: Practical 13

Course Code	**605**
Course Title	**Practical 13**
Credit	3
Teaching per Week	6 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2018
Purpose of Course	To impart practical knowledge of object oriented programming and other concepts using java
Course Objective	To give practical knowledge of object oriented programming using java
Course Outcomes	CO1 : Students will be able to develop application using Object Oriented concepts in Java. CO2 : Students will be able to develop application in JAVA Applets and Swing. CO3 : Students will be able to develop backend application using Java and JDBC connections.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Basic knowledge of C++ programming language and concepts
Course Outcome	Students will be able to solve problems using java; object oriented programming methodologies

Course : 605 : Practical 13

Course Code	605
Course Title	Practical 13
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2018
Purpose of Course	To impart practical knowledge of object oriented programming and other concepts using java
Course Objective	To give practical knowledge of object oriented programming using java
Prerequisite	Basic knowledge of C++ programming language and concepts
Course Outcome	Students will be able to solve problems using java; object oriented programming methodologies
Course Content	Practical based on Paper No 601 : Java
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Desai

B.Sc. (I.T.) 6th Semester

Course: 606: Practical 14

Course Code	**606**
Course Title	**Practical 14**
Credit	3
Teaching per Week	6 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2018
Purpose of Course	To impart practical knowledge of web programming
Course Objective	To give practical knowledge of ASP.Net programming using C#
Course Outcomes	CO1 : Students will be able to develop console based application and windows form application in C#.NET CO2 : Students will be able to develop web application in ASP.NET using C#.NET CO3 : Students will be able to integrate ADO.NET in .NET applications.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Programming concepts, HTML and GUI development
Course Outcome	Students will be able to develop web applications in ASP.Net using C#.Net language

Course : 606 : Practical 14

Course Code	606
Course Title	Practical 14
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2018
Purpose of Course	To impart practical knowledge of web programming
Course Objective	To give practical knowledge of ASP.Net programming using C#
Prerequisite	Programming concepts, HTML and GUI development
Course Outcome	Students will be able to develop web applications in ASP.Net using C#.Net language
Course Content	Practical based on Paper No. 602 : ASP.NET
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

B.Sc. (I.T.) 6th Semester

Course: 607: Project

Course Code	607
Course Title	**Project**
Credit	4
Teaching per Week	-
Duration	3 Months
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2018
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.
Course Objective	To help students to develop software applications using any programming language or framework.
Course Outcomes	CO1 : Students will be able to develop software application. CO2 : Students will be able to apply Software Engineering concepts to solve real world problems. CO3 : Students will be able to apply database related concepts to design database for the project.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.

Course : 607 : Project

Course Code	607
Course Title	Project
Credit	4
Teaching Per Week	-
Duration	3 Months
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2018
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.
Course Objective	To help students to develop software applications using any programming language or framework.
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.
Course Content	The students are required to develop project. The students must prepare documentation of the project completed 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 institution. 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. Project Title Report 3. Progress Report 4. Project Completion Certificate 5. Institution Certificate 6. Non disclosure of Source Code Certificate (In case the student is unable to submit project source code)
Reference Books	NIL
Teaching Methodology	Project guidance, Review
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 Criteria	5 Years (Integrated): 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	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** The program trains students for designing and conceptualizing the software architecture, planning and managing the product development process of complex and live software projects. It also makes students understand the decision making for selection of an appropriate project management capabilities. **PO6 : Real World Problem / Project Development** Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Students will learn to develop and strengthen the fundamental concepts that are required to solve complex programming problems.

	PSO2 : Students will develop the ability to identify, formulate and design solutions to face computational challenges. PSO3 : Students will be able to apply software engineering concepts to solve real world problems. PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile application, Desktop application, etc. PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.T domain.

Mapping between POs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
PO1					
PO2					
PO3					
PO4					
PO5					
PO6					
PO7					

Medium of Instruction: English

Program Structure: B.Sc. (I.T.) – Semester 7 (M.Sc. (I.T.) 5 years Integrated Course)

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
701	Application Development using Full Stack	4	0	4	3 Hrs	70	30	100
702	Application Development using .NET CORE	4	0	4	3 Hrs	70	30	100
703	Software Engineering	4	0	4	3 Hrs	70	30	100
704	Optimization Techniques	4	0	4	3 Hrs	70	30	100
705	Practical 15	-	3	3	2Hrs	70	30	100
706	Practical 16	-	3	3	2 Hrs	70	30	100
707	Part Time Project 1	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700

Program Structure: B.Sc. (I.T.) – Semester 8 (M.Sc. (I.T.) 5 years Integrated Course)

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
801	Java Web Development	4	0	4	3 Hrs	70	30	100
802	Enterprise Java	4	0	4	3 Hrs	70	30	100
803	Elective : Elective 1 Smart Device Computing using iOS Elective 2 Smart Device Computing using Android	4	0	4	3 Hrs	70	30	100
804	Artificial Intelligence	4	0	4	3 Hrs	70	30	100
805	Practical 17	-	3	3	2 Hrs	70	30	100
806	Practical 18	-	3	3	2 Hrs	70	30	100
807	Part Time Project 2	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700

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 2019

Program Structure		M.Sc. (I.T.) – Semester 7 (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		
701	Application Development using Full Stack	4	0	4	3 Hrs	70	30	100
702	Application Development using .NET CORE	4	0	4	3 Hrs	70	30	100
703	Software Engineering	4	0	4	3 Hrs	70	30	100
704	Optimization Techniques	4	0	4	3 Hrs	70	30	100
705	Practical 15	-	3	3	2 Hrs	70	30	100
706	Practical 16	-	3	3	2 Hrs	70	30	100
707	Part Time Project 1	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700

Program Structure		M.Sc. (I.T.) – Semester 8 (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		
801	Java Web Development	4	0	4	3 Hrs	70	30	100
802	Enterprise Java	4	0	4	3 Hrs	70	30	100
803	Elective : Elective 1 Smart Device Computing using iOS Elective 2 Smart Device Computing using Android	4	0	4	3 Hrs	70	30	100
804	Artificial Intelligence	4	0	4	3 Hrs	70	30	100
805	Practical 17	-	3	3	2 Hrs	70	30	100
806	Practical 18	-	3	3	2 Hrs	70	30	100
807	Part Time Project 2	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700
Program Passing Rules		As per University rules						

M.Sc. (I.T.) 7th Semester

Course: 701: Application Development using Full Stack

Course Code	**701**
Course Title	**Application Development using Full Stack**
Credit	**4**
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course is designed to augment students' programming skills with the latest technologies.
Course Objective	To provide understanding of the prototypal inheritance, Node, express, mongoDB, Angular and making students able to develop programs Full stack programs.
Course Outcomes	CO1 : Students will be able to learn about MVC applications using NODE.JS, Express. CO2 : Students will be able to develop backend REST API using Express and learn API Security. CO3 : Students will be able to develop front end apps using Angular and version controlling using git.
Mapping between COs with PSOs	
Pre-requisite	Basic Javascript
Course Outcome	This would help students to understand the paradigm change in programming and help them in developing applications using express, node with document database MongoDB along with angular.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 701 : Application Development using Full Stack

Course Code	701
Course Title	Application Development using Full Stack
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course is designed to augment students programming skills with latest technologies.
Course Objective	To provide understanding of the prototypal inheritance, Node, express, mongoDB, Angular and making students able to develop programs Full stack programs.
Pre-requisite	Basic Javascript
Course Out come	This would help students to understand the paradigm change in programming and help them in developing applications using express,node with document database MongoDB along with angular.
Course Content	**Unit 1 : Introduction of Node.js Ecosystem** 1.1. Architecture of Node.js Ecosystem 1.2. Familiarity with JavaScript 1.3. The Problem with I/O 1.4. Prototypal inheritance 1.5. UI-UX, Responsive design, Security 1.6. Installing Node.js 1.7. REPL **Unit 2 : Node.js** 2.1 Module and npm 2.1.1 npm 2.1.2 package.json 2.1.3 The node_modules 2.1.4 require(), createServer() 2.2 Node concepts 2.1.1 The Event Loop 2.1.2 Asynchronous Coding 2.1.3 Callback Functions 2.1.4 Calling Conventions 2.1.5 Exception Handling 2.1.6 Callback Hell 2.1.7 Event Emitters 2.1.8 Extending EventEmitter 2.1.9 Listening for Events 2.1.10 Exception Handling 2.1.11 File Systems 2.1.12 Node.js - RESTful API 2.3 Core Modules 2.3.1 Command Line Arguments 2.3.2 Working with the File System 2.3.3 Global objects 2.3.4 File Systems and Streams 2.3.5 Utility Modules 2.3.6 Web Module 2.3.7 Routes 2.3.8 Accessing Request Headers 2.3.9 Working with Database Engine like Mongo and Mongoose to insert, update and delete data **3. Express** 3.1 Routing 3.2 HTTP Methods 3.3 URL Building 3.4 Middleware 3.5 Templating 3.6 Static Files 3.7 Form Data

P. Y. Deo

	3.8 Database 3.9 Cookies 3.10 Sessions 3.11 Authentication 3.12 RESTful APIs 3.13 Error handling **4. AngularJS** 4.1. Single-page Application Framework 4.2. Angular CLI 4.3. Model-View-Controller Architecture 4.4. Two Way Data Binding 4.5. Directives, Pipes, Components, Scope Inheritance, Method Chaining, Templates, Services, Forms and Validation 4.6. Animation and Routing 4.7. Calling API, Using Third Party API 4.8. Web-Sockets, Use of UI Frameworks Plug-ins **5. Developer tools** 5.1. Browser Tools 5.2. Version Control using Git and others Tools
Reference Book	1. Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications – Brad Dayley and Brendan Dayley-Second Edition- Kindle Edition 2. MEAN Cookbook: The meanest set of MEAN stack solutions around - Nicholas McClay-1st edition-Kindle edition 3. Node.js for PHP developers - Daniel Howard - First edition - O'Reilly 4. Full Stack JavaScript Development With MEAN: MongoDB, Express, AngularJS, and Node.JS - Colin J Ihrig and Adam Bretz-first edition- Kindle edition 5. Node.js 8 the Right Way: Practical, Server-Side JavaScript That Scales--Jim Wilson --Andy Hunt 6. Mastering Node.js - Second Edition: Build robust and scalable real-time server-side web application -- Sandro Pasquali --1st edition – Paperback
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Dash

M.Sc. (I.T.) 7th Semester

Course: 702: Application Development using .NET CORE

Course Code	**702**
Course Title	**Application Development using .NET CORE**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to understand and use .NET advanced concepts with real world .NET applications.
Course Objective	To impart knowledge of Enterprise application development using .NET Framework.
Course Outcomes	CO1 : Students will be able to learn MVC Core and MVC 5. CO2 : Students will be able to learn about Web API in .NET framework and .NET Core and use it in other apps. CO3 : Students will be able to learn C# language features like tuples, expression bodied members, local/nested functions, delegates & events and LINQ.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Fundamental, ADO.NET, ASP.NET, Basic knowledge of C#
Course Outcome	Students will be able to develop enterprise applications using .NET advanced concepts.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 702 : Application Development using .NET CORE

Course Code	702
Course Title	Application Development using .NET CORE
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course helps students to understand and use .NET advanced concepts with real world .NET applications.
Course Objective	To impart knowledge of Enterprise application development using .NET Framework.
Pre-requisite	Object Oriented Fundamental, ADO.NET, ASP.NET, Basic knowledge of C#
Course Out come	Students will be able to develop enterprise applications using .NET advanced concepts.
Course Content	**Unit : 1: ASP.NET using C#.Net** 1.1 Overview of C#.NET Language 1.2 Overview of ASP.NET Features 1.3 Generics 1.4 Serialization 1.5 Membership Functionality 1.6 Globalization and Localization 1.7 Working with AJAX 1.7.1 Client Side and Server Side AJAX 1.7.2 AJAX Toolkit 1.8 Web Services 1.8.1 Introduction to Web Services 1.8.2 RESTful API 1.8.3 Working with .NET Application 1.2 Working with RESTful Services **Unit : 2 : ASP.NET MVC** 2.1 MVC Architectural Pattern 2.2 URL Routing Engine 2.3 Routing Configuration 2.4 Wiring Controller, Model, and View 2.5 Data Access and Mo leling 2.6 TempData, ViewBag and ViewData 2.7 Working with RESTful Services 2.8 Unit Testing and ASP.NET MVC 2.9 Razor View Engine **Unit : 3 : Language Integrated Queries - LINQ** 3.1 LINQ Language Features 3.2 Object Initialization 3.3 Anonymous Types 3.4 Implicitly Typed Local Variables 3.5 Lambda Expression 3.6 Query Expression 3.7 LINQ to Objects 3.8 LINQ to SQL 3.9 LINQ to Entities **Unit : 4 : Programming using C#.Net CORE** 4.1 Overview of C#.Net CORE 4.2 .NET CORE Assemblies and Libraries 4.3 Pattern Matching 4.4 Tuples and Deconstruction

	4.5 Local/Nested Functions 4.6 Expression Bodied Members 4.7 Working with Delegates and Events 4.8 Async return types 4.9 NuGet Package **Unit : 5 : Application Designing using ASP.NET Core** 5.1 Introduction to ASP.NET Core 5.2 Working with OpenID and OAuth Login 5.3 Asynchronous Programming 5.4 Multiple Environments and Development Mode 5.5 Working with WebSockets and SignalR 5.6 Self hosting of Web Applications 5.7 Dependency Injection 5.8 Action Filters 5.9 Security and Identity 5.10 Working with SQL and No-SQL Data Storage Types
Reference Book	1. Professional C# 7 and .NET Core 2.0 by Christian Nagel, Wrox / Wiley, 2018 2. C# 7 and .NET Core Cookbook by Dirk Strauss, O'Reilly / Packt Publishing Limited, 2017 3. C# 7.1 and .NET Core 2.0 - Modern Cross-Platform Development - Third Edition by Mark J. Price, Packt Publishing Limited, 2017 4. C# 7 and .NET Core 2.0 Blueprints by Dirk Strauss and Jas Rademeyer, Packt Publishing Ltd, 2018 5. C# 7 and .NET Core: Modern Cross-Platform Development by Mark J. Price, Packt Publishing Ltd, 2017 6. Learning ASP.NET Core 2.0 by Jason De Oliveira and Michel Bruchet, Packt Publishing Ltd, 2017 7. Mastering ASP.NET Core 2.0 by Ricardo Peres, Packt Publishing Limited, 2017 8. Professional ASP.NET MVC 5 by Jon Galloway, Wrox, 2014 9. Beginning ASP.NET 4.5: in C# and VB by Imar Spaanjaars, Wiley, 2014 10. ASP.NET Core 2 Fundamentals by Onur Gumus and Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2018 11. Learning ASP.NET Core MVC Programming by Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2016 12. ASP.NET Core Essentials by Shahed Chowdhuri, Packt Publishing Ltd, 2016 13. Enterprise Application Architecture with .NET Core by Ganesan Senthilvel, Ovais Mehboob Ahmed Khan, Habib Ahmed Qureshi, Packt Publishing Ltd, 2017 14. ASP.NET Core 2 and Angular 5 by Valerio De Sanctis, Packt Publishing Ltd, 2017 15. ASP.NET MVC with Entity Framework and CSS by Lee Naylor, APress, 2016 16. Pro ASP.NET Core MVC by Adam Freeman, Springer, 2016
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 7th Semester

Course: 703: Software Engineering

Course Code	703
Course Title	**Software Engineering**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	To develop skills of software engineering in students.
Course Objective	To provide insights about software engineering project planning, scheduling, SCM fundamentals, pattern based design and advanced UML concepts. Students would be able to do plan, design, analyze risk and manage a software development process efficiently after learning this course.
Course Outcomes	CO1 : Students will be able to learn about how to prepare SRS and use it in projects. CO2 : Students will be able to learn project management activities including Risk Management. CO3 : Students will be able to learn about object oriented analysis and design.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of software analysis and design
Course Outcome	This would help students to analyze risk, perform scheduling and design any kind of system.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 703 : Software Engineering

Course Code	703
Course Title	Software Engineering
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	To develop skills of software engineering in students
Course Objective	To provide insights about software engineering project planning, scheduling, SCM fundamentals, pattern based design and advanced UML concepts. Students would be able to do plan, design, analyze risk and manage a software development process efficiently after learning this course.
Pre-requisite	Basic concepts of software analysis and design
Course Out come	This would help students to analyze risk , perform scheduling and design any kind of system.
Course Content	**Unit 1 : Project Management** 1.1 Software Matrices 1.1.1 Project Management 1.1.2 Software Measurements 1.1.3 Metrics for Software Quality 1.1.4 Cost and Efforts Estimation Model 1.2. Project Scheduling 1.2.1 Relationship between People & Effort 1.2.2 Defining a Task set for the Software Project 1.2.3 Selecting & Refining Software Engineering Tasks 1.2.4 Scheduling and tracking techniques 1.2.5 Earned Value Analysis 1.3. Risk Management 1.3.1 Software Risk 1.3.2 Risk Identification and Categories of Risk 1.3.3 Projection 1.3.4 Refinement 1.3.5 RMMM Plan 1.4. Change Management 1.4.1 Software Configuration Management 1.4.2 SCM Repository 1.4.3 SCM Process 1.4.4 Version Control and Change Control 1.5. Project, task and agile development tool 1.5.1 Introduction to project and agile management tool 1.5.2 Use of tool like trello / axiom / workspace or similar **Unit 2 : Advance UML** 2.1 Introduction to UML 2.2 Structural Modeling and Use Cases 2.3 Behavioral Modeling with UML 2.4 Advanced Modeling with UML 2.5 Metadata Integration with UML, MOF and XMI **Unit 3 : Web Engineering** 3.1 Attributes of web based application 3.2 Framework of Web engineering 3.3 Analyzing Web-Based system 3.4 Design of Web-Based Application 3.5 Testing of Web Application 3.6 Management Issues **Unit 4 : Software Design patterns** 4.1 Design Pattern Principles and Techniques 4.2 Software Architecture 4.3 Types of Design patterns 4.3.1 Creational pattern 4.3.2 Structural pattern 4.3.3 Behavioral pattern

	Unit 5 : Software Quality Assurance 5.1 Software Quality Assurance 5.2 Cost of Quality 5.3 Framework and Standards SQA Framework 5.4 SQA Plan 5.5 Components of Software Quality Assurance 5.6 Quality Standards: ISO and companion Standards, CMM, CMMI, Six- Sigma
Reference Book	1. Software Engineering A practitioner's approach – Roger S Pressman - Seventh Edition- McGraw Hill 2. Object Oriented Modeling Design - James Rumbaugh, Michael Blaha – PHI 3. An Integrated Approach to Software Engineering – Pankaj Jalote – Narosa 4. Object-Oriented Software Engineering- Timothy C. Lethbridge, Robert Laganiere- TMH, 2008 5. Software quality assurance – from theory to implementation- Daniel Galin- Pearson education 6. Software Engineering- A programming approach- D. Bell, I. Morrey-PHI 7. UML 2.0 in a Nutshell: A Desktop Quick Reference (In a Nutshell (O'Reilly))-Day Pilone,Neil Pitman-2nd edition-OiReilly 8. UML Distilled: A Brief Guide to the Standard Object Modeling Language, M. Fowler,,3rd edition, Addison-Wesley 9. Meta Object Facility (MOF) 2.0 Query/View/Transformation Specification, V1.1, Object Management Group Std 10. UML™ Bible, Tom Pender, John Wiley & Sons 11. Design Patterns: Elements of Reusable Object-Oriented Software, John Vlissides, Ralph Johnson, Richard Helm, Erich Gamma, , Addison-Wesley
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. M. Desai

M.Sc. (I.T.) 7th Semester

Course: 704: Optimization Techniques

Course Code	**704**
Course Title	**Optimization Techniques**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	The purpose of this course is to impart knowledge of various Optimization Techniques.
Course Objective	To impart knowledge of various Optimization Techniques to solve real world problem.
Course Outcomes	CO1 : Students will be able to learn various optimization techniques like job sequencing and network analysis. CO2 : Students will be able to learn about queuing theory and concepts of simulation. CO3 : Students will be able to learn about dynamic programming.
Mapping between COs with PSOs	
Pre-requisite	Basic knowledge of Mathematics.
Course Outcome	Students will be able to apply Optimization Techniques for solving real world problems.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 704 : Optimization Techniques

Course Code	704
Course Title	Optimization Techniques
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc)
Last Review / Revision	June 2019
Purpose of Course	The purpose of this course is to impart knowledge of various Optimization Techniques.
Course Objective	To impart knowledge of various Optimization Techniques to solve real world problem.
Pre-requisite	Basic knowledge of Mathematics.
Course Out come	Students will be able to apply Optimization Techniques for solving real world problems.
Course Content	**Unit : 1 : Job Sequencing** 1.1 Processing n jobs through 2 machines 1.2 Processing n jobs through 3 machines 1.3 Processing 2 jobs through m machines 1.4 Processing n jobs through m machines **Unit : 2 : Network Analysis** 2.1 Project Evaluation and Review Technique (PERT) 2.2 Critical Path Method (CPM) **Unit : 3 : Queuing Theory** 3.1 Essential features of queuing system 3.2 Performance measurement of queuing system 3.3 Classification of queuing model 3.4 Single server queuing model 3.5 Multi-server queuing model **Unit : 4 : Simulation** 4.1 Simulation Introduction 4.2 Types of simulation 4.3 Steps of simulation process 4.4 Advantages and disadvantages of simulation process 4.5 Stochastic simulation and random numbers **Unit : 5 : Dynamic programming** 5.1 Dynamic programming 5.2 Developing optimum decision policy 5.3 Dynamic programming under certainty 5.4 Shortest route problem 5.5 Multiple separable Return function and single additive constraints 5.6 Additive separable Return function and single additive constraints 5.7 Additive separable Return function and single multiplicative constraints
Reference Book	1. Operation Research, S. D. Sharma; Kedar Nath, Ram Nath & Co. 2. Kantiswarup, P.K.Gupta and Manmohan: Sultan Chand and Sons. 3. Introduction to Operation Research Computer Oriented algorithm; B.E. Gillet 4. Operation research an Introduction; H.A. Taha 5. Optimization for Engineering Design, Algorithms and Examples Prentice; Kalyanmoy Deb; Hall of New Delhi, India, 2000 6. PERT and CPM: Principles and Applications; 2nd edition, 1975; Srinath L.S.
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. Y. Desai

M.Sc. (I.T.) 7th Semester

Course: 705: Practical 15

Course Code	705
Course Title	Practical 15
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2019
Purpose of Course	The course provides practical knowledge of web application development using full stack development frameworks like Node.js, AngularJs, Express, etc.
Course Objective	The course prepares students to develop lightweight application using full stack development frameworks like Node.js, AngularJs, Express, etc.
Course Outcomes	CO1 : Students will be able to develop MVC based programs using NODE.JS, Express. CO2 : Students will be able to develop backend REST API using Express and implement API Security. CO3 : Students will be able to develop front end apps using Angular and implement version controlling using git practically.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming Concepts
Course Outcome	After completion of this course, students will be able to develop light weight applications using full stack development frameworks like Node.js, AngularJs, Express, etc.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 705 : Practical 15

Course Code	705
Course Title	Practical 15
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of web application development using full stack development frameworks like Node.js, AngularJs, Express, etc.
Course Objective	The course prepares students to develop light weight application using full stack development frameworks like Node.js, AngularJs, Express, etc.
Prerequisite	Object Oriented Programming Concepts
Course Outcome	After completion of this course, students will be able to develop light weight applications using full stack development frameworks like Node.js, AngularJs, Express, etc.
Course Content	Practical based on Paper No. 701 - Application Development using Full Stack.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

P. M. Das

M.Sc. (I.T.) 7th Semester

Course: 706: Practical 16

Course Code	**706**
Course Title	**Practical 16**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2019
Purpose of Course	The course provides practical knowledge of C#, LINQ, .NET Core, MVC, etc.
Course Objective	The course prepares students to develop .NET based web applications.
Course Outcomes	CO1 : Students will be able to develop MVC Core and MVC 5 based programs. CO2 : Students will be able to develop Web API in .NET framework and .NET Core and use it in other apps. CO3 : Students will be able to implement C# language features like tuples, expression bodied members, local/nested functions, delegates & events and LINQ practically.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming Concepts
Course Outcome	After completion of this course, students will be able to develop .NET based web applications.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 706 : Practical 16

Course Code	706
Course Title	Practical 16
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of C#, LINQ, .NET Core, MVC, etc.
Course Objective	The course prepares students to develop .NET based web applications.
Prerequisite	Object Oriented Programming Concepts
Course Outcome	After completion of this course, students will be able to develop .NET based web applications.
Course Content	Practical based on Paper No. 702- Application Development using .NET CORE.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 7th Semester

Course: 707: Part Time Project 1

Course Code	**707**
Course **Title**	**Part Time Project 1**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2019
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.
Course Objective	To help students to develop software applications using AngularJS, Node.js and .NET.
Course Outcomes	CO1 : Students will be able to develop project using different technologies like Angular, Node.js and .NET. CO2 : Students will be able to apply software engineering concepts to solve real world problems. CO3 : Students will be able to apply database related concepts to design database for the project.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.

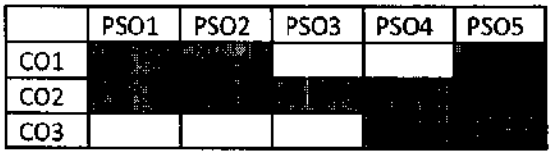
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 707 : Part Time Project 1

Course Code	707
Course Title	Part Time Project 1
Credit	3
Teaching Per Week	3 Hrs
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.
Course Objective	To help students to develop software applications using AngularJS, Node.js and .NET.
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.
Course Content	The students are required to develop a project using .NET technologies and popular JavaScript based frameworks. The students must prepare documentation of the project completed 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 institution. 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. Project Title Report 3. Progress Report 4. Project Completion Certificate 5. Institution Certificate 6. Non disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 8th Semester

Course: 801: Java Web Development

Course Code	**801**
Course Title	**Java Web Development**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to get an idea about how to use Java in Web Programming
Course Objective	The objective of the course is to make them understand and implement the Web Oriented Project Development Model of Java
Course Outcomes	CO1 : Students will be able to learn about Java architecture and different frameworks. CO2 : Students will be able to learn about Java design patterns. CO3 : Students will be able to learn about Java security with authentication and authorization.
Mapping between COs with PSOs	
Pre-requisite	Understanding of OOPS concept and its implementation by Java Language
Course Outcome	Students will be able to develop Web Application in Java

Course : IT 801 : Java Web Development

Course Code	801
Course Title	Java Web Development
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course helps students to get an idea about how to use Java in Web Programming
Course Objective	The objective of the course is to make them understand and implement the Web Oriented Project Development Model of Java
Pre-requisite	Understanding of OOPS concept and its implementation by Java Language
Course Out come	Students will be able to develop Web Application in Java
Course Content	**Unit 1 : JAVA Web Architecture** 1.1 The Java Advantage for Web 1.2 Java Editions, Java Enterprise Edition 1.3 Java EE Web Architecture 1.4 Java Web Application Servers 1.5 Installing and Configuring Payara Application Server 1.6 Java EE APIs for building Web Applications 1.7 IDEs for Enterprise Application Development **Unit 2 JAVA Servlets** 2.1 Introduction to Java Servlets 2.2 The Java Servlet API 2.3 Servlet Life Cycle 2.4 Request and Response 2.5 Dispatching and forwarding the request 2.6 Getting Values from Forms and QueryStrings 2.7 Working with HTTP Headers 2.8 Cookies 2.9 Hidden Form Field 2.10 URL Rewriting 2.11 Session 2.12 ServletConfig and ServletContext 2.13 Attribute in Servlet 2.14 Servlet Filters 2.15 Servlet Web Listeners 2.16 Working with Databases 2.17 Configuring Deployment Descriptor(web.xml) 2.18 Asynchronous Servlets 2.19 Server Push 2.20 Web sockets **UNIT- 3 JAVA SERVER PAGES, JSTL AND EL** 3.1 Introduction to Java Server Pages(JSP 3.2 Lifecycle of JSP 3.3 JSP Scripting Elements 3.4 Implicit Objects 3.5 JSP Directive Elements 3.6 Action Elements 3.7 Working with Java Beans 3.8 JSP Form Processing, Form Validation with Java Bean 3.9 JSP Custom Tags 3.10 State Management 3.11 Working with AJAX

	3.12 Working with Web Sockets 3.13 EL - Expression Language 3.14 Introduction to JSTL 3.15 Internationalization and Localization with fmt tag 3.16 Working with XML with JSTL 3.17 Working with Databases with JSTL/FI **Unit 4 : JAVA Web Application Frameworks** 4.1 Component Based Framework – JAVA SERVER FACES 4.1.1 Introduction to JSF 4.1.2 Request Processing Lifecycle 4.1.3 JSF Managed Beans 4.1.4 JSF UI Components 4.1.5 JSF Validators and Converters 4.1.6 Event Handling 4.1.7 Composite Components 4.1.8 Templating in JSF 4.1.9 Working with databases 4.1.10 Working with primefaces 4.2 Action Based Framework – SPRING 4.2.1 Introduction to Spring 4.2.2 Lifecycle of Spring MVC 4.2.3 DispatcherServlet 4.2.4 Multiple Controllers 4.2.5 Working with databases 4.2.6 Spring Boot **Unit 5 - JAVA Web Security** 5.1 The Need of ertificates Web Security 5.2 Realm, Users, Group and Roles 5.3 Basic Authentication 5.4 Form Based Authentication 5.5 Protecting Your Resources with Authorization 5.6 Java API for Authentication and Security – JAAS 5.7 Using SSL Certificates in Web Application
Reference Book	1. JDBC 4.2, Servlet 3.1, and JSP 2.3 Includes JSF 2.2 and Design Patterns, Black Book, 2ed - Santosh Kumar, Dreamtech Press 2. Servlet & JSP: A Beginner's Tutorial - Budi Kurniawan, Brainy Software 3. The Definitive Guide to JSF in Java EE 8: Building Web Applications with JavaServer Faces - Bauke Scholtz, Arjan Tijms – Apress 4. Mastering JavaServer Faces 2.2 - Anghel Leonard - Packt Publishing 5. Spring in Action 4ed - Craig Walls – Manning 6. Getting Started With Spring Framework: A Hands-on Guide to Begin Developing Applications Using Spring Framework - Ashish Sarin, J Sharma - Createspace Independent Pub 7. Spring 5 Design Patterns - Dinesh Rajput – Packt 8. Learning Spring Boot 2.0 - Greg L. Turnquist - Packt
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 8th Semester

Course: 802: Enterprise Java

Course Code	802
Course Title	Enterprise Java
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to understand and develop large scale enterprise , distributed and scalable applications using Java
Course Objective	The objective of the course is to provide in depth knowledge of all JAVA API which contribute to the development of high performing , secure , distributed and scalable applications in line with the current trends in the software industry
Course Outcomes	CO1 : Students will be able to learn about enterprise business logic, enterprise security and database persistence. CO2 : Students will be able to learn about concepts of web services, REST services and REST patterns. CO3 : Students will be able to learn about enterprise java security with SSL certificates, securing REST services with authentication and SSL.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Java Language and Web Application concepts
Course Outcome	Students will be able to develop large scale and distributed applications in Java

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 802 : Enterprise Java

Course Code	IT 802
Course Title	Enterprise Java
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course helps students to understand and develop large scale enterprise , distributed and scalable applications using Java
Course Objective	The objective of the course is to provide in depth knowledge of all JAVA API which contribute to the development of high performing , secure , distributed and scalable applications in line with the current trends in the software industry
Pre-requisite	Knowledge of Java Language and Web Application concepts
Course Out come	Students will be able to develop large scale and distributed applications in Java
Course Content	**Unit 1 - JAVA EE and EJB** 1.1 Layered model architectures – principles and goals 1.2 Java EE definition and characteristics 1.3 Java EE technologies in a multi-tier architecture 1.4 Stateless Session Bean 1.5 Stateful Session Bean 1.6 Binding and looking up objects 1.7 Singleton Beans 1.8 Local and Remote Lookups 1.9 Timers and Schedulers 1.10 Asynchronous Beans **Unit-2 JAVA Messaging Services** 2.1 JMS Architecture 2.2 Queue And Topic Messages 2.3 Message Driven Beans Life Cycle 2.4 JMS Producers and Consumers 2.5 Creating Client for MDB **Unit 3 – ORM With JAVA Persistence** 3.1 JPA overview 3.2 JPA architecture 3.3 ORM with Entities 3.4 JPA Annotations 3.5 One to One 3.6 One to Many 3.7 Many to Many Relationships 3.8 JPA Query Language 3.9 Named, Dynamic Queries AND Native Queries 3.10 Criteria Queries 3.11 Transactions 3.12 Using Hibernate as ORM **Unit 4 - WEB Services** 4.1 Introduction to web services 4.2 SOAP Envelope ,WSDL , Schema and UDDI 4.3 Creating and Publishing a SOAP based Web Service 4.4 Searching and Consuming SOAP based Web Service 4.5 Google Remote Procedure Call (GRPC) 4.6 REST services with JAX-RS API 4.7 REST Patterns

	4.8 Using HTTP Methods and URL-Patterns in REST 4.9 JERSEY Client for REST Services 4.10 Using JavaScript API for calling REST methods 4.11 Micro-Services Architecture in Java 4.12 In Grid Data base using JCache / Hazelcast Unit 5 - JAVA Enterprise Security 5.1 Java API for Authentication and Security – JAAS 5.2 JAAS security for web and EJB applications 5.3 Maintaining Confidentiality and Trust with SSL certificates 5.4 JAAS Security to SOAP based Web Services 5.5 Securing REST services using Authentication Filters 5.6 Securing REST services with SSL 5.7 Security with JWT and OAuth
Reference Book	1. Mastering Enterprise JavaBeans , Enterprise Edition, by Ed Roman 2. Java 8 EE Tutorial : Basic Concepts by Oracle press 3. Beginning Java™ EE 8 Platform with PayaraTM Server Novice to Professional by Antonio Goncalves 4. Microservice Architecture: Aligning Principles, Practices, and Culture by Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen 2018 5. Java EE 8 Application Development by David R. Heffelfinger Packt Publication Jan 2018 6. Beginning EJB 3: Java EE 7 Edition by by Wetherbee and Chirag Rathod 7. High-Performance Java Persistence by Vlad Mihalcea 2018
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 8th Semester

Course: 803: Elective 1: Smart Device Computing Using iOS

Course Code	**803**
Course Title	**Elective 1: Smart Device Computing Using iOS**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	The Purpose of course is to help understanding the components and structure of mobile application development using iOS. The course also provides students with the skills necessary to develop an iOS App from scratch to deploying it on the Apple Store.
Course Objective	The objective of the course is to impart knowledge of Swift and Apple iOS application Design and Development.
Course Outcomes	CO1 : Students will be able to learn about latest design concepts, controls and components of iPAd/ iPhone application development. CO2 : Students will be able to learn the different design patterns and UIControls in iOS with Swift programming. CO3 : Students will be able to learn about data persistence, services and data manipulation techniques.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Object Oriented Programming is desirable.
Course Outcome	The primary learning outcome for this course is that students will be able to design and create iOS apps. Students will leverage Swift, the iOS SDK, and Apple developer tools. With iOS as the platform, students will learn Object-oriented programming, Design Patterns, Type Systems, Functional Language features, user interface design, best practices in programming, and problem analysis.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: 803 Elective 1: Smart Device Computing Using iOS

Course Code	803 Elective 1
Course Title	Smart Device Computing Using iOS
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	The Purpose of course is to help understanding the components and structure of mobile application development using iOS. The course also provides students with the skills necessary to develop an iOS App from scratch to deploying it on the Apple Store.
Course Objective	The objective of the course is to impart knowledge of Swift and Apple iOS application Design and Development.
Pre-requisite	Knowledge of Object Oriented Programming is desirable.
Course Out come	The primary learning outcome for this course is that students will be able to design and create iOS apps. Students will leverage Swift, the iOS SDK, and Apple developer tools. With iOS as the platform, students will learn Object-oriented programming, Design Patterns, Type Systems, Functional Language features, user interface design, best practices in programming, and problem analysis.
Course Content	**Unit 1 : Introduction to iOS with Swift Language** 1.1. Introduction iOS and iOS Architecture 1.1.1. Foundation Framework 1.1.2. Cocoa Framework 1.2. Introduction to Xcode IDE 1.2.1. Setting up Development Environment 1.2.2. Xcode Development Tools – Interface Builder and Simulator 1.2.3. Testing and Debugging 1.3. Introduction to Swift 1.3.1. Datatypes, Variables in Swift 1.3.2. Tuples, Constants, Literals in Swift 1.3.3. Working with Strings in Swift 1.4. Optionals in Swift 1.4.1. Implicit Optionals 1.4.2. Explicit Optionals 1.5. Collections in Swift 1.5.1. Dictionaries, Arrays, and Sets 1.6. Control Flows and Functions in Swift 1.7. Object Oriented Programming in Swift 1.7.1. Custom Class and Instance Creation 1.7.2. Inheritance and Polymorphism 1.8. Properties and it's Attributes 1.9. Initializers in swift 1.9.1. Id 1.9.2. Self 1.9.3. Super 1.10. Enum and Struct 1.11. Protocols and Extensions 1.12. Information Property List File and App Permissions **Unit 2 : iOS Design Patterns** 2.1 Introduction to Storyboard 2.2 Introduction to UIView, UIWindow and UIViewController 2.3 Model View Controller (MVC) Pattern in Interface Design 2.4 Application Life Cycle and View Controller Life Cycle 2.5 Working with Basic UIElements 2.5.1 UILabel, UIButton, UITextFeild, UIImageView etc. 2.6 IBActions and IBOutlets 2.7 Auto Layout Constraints to create Adaptive UI

	2.8 UIAnimation 2.8.1 Animation using Auto Layout Constraints 2.8.2 Animation with UIImageView 2.9 Recognizing and Handling Gestures 2.9.1 Introduction to UIGestureRecognizer 2.9.2 Working with different types of Gestures 2.9.3 Gestures with UIElements **Unit 3 : UIControls in iOS** 3.1 Navigation Controller and its Usage 3.2 Navigation Techniques 3.2.1 Segue 3.2.2 Push and Pop 3.2.3 Present and Dismiss 3.3 Working with TableView 3.3.1 Static TableViewController 3.3.2 Dynamic TableView 3.3.2.1 Plain TableView 3.3.2.2 Grouped TableView 3.4 Working with PickerView 3.4.1 UIPickerView 3.4.2 UIDatePickerView 3.5 Working with Miscellaneous Controls in iOS 3.5.1 UICollectionView 3.5.2 UITabBarController 3.5.3 UIScrollView 3.5.4 UIWebView 3.5.5 ContainerView 3.6 Working with AlertController and its Types **Unit 4 : Data Persistence and Data Manipulation Techniques** 4.1 Working with UserDefaults for data persistence 4.2 Introduction to FileManager 4.3 Frameworks and Library Configurations 4.4 Data Persistence Techniques 4.4.1 SQlite Framework 4.4.2 Core Data Framework 4.5 Working with URL and URL Classes 4.6 Data Manipulation Techniques 4.6.1 JSON Parsing 4.6.2 XML Parsing **Unit 5 : Advance Programming in iOS** 5.1 Location based Services 5.1.1. Core Location Services 5.1.2. CLLocation and CLLocationManager Classes 5.1.3. MapKit, MapView and MKPointAnnotation 5.1.4. Location Based Call-outs 5.2 Introduction to the working of Push Notifications 5.3 Publishing iOS App to Apple Store
Reference Book:	1. Swift Programming: The Big Nerd Ranch Guide (2nd Edition) (Big Nerd Ranch Guides) 2nd Edition by Matthew Mathias (Author), John Gallagher (Author) 2. Swift: A Comprehensive Intermediate Guide to Learn and Master the Concept of Swift Programming Kindle Edition by MG Martin (Author) 3. iOS 12 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics 1st Edition by Matt Neuburg (Author) 4. Classic Computer Science Problems in Swift: Essential Techniques for Practicing Programmers1st Edition by David Kopec
Teaching Methodology:	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method:	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 8th Semester

Course: 803: Elective 2: Smart Device Computing Using Android

Course Code	**803**
Course Title	**Elective 2: Smart Device Computing Using Android**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	Purpose of Course is help students to understand the components and structure of mobile application development framework of Android. The course also provides students with the skills necessary to develop an Android App from scratch to deploying it on the Google App Store.
Course Objective	Learn the basic and important design concepts and issues of development of mobile applications. Understand the capabilities and limitations of mobile devices. Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible.
Course Outcomes	CO1 : Students will be able to learn about latest design concepts, controls and components of mobile application development in Android. CO2 : Students will be able to develop android applications using local database SQLite and integrate webservices in Android. CO3 : Students will be able to learn about different android services like background services, location based services, google maps etc.
Mapping between COs with PSOs	
Pre-requisite	Basic programming knowledge of Java and Event handling
Course Outcome	Course Outcome is student will design and develop user Interfaces for the Android platform by applying Java programming concepts to Android application development and will be familiar with technology and business trends impacting mobile applications. Competent with the characterization and architecture of mobile applications

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: 803 Elective 2: Smart Device Computing Using Android

Course Code	803 Elective 2
Course Title	Smart Device Computing Using Android
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, practical, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	Purpose of Course is help students to understand the components and structure of mobile application development framework of Android. The course also provides students with the skills necessary to develop an Android App from scratch to deploying it on the Google App Store.
Course Objective	Learn the basic and important design concepts and issues of development of mobile applications. Understand the capabilities and limitations of mobile devices. Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible.
Pre-requisite	Basic programming knowledge of Java and Event handling
Course Out come	Course Out come is student will design and develop user Interfaces for the Android platform by applying Java programming concepts to Android application development and will be familiar with technology and business trends impacting mobile applications. Competent with the characterization and architecture of mobile applications
Course Content	**Unit 1 : Basics of Android** 1.1. Introduction to Android OS 1.1.1. Android Framework 1.2. Introduction to Android Studio 1.2.1. Setting up development environment 1.2.2. Android Development Tools 1.2.3. Android Studio Project structure 1.2.4. Testing and Debugging 1.3. Activity and Activity Life Cycle 1.4. View and ViewGroups 1.4.1. Linearlayout, Relative Layout, Constraint Layout, Webview,Gridview, Recycler View, Adapter View 1.5. Intent and Intent filter 1.6. Android UI Widgets 1.7. Menus in Android 1.7.1. OptionsMenu 1.7.2. PopupMenu 1.7.3. ContextMenu 1.8. Dialogs and Notifications 1.9. Fragment 1.9.1. Fragment Life Cycle 1.9.2. Creating Fragment 1.9.3. Communicate with other fragments 1.10. Styles and Themes 1.11. App Manifest File 1.12. App Permissions 1.13. App Bar 1.13.1. Setup the App bar 1.13.2. Add and handle actions **Unit 2 : Data Storage and Retrival** 2.1 Working with files 2.1.1 Internal Storage 2.1.2 External Storage 2.2 Working with network(P2P connection) 2.3 Managing Data using SQLite 2.4 Database Debugging 2.5 Shared Preferences 2.6 Content Provider

	2.6.1 ContentResolver 2.6.2 Working with Content Provider(Contacts,SMS,Call,MMS) 2.6.3 Creating Content Provider 2.7 Data Backup **Unit 3 : Services in Android** 3.1 Overview of Services 3.2 Service types 3.2.1 Bounded 3.2.2 Started 3.3 Asynchronous Task 3.4 Broadcast Receivers 3.4.1 Listening for specified broadcasts 3.4.2 System broadcasts 3.4.3 Custom & User defined broadcasts 3.4.4 Sticky Broadcasts 3.5 Google play services 3.6 Google Map and Events with Google Map 3.7 Geo coding and Reverse geo coding **Unit 4 : Working with Audio, Video and Camera** 4.1 Camera 4.1.1 Taking Photos 4.1.2 Recording Videos 4.1.3 Controlling the camera 4.2 Images & Graphics 4.2.1 Drawables 4.3 Audio and Video 4.3.1 MediaPlayer 4.3.2 MediaController 4.4 Animations **Unit 5 : Advance Programming in Adroid** 5.1 Android Web Services 5.1.1. Check HttpURL Connection. 5.1.2. Web Service Call 5.1.3. SQLITE and MySql in web Service 5.2 XML and JSON Parsing 5.3 Push Notifications 5.4 Working with Bluetooth, Wi-Fi and Sensors 5.5 Kotlin language in Android 5.6 Gradle plugin integration 5.7 Social Login with Google, Facebook or Twitter 5.8 Network Connectivity 5.9 Publishing App
Reference Book	1. Professional Android 4 by Reto Meier WROX Publication 2. Hello, Android: Introducing Google's Mobile Development Platform by Ed Burnitte SPD publication 3. Android Essentials by Chris Haseman Apress Publication 4. Android Development by Mark L Murphy Wiley India 5. Sams Teach Yourself Android by Lauren Darcey &Sams Publishing 6. Android Application Development Black Book by Pradeep Kothari Dreamtech publication 7. Android Programming : Pushing the Limits by Erik Hellman Wiley India 8. Android Sensor Programming by Greg Milette Wiley India
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

P. Y. Desai

M.Sc. (I.T.) 8th Semester

Course: 804: Artificial Intelligence

Course Code	804
Course Title	**Artificial Intelligence**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course makes students learn to develop solutions for solving various artificial Intelligence based problem using PROLOG
Course Objective	To provide background knowledge of AI and to prepare students for further studies in AI
Course Outcomes	CO1 : Students will be able to learn about concepts of AI and intelligent agent. CO2 : Students will be able to learn various searching techniques,game playing techniques etc. CO3 : Students will be able to learn about knowledge representation and use it in ML, NLP, Expert System etc.
Mapping between COs with PSOs	
Pre-requisite	Significant experience in programming , knowledge of data structures and mathematical concepts
Course Outcome	After learning this course, students will be able to understand, identify and solve artificial intelligence problems, understand NLP and ML

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 804 : Artificial Intelligence

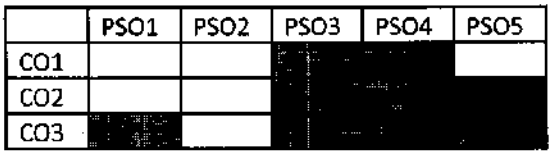
Course Code	804
Course Title	Artificial Intelligence
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course makes students learn to develop solutions for solving various artificial intelligence based problem using PROLOG
Course Objective	To provide background knowledge of AI and to prepare students for further studies in AI
Pre-requisite	Significant experience in programming , knowledge of data structures and mathematical concepts
Course Outcome	After learning this course, students will be able to understand, identify and solve artificial intelligence problems, understand NLP and ML
Course Content	**Unit : 1 : Introduction to AI and Intelligent Agent** 1.1 Introduction to AI 1.2 History of AI 1.3 Emergence of Intelligent Agents 1.4 PEAS Representation for an agent 1.5 Agent Environment 1.6 Concept of Rational Agent 1.7 Structure of Intelligent Agents 1.8 Types of Agents 1.9 Communication as Action 1.10 Types of Communicating Agents **Unit : 2 : Search Algorithms and Optimization** 2.1 Solving Problems by Searching 2.2 Problem Formulation 2.3 Uninformed Search Methods - DFS, BFS, Iterative Deepening, Comparing Different Techniques, Search DFID 2.4 Informed Search Methods- Heuristic Functions, Hill Climbing, Simulated Annealing, A*, Performance Evaluation, AO*, Beam Search, Tabu Search, Dijkstra's Algorithm 2.5 Constraint Satisfaction Problems, Map Coloring, Crypt Arithmetic, Backtracking for CSP, Local Search **Unit : 3 : Gaming** 3.1 Game Playing 3.2 Game Playing - Minimax Search 3.3 Game Playing - AlphaBeta 3.4 Game Playing - SSS* **Unit : 4 : Planning** 4.1 Planning FSSP, BSSP 4.2 Goal Stack Planning, Sussman's Anomaly 4.3 Non-linear planning 4.4 Plan Space Planning 4.5 Graph Plan 4.6 Game Playing Algorithms 4.7 Planning as constraint Satisfaction **Unit : 5 : Knowledge Representation** 5.1 A knowledge based Agents

P. M. Dasi

	5.2 Logic and Inferences 5.2.1 Formal Logic 5.2.2 Logic and knowledge 5.2.3 Propositional Logic 5.2.4 Resolution Method and Refutation for PL 5.2.5 First-Order Logic (FOL) 5.2.6 Incompleteness of forward chaining 5.2.7 Forward and backward chaining , Resolution 5.2.8 Horn Clauses and SLD resolution 5.2.9 Overview of Second Order Logic 5.3 Genetic Algorithms 5.4 Fuzzy Logic 5.5 Expert System Life Cycle 5.6 States in Expert System Development 5.7 RETE Algorithm for Pattern Matching 5.8 Introduction to Ontology and its applications 5.9 Rule Based Programs using PROLOG 5.9.1 Facts 5.9.2 Objects 5.9.3 Predicates and Rules 5.9.4 PROLOG Variable and its Type 5.9.5 Arithmetic and Relational Operators 5.9.6 I/O Predicates 5.9.7 Fail & ! Predicates 5.9.8 Recursion & repeat predicates
Teaching Methodology	Black Board Teaching, power point presentation for theory &, practical
Evaluation Method	30% Internal Exam 70% External Exam

M.Sc. (I.T.) 8th Semester

Course: 805: Practical 17

Course Code	**805**
Course Title	**Practical 17**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2019
Purpose of Course	The course provides practical knowledge of web application development using JAVA technologies like JSP, Servlets, JSF, EJB, JMS, JPA, etc.
Course Objective	The course prepares students to develop web applications using JAVA based frameworks.
Course Outcomes	CO1 : Students will be able to develop web applications using JAVA based frameworks and design patterns. CO2 : Students will be able to implement java security and enterprise java security with authentication and authorization. CO3 : Students will be able to implement web services, REST services and REST patterns in their web applications.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming Concepts and Core JAVA
Course Outcome	After completion of this course, students will be able to develop web applications using JAVA.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 805 : Practical 17

Course Code	805
Course Title	Practical 17
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of web application development using JAVA technologies like JSP, Servlests, JSF, EJB, JMS, JPA, etc.
Course Objective	The course prepares students to develop web applications using JAVA based frameworks.
Prerequisite	Object Oriented Programming Concepts and Core JAVA
Course Outcome	After completion of this course, students will be able to develop web applications using JAVA.
Course Content	Practical based on Paper No. 801 – JAVA Web Development and 802 – Enterprise JAVA.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 8th Semester

Course: 806: Practical 18

Course Code	**806**
Course Title	**Practical 18**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2019
Purpose of Course	The course provides practical knowledge of application development for smart devices using iOS or Android.
Course Objective	The course prepares students to develop applications for smart devices using iOS or Android.
Course Outcomes	**Elective 1** CO1 : Students will be able to develop simple applications with playground tools in XCode. CO2 : Students will be able to develop GUI applications with XCode IDE. CO3 : Students will be able to develop location based services using various frameworks. **Elective 2** CO1 : Students will be able to develop android applications using the latest design concepts, controls and components. CO2 : Students will be able to develop applications using the local database-SQLite and integrate webservices in android. CO3 : Students will be able to create applications using background services, location services, google maps, etc.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Basic Programming Concepts
Course Outcome	After completion of this course, students will be able to develop applications for smart devices using iOS or Android.

Course : IT 806 : Practical 18

Course Code	806
Course Title	Practical 18
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of application development for smart devices using iOS or Android.
Course Objective	The course prepares students to develop applications for smart devices using iOS or Android.
Prerequisite	Basic Programming Concepts
Course Outcome	After completion of this course, students will be able to develop applications for smart devices using iOS or Android.
Course Content	Practical based on elective Paper No. 803 – (Elective I : Smart Device Computing Using iOS or Elective II : Smart Device Computing Using Android).
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 8th Semester

Course: 807: Part Time Project 2

Course Code	**807**
Course Title	**Part Time Project 2**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2019
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.
Course Objective	To help students to develop software applications using Java Enterprise Edition.
Course Outcomes	CO1 : Students will be able to develop multi layered and MVC based Java applications. CO2 : Students will be able to apply Software engineering concepts to solve real world problems. CO3 : Students will be able to apply database related concepts to design database for the project.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : 807 : Part Time Project 2

Course Code	807
Course Title	Part Time Project 2
Credit	3
Teaching Per Week	3 Hrs
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.
Course Objective	To help students to develop software applications using Java Enterprise Edition.
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.
Course Content	The students are required to develop project using Java Enterprise Edition. The students must prepare documentation of the project completed 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 institution. 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. Project Title Report 3. Progress Report 4. Project Completion Certificate 5. Institution Certificate 6. Non disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)
Reference Books	NIL
Teaching Methodology	Project guidance, Review
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 Criteria	5 Years (Integrated): 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	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** The program trains students for designing and conceptualizing the software architecture, planning and managing the product development process of complex and live software projects. It also makes students understand the decision making for selection of an appropriate project management capabilities. **PO6 : Real World Problem / Project Development** Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Students will learn to develop and strengthen the fundamental concepts that are required to solve complex programming problems.

	PSO2 : Students will develop the ability to identify, formulate and design solutions to face computational challenges. PSO3 : Students will be able to apply software engineering concepts to solve real world problems. PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile application, Desktop application, etc. PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.T domain.
Mapping between POs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
PO1					
PO2					
PO3					
PO4					
PO5					
PO6					
PO7					

Medium of Instruction	English
Program Structure	M.Sc. (I.T.) – Semester 9 (M.Sc. (I.T.) 5 years Integrated Course)

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
901	Internet of Things	4	0	4	3 Hrs	70	30	100
902	Machine Learning using Python	4	0	4	3 Hrs	70	30	100
903	Cloud Computing	4	0	4	3 Hrs	70	30	100
904	Business Intelligence	4	0	4	3 Hrs	70	30	100
905	Practical 19	-	3	3	2 Hrs	70	30	100
906	Practical 20	-	3	3	2 Hrs	70	30	100
907	Part Time Project 3	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700

Program Structure	B.Sc. (I.T.) – Semester 10 (M.Sc. (I.T.) 5 years Integrated Course)

Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
1001	Project	-	-	25	-	490	210	700
	Total			25	-	490	210	700

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 2020

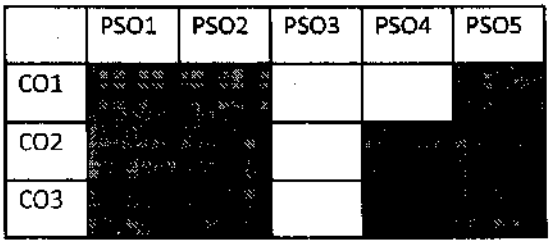
Program Structure		**M.Sc. (I.T.) – Semester 9 (M.Sc. (I.T.) 5 years Integrated Course)**						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
901	Internet of Things	4	0	4	3 Hrs	70	30	100
902	Machine Learning using Python	4	0	4	3 Hrs	70	30	100
903	Cloud Computing	4	0	4	3 Hrs	70	30	100
904	Business Intelligence	4	0	4	3 Hrs	70	30	100
905	Practical 19	-	3	3	2 Hrs	70	30	100
906	Practical 20	-	3	3	2 Hrs	70	30	100
907	Part Time Project 3	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700

Program Structure		**M.Sc. (I.T.) – Semester 10 (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		
1001	Project	-	-	25	-	490	210	700
	Total			25	-	490	210	700

Program Passing Rules	**As per University rules**

M.Sc. (I.T.) 9th Semester

Course: 901: Internet of Things

Course Code	**901**
Course Title	**Internet of Things**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of this course is to provide way to understand concept of Internet of Things (IoT) Architecture, various protocols and implementation of IOT Applications.
Course Objective	To provide understanding of IoT application development process, IOT reference architecture, concept of data communication in IoT and usage of development platforms & Tools.
Course Outcomes	CO1 : Students will be able to learn about role of embedded system in IOT CO2 : Students will be able to learn about connectivity of IOT with Internet, Cloud etc. CO3 : Students will be able to learn to collect sensor data in real time environment and develop machine to machine communication.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Programming and Computer Network
Course Outcome	After completion of this course students will be able to understand IOT reference architecture and IoT application development process.

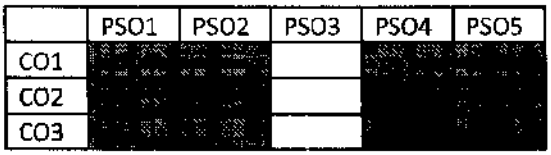
Course : IT 901 : Internet of Things

Course Code	901
Course Title	Internet of Things
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2020
Purpose of Course	The purpose of this course to providesway to understand concept of Internet of Things (IoT) Architecture,various protocols andimplementation of IOT Applications.
Course Objective	To provide understanding of IoT application development process, IOT reference architecture, concept of data communication in IoT and usage of development platforms & Tools.
Pre-requisite	Basicconcepts ofProgramming and Computer Network
Course Out come	After completion of this course students will be ableto understand IOT reference architecture and IoT application development process.
Course Content	**Unit : 1: Introduction of IOT** 1.1 Introduction of IOT, 1.2 Introduction of IOT reference architecture and IOT reference model 1.3 IOT application fields. 1.4 Threads and security issues with IOT system. 1.5 IOT case studies **Unit : 2: IOT hardware platforms of IOT end devices** 2.1 Sensing devices and smart IOT end points : Sensors, sensor devices and Input devices, actuators 2.2 Introduction of Embedded system and its role in IOT 2.3 Embedded system microcontroller architecture :8-bit microcontroller: 8051, 32 bit microcontroller: ARM 2.4 Introduction IOT system educational Hardware development platforms: Arduino and Raspberry Pi 2.5 Introduction of Raspberry Pi hardware Peripherals **Unit : 3: IOT communication Protocols and information theory** 3.1 RF energy and theoretical range 3.2 Short range communication used in IOT: Non-IP based and IP based WPAN (Wireless personal area network) and its protocols 3.3 Long rang communication(LPWAN) used in IOT and its protocols 3.4 IOT edge to cloud protocols, Cloud service models 3.5 Introduction of Data management system for IOT **Unit : 4: Software Installation and Python Programming** 4.1 Overview of Raspberry Pi (RPi) hardware platforms and Compatible operating systems 4.2 Setup and Install of Operating System on Raspberry Pi 4.3 Raspbian OS package Installation and updating process. 4.4 Overview of Super user privileges, Linux commands, Navigating file system, Integration with file and source code over internet through command line interface in Raspberry Pi 4.5 Working with Python script. 4.6 Dictionary concept in Python. 4.7 Formatting number and dates in Python. 4.8 File handing in Python 4.9 Exception handling in Python 4.10 Command line arguments in Python **Unit : 5: Building IoT Applications using variousDevelopment Platforms** 5.1 Interface with various types of sensors using Arduino and Raspberry Pi. 5.2 Working with various types of I/O and Peripherals of Raspberry Pi 5.3 Working with database in IOT.

	5.4 Introduction of open source tools supported by Raspberry pi for IoT. 5.5 IOT Application development using open source tool. 5.5.1 Implementation of IoT Communication Models and Protocols. 5.5.2 IoT Applications with Data Logging and Reporting
Reference Book	1. Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education private limited, 2017 2. Learning Internet of Things, Peter Waher, / Packt Publishing Limited, 2015 3. Internet of Things: Technologies and Applications for a New Age of Intelligence,Vlasios Tsiatsis, Stamatis Karnouskos and Jan Holler, Academic Press,2018 4. Raspberry Pi Cookbook,Simon Monk,, O'Reilly Publishing Limited, 2014 5. The Internet of Things, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley,2018 6. Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley,2018 7. The Internet of Things, Hakima Chaouchi, Wiley,2017 8. Linux Lab: Hands on Linux, dreamtech Press,2012 9. Python Machine Learning by Sebastian Raschka, Packt, 2015 10. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili, Packt, 2017 11. Machine Learning using Python by U Dinesh Kumar and Manaranjan Pradhan, Wiley, 2019
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 9th Semester

Course: 902: Machine Learning using Python

Course Code	**902**
Course Title	**Machine Learning using Python**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	This course helps students to understand and implement Machine Learning concepts using Python language.
Course Objective	To impart a comprehensive knowledge of Python language and machine learning concepts.
Course Outcomes	CO1 : Students will be able to learn how to evaluate models generated from data CO2 : Students will be able to design and implement various machine learning algorithms for real-world problems using Python programming language. CO3 : Students will be able to learn Regression Techniques and Advanced ML using Python libraries.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Programming, Mathematical and Statistics
Course Outcome	After completing the course student will be able to develop programs using Python language and implement supervised and unsupervised machine learning algorithms.

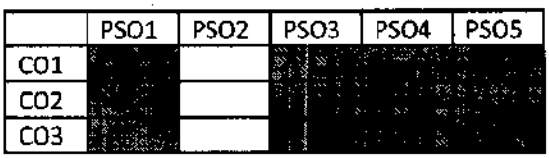
Course : IT 902 : Machine Learning using Python

Course Code	902
Course Title	Machine Learning using Python
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2020
Purpose of Course	This course helps students to understand and implement Machine Learning concepts using Python language
Course Objective	To impart a comprehensive knowledge of Python language and machine learning concepts.
Pre-requisite	Basic concepts of Programming, Mathematical and Statistics
Course Out come	After completing the course student will be able to develop programs using Python language and implement supervised and unsupervised machine learning algorithms.
Course Content	**Unit : 1: Introduction to Machine Learning** 1.1 Overview of ML 1.2 Applications of ML 1.3 ML types 1.4 ML Tools 1.5 Characterization of Machine Learning Problems **Unit : 2: Python for Machine Learning** 2.1 Python Environment Set-up 2.2 Python variables and Data Types 2.3 Python syntax 2.4 Python Operators - Comparison, Logical and Identity 2.5 Python Conditional statements 2.6 Python Functions 2.7 Python Sequences 2.8 Lists, Tuples, Dictionaries 2.9 Python Iterations 2.10 Python Object Oriented Programming 2.11 Python Math Operations - Matrix, Scalars and Vectors, Arrays in Python, Addition and Subtraction of matrices, Dot Product of matrices **Unit : 3: Working with Python Libraries** 3.1 Numpy 3.2 Pandas 3.3 Scipy 3.4 Scikit-learn 3.5 TensorFlow 3.6 Keras 3.7 PyTorch 3.8 Matplotlib **Unit : 4: Machine Learning Models** 4.1 Data set Preparation and introduction to MNIST Data set 4.2 Data set Pre-processing 4.3 Supervised ML 4.4 k-Nearest Neighbor - k-NN Concept and Intuition, Effect of k 4.5 Naïve Bayes and Bayes Classifier 4.6 Multiclass Classification 4.7 Unsupervised ML - Dimensionality Reduction- PCA, K-means Clustering 4.8 Introduction to Reinforcement Learning 4.9 Artificial Neural Network **Unit : 5: Regression Techniques and Advanced ML** 5.1 Linear 5.2 Polynomial

	5.3 Logistic 5.4 Cross Validation 5.5 Introduction to Deep Learning **Case Study** – Object Classification and Recognition
Reference Book	1. Machine Learning using Python by U Dinesh Kumar and Manaranjan Pradhan, Wiley, 2019 2. Machine Learning For Absolute Beginners: A Plain English Introduction, by Oliver Theobald 2nd Edition Scatterplot Press, 2017 3. Machine Learning: The New AI (The MIT Press Essential Knowledge Series), By Ethem Alpaydin, MIT Press, 2016 4. Python Machine Learning by Sebastian Raschka, Packt, 2015 5. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili, Packt, 2017 6. Fundamentals of Deep Learning by Nikhil Buduma, O'Reilly, 2017
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 9th Semester

Course: 903: Cloud Computing

Course Code	903
Course Title	**Cloud Computing**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	This course helps students to understand concepts of Cloud Computing and Micro Service Architecture implementations.
Course Objective	To impart knowledge of Cloud Computing concepts and cloud services for application development, deployment and management on cloud.
Course Outcomes	CO1 : Students will be able to learn about cloud infrastructure and architectures. CO2 : Students will be able to learn concepts of cloud computing and basic services of AWS, Azure and GCP CO3 : Students will be able to learn about microservices architecture and devOps toolchain.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Programming, Operating System and Networking
Course Outcome	Students will get knowledge of Cloud Computing concepts along with development, deployment and management of application(s) using Micro Service Architecture.

Course : IT 903 : Cloud Computing

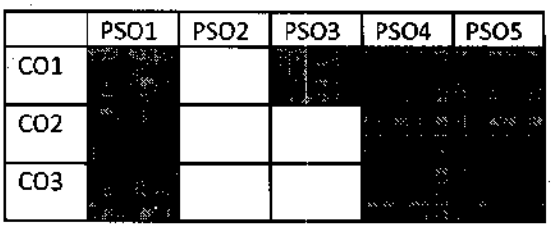
Course Code	903
Course Title	Cloud Computing
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2020
Purpose of Course	This course helps students to understand concepts of Cloud Computing and Micro Service Architecture implementations.
Course Objective	To impart knowledge of Cloud Computing concepts and cloud services for application development, deployment and management on cloud.
Pre-requisite	Basic concepts of Programming, Operating System and Networking
Course Out come	Students will get knowledge of Cloud Computing concepts along with development, deployment and management of application(s) using Micro Service Architecture.
Course Content	**Unit : 1: Introduction to Cloud Computing** 1.1 Characteristics of Cloud Computing 1.2 Cloud Service Models - Infrastructure as a Service, Platform as a Service, Software as a Service and Anything as a Service 1.3 Cloud Deployment Models - Private Cloud, Community Cloud, Public Cloud andHybrid Cloud 1.4 Difference Between Traditional Commuting and Cloud Computing 1.5 Virtualization 1.5.1 Need of Virtualization 1.5.2 Types of Virtualization 1.5.3 Virtualization in Cloud Computing 1.6 Containerization 1.6.1 Concept of Containerization 1.6.2 Need of Containerization 1.6.3 Containerization and Virtualization **Unit : 2: Cloud Infrastructure and Architectures** 2.1 Cloud Computing Stack 2.1.1 Composability 2.1.2 Infrastructure 2.1.3 Platforms 2.1.4 Virtual Applications 2.1.5 Communication Protocols 2.1.6 Applications 2.2 Cloud Data Center Architecture 2.3 Conceptual View of Networking in Cloud Computing 2.4 Cloud Data Storage (Overview of SAN, DFS, etc.) 2.5 Computing Cluster in Cloud 2.6 Service Level Agreement and Cloud Pricing Model 2.7 Cloud Security Concepts 2.8 QoS Measurement in Cloud 2.9 Inter Cloud Communication **Unit : 3: Service Offerings by Cloud Providers** 3.1 Introduction to Amazon Cloud Services 3.1.1 EC2 – Elastic Cloud Compute 3.1.2 Elastic Container Service 3.1.3 Elastic Kubernetes Service 3.1.4 Lambda – Serverless Computing 3.1.5 VPC – Virtual Private Cloud 3.1.6 S3 – Simple Storage Service 3.1.7 EBS – Elastic Block Storage 3.1.8 RDS – Relational Database Service 3.1.9 DynamoDB 3.1.10 Cloud9

	3.2 Introduction to Microsoft Azure 3.2.1 Service Fabric 3.2.2 AKS – Azure Kubernetes Service 3.2.3 Container Instances 3.2.4 Azure SQL 3.2.5 Azure DevOps 3.2.6 Security Center 3.2.7 Azure IoT Hub 3.2.8 Traffic Manager 3.2.9 Cognitive Services 3.3 Introduction to Google Cloud Services 3.3.1 Google App Engine 3.3.2 Google Compute Engine 3.3.3 Google Kubernetes Engine 3.3.4 Cloud Functions 3.3.5 Cloud SQL 3.3.6 Cloud BigTable 3.3.7 Cloud Code 3.3.8 Virtual Private Cloud 3.3.9 Knative 3.3.10 Persistent Disk **Unit : 4: Micro Services Architecture (MSA)** 4.1 An Overview of Current Architectural Patterns 4.1.1 Monolithic architecture 4.1.2 Enterprise Architecture 4.1.3 Service Oriented Architecture 4.1.4 Micro Services Architecture 4.2 Microservice Architecture 4.2.1 Decomposition 4.2.2 Decompose by Business Capability 4.2.3 Decompose by Subdomain 4.2.4 Self-Contained Service 4.2.5 Service per Team 4.3 Data Management 4.3.1 Database per Service 4.3.2 Saga Design Pattern for Database Transactions in MSA 4.3.3 API Composition 4.3.4 Command Query Responsibility Segregation (CQRS) 4.3.5 Domain Event 4.3.6 Event Sourcing 4.4 Transactional Messaging 4.4.1 Transactional Outbox 4.4.2 Transaction Log Tailing 4.5 Health Check API 4.6 Log Deployments and Changes **Unit : 5: Realizing Micro Services with DevOps** 5.1 Ecology for MSA 5.2 Micro Servers 5.3 Rest API 5.4 Packaging Micro Services Applications 5.5 Containerization with Docker 5.6 Docker Client Commands 5.7 Cluster Management with Hazelcast 5.8 Data Caching for Micro Services 5.9 Container Orchestration and Load Balancing 5.10 Security Propagation across Micro Services 5.11 Micro Profile based Application for MSA 5.12 Service Discovery API 5.13 Deploying MSA based Applications on cloud.

Reference Book	1. Cloud Computing and Virtualization by Dac-Nhuong Le, Raghvendra Kumar, Gia Nhu Nguyen, Jyotir Moy Chatterjee, WILEY, 2018 2. Cloud Computing : A Practical Approach by Anthony Velte, Toby Velte, Robert Elsenpeter, Mc Graw Hill, 2017 3. Cloud Computing – Black Book by Kailash Jayaswal, Jagannath kallakurchi, Donald Houde, Deven Shah, Dreamtech Press, 2014 4. Architecting The Cloud by Michael Kavis, WILEY, 2014 5. Learning AWS by Aurobindo Sarkar, Amit Shah, Packt Publication, 2015 6. Google Cloud Platform Cookbook by LegorieRajan, Packt Publication, 2018 7. Building Your Next Big Thing with Google Cloud Platform by S.P.T. Krishnan, Jose L. Ugia Gonzalez, Apress, 2015 8. Microsoft Azure Fundamentals by Jim Cheshire, Pearson, 2019 9. Microservice Architecture: Aligning Principles, Practices, and Culture by Mike Amundsen, Ronnie Mitra, SPD publications, 2016 10. Building Microservices Paperbackby Sam Newman, SPD Press, 2017 11. Microservices for Java EE Architects: Addendum for The Java EE Architect's Handbook by Derek C. Ashmore, 2017 12. Kubernetes Microservices with Docker by Deepak Vohra,Apress Publication, 2018 13. Docker Quick Start Guide: Learn Docker like a boss, and finally own your applications by Earl Waud, PACKT publications, 2018 14. Apache ZooKeeper Essentials by Saurav Haloi, PACKT publications, 2015 15. Hazelcast A Complete Guide - 2019 Edition by Gerardus Blokdyk publication: 5STARCooks, 2019 16. Microservices Patterns: With examples in Java by Chris Richardson, Publisher: Manning Publications, 2018 17. Microservices and Containers 1st Edition by Parminder Singh, Kocher Publisher - Addison-Wesley Professional, 2018 18. Hands-On Microservices with Kubernetes: Build, deploy, and manage scalable microservices on Kubernetes, by Gigi Sayfan,Packt Publications
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 9th Semester

Course: 904: Business Intelligence

Course Code	**904**
Course Title	**Business Intelligence**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	This course helps students to provide practical knowledge of Business Intelligence.
Course Objective	To impart theoretical and practical knowledge of Data Warehouse, Data Mining and Data Visualization.
Course Outcomes	CO1 : Students will be able to learn about concepts of database warehousing and data mining. CO2 : Students will be able to learn about data mining using DMX in SSAS. CO3 : Students will be able to perform data visualization using SSRS and power BI.
Mapping between COs with PSOs	
Pre-requisite	RDBMS
Course Outcome	Students will be able to perform ETL from any data source, create multidimensional cube or tabular data, perform data mining and data visualization.

Course: IT 904: Business Intelligence

Course Code	904
Course Title	Business Intelligence
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2020
Purpose of Course	This course helps students to provide practical knowledge of Business Intelligence.
Course Objective	To impart theoretical and practical knowledge of Data Wearhouse, Data Mining and Data Visualization.
Pre-requisite	RDBMS
Course Out come	Student will be able to perform ETL from any data source, create multidimensional cube or tabular data, perform data mining and data visualization.
Course Content	**Unit: 1 : Introduction to Data Warehouse** 1.1 The Need for Data Warehousing 1.2 Increasing Demand for Strategic Information 1.3 Inability of Past Decision Support System 1.4 OLTP Vs OLAP 1.5 Data Warehouse Components 1.6 Benefits of Data Warehousing 1.7 Features of a Data Warehouse 1.8 The Information Flow Mechanism 1.9 Role of Metadata 1.10 Classification of Metadata 1.11 Data Warehouse Architecture 1.12 Different Types of Architecture 1.13 Data Warehouse and Data Marts 1.14 Application of DW **Unit : 2: ETL (Extraction Transformation and Loading)usingSSIS** 2.1 Extraction using SSIS 2.1.1 Connection manager 2.1.2 OLEDB CM 2.1.3 ADO CM 2.1.4 ADO.NET CM 2.1.5 Cache CM 2.1.6 Excel CM 2.1.7 File CM 2.1.8 FTP and SFTP 2.1.9 SMO 2.2 SSIS Sources 2.2.1 Source Assistant 2.2.2 ADO.NET 2.2.3 OLEDB 2.2.4 ADO.NET source 2.2.5 Excel Source 2.2.6 OLEDB Source 2.2.7 Flat file source 2.3 SSIS Destination 2.3.1 ADO 2.3.2 OLEDB 2.3.3 Flat file 2.4 Containers 2.4.1 For loop containers 2.4.2 ForEach loop containers 2.4.3 File Enumerator 2.4.4 NodeList Enumerator

	2.4.5 SMO enumerator 2.4.6 Variable enumerator **Unit : 3: Transformations using SSIS** 3.1 Copy Column Transformation 3.2 Data Conversion Transformation 3.3 Control flow 3.4 Data flow 3.5 Derived column transformation 3.6 Sort transformation 3.7 Union all transformation 3.8 Merge transformation 3.9 Aggregate transformation 3.10 Export column transformation 3.11 Multicast and merge join 3.12 Import Column transformation 3.13 Lookup 3.14 Event handlers 3.15 Merge Join transformation 3.15.1 Inner Join 3.15.2 Left outer Join 3.15.3 Right Outer Join 3.15.4 Full Outer Join 3.16 Multicast Transformation 3.17 Delete, Update operations 3.18 Union all transformation 3.19 Script task, KRA weight **Unit : 4:Dimensional Modeling using SSAS** 4.1 Fact Tables, Fact less Fact Table and Dimension Tables 4.2 Star Schema 4.3 Snowflake schema 4.4 Updates to dimensions 4.5 Slowly changing, rapidly changing dimensions and large dimensions 4.6 Keys 4.7 Types of models 4.8 Creating tabular model 4.9 Creating relationships 4.10 Creating calculated column 4.11 Create measures 4.12 Key Performance Indicators (KPI) 4.13 Perspectives 4.14 Hierarchies 4.15 Partitions 4.16 Deployment 4.17 DirectQuery mode 4.18 Creating Multidimensional model 4.19 Aggregate fact tables 4.20 Attribute relationships 4.21 Adding and removing measures 4.22 Working with calculations 4.23 Named Query and Named Calculations 4.24 Working with KPI 4.25 Create and run MDX (SSDT) 4.26 Different storage models - ROLAP , MOLAP and HOLAP 4.27 Deployment in SSIS 4.28 Error log **Unit : 5 : Visualizations (Using SSRS, Power BI) and Advanced topics** 5.1 Query 5.2 Models

	5.3 View 5.4 Creating Measures and quik measures 5.5 Creating Visualization 5.6 Embedding power BI reports 5.7 SSRS 5.7.1 Creating reports 5.7.2 Working with Tablix 5.7.3 Working with parameter 5.7.4 Paginated BI Reports 5.7.5 Sub-Reports 5.7.6 Deployment 5.8 Advance topics 5.8.1 Azure DW 5.8.2 Data Lake 5.8.3 Data mining using SSAS 5.8.4 Classification 5.8.5 Association 5.8.6 Clustering
Reference Book	1. "The Data Warehouse Toolkit", Second Edition, Kimball, et al. , John Wiley & Sons; ISBN: 9814-12-614-4, Oct 2004 2. "Data Warehousing in the Real World", Sam Anahory and Dennis Murray, Pearson Education, ISBN – 81-317-0459-9 , 2007 3. "Microsoft SQL Server 2008 Integration Services", Kirk Haselden, Pearson ,ISBN- 978- 81- 317- 3477-3, 2011 4. "Data Warehouse Fundamentals", Paulraj Ponniah, Wiley India Edition, ISBN- 81-265-0919-8,2006 5. Microsoft SQL Server 2012 Integration Services: An Expert Cookbook, Reza Rad, Pedro Perfeito, Packt, May 23, 2012, ISBN: 9781849685245 6. Developing SSRS Reports for Dynamics AX, Mukesh Hirwani, Packt, September 24, 2013, ISBN: 9781782177746 7. MDX with SSAS 2012 Cookbook, Tomislav Piasevoli, Sherry Li, August 25, 2013, Packt , ISBN: 9781849689601 8. Expert Cube Development with SSAS Multidimensional Models, Alberto Ferrari, Chris Webb, Et al, February 21, 2014, Packt, ISBN: 9781849689908
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.T.) 9th Semester

Course: 905: Practical 19

Course Code	**905**
Course Title	**Practical 19**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of the course is to provide practical knowledge of IoT and Machine Learning algorithms.
Course Objective	The objective of the course is to impart knowledge of implementation of IoT and Machine Learning algorithm.
Course Outcomes	CO1 : Students will be able to understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc. CO2 : Students will be able to design and implement various machine learning algorithms using real world data sets. CO3 : Students will be able to use real IoT protocols for device to device communication
Mapping between COs with PSOs	
Pre-requisite	Basics concepts of Embedded system, applied mathematics and statistics.
Course Outcome	After completion of this course, students will be able to develop IoT based applications and implement Machine Learning algorithms.

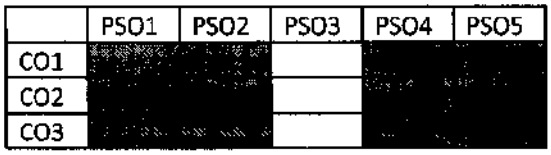
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 905 : Practical 19

Course Code	905
Course Title	Practical 19
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	The purpose of the course is to provide practical knowledge of IoT and Machine Learning algorithms.
Course Objective	The objective of the course is to impart knowledge of implementation of IoT and Machine Learning algorithm.
Prerequisite	Basics concepts of Embedded system, applied mathematics and statistics.
Course Outcome	After completion of this course, students will be able to develop IoT based applications and implement Machine Learning algorithms.
Course Content	Practical based on Paper No. 901 – Internet of Things and 902 – Machine learning using Python
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 9th Semester

Course: 906: Practical 20

Course Code	**906**
Course Title	**Practical 20**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of this course is to provide practical knowledge of Business Intelligence and application development using Micro Services Architecture.
Course Objective	The objective of the course is to impart practical knowledge of Data Warehouse, Data Mining, Data Visualization and application development using Micro Services Architecture.
Course Outcomes	CO1 : Students will be able to develop REST/Event based applications using micro services architecture. CO2 : Students will be able to deploy the applications using devOps toolchain. CO3 : Students will be able to perform data transformation of different formats of data and create multidimensional data using SSAS and MDX and data visualizations with SSRS and PowerBI.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of RDBMS and Programming
Course Outcome	Student will be able to perform ETL from any data source, create multidimensional cube or tabular data, perform data mining and data visualization using latest Microsoft tools and technologies. Furthermore, students will be able to develop applications using Micro Services Architecture.

Course:IT 906: Practical 20

Course Code	906
Course Title	Practical20
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	The purpose of this course is to provide practical knowledge of Business Intelligence andapplication development usingMicro Services Architecture.
Course Objective	The objective of the course is to impart practical knowledge of Data Wearhouse, Data Mining, Data Visualization and application development usingMicro Services Architecture.
Prerequisite	Basic concepts of RDBMS and Programming
Course Outcome	Student will be able to perform ETL from any data source, create multidimensional cube or tabular data, perform data mining and data visualization using latest Microsoft tools and technologies.Furthermore, students willbe able to develop applications using Micro Services Architecture.
Course Content	Practical based on Paper No. 903 – Cloud Computing (Unit 4 : Micro Services Architecture) and 904 – Business Intelligence
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 9th Semester

Course: 907: Part Time Project 3

Course Code	**907**
Course Title	**Part Time Project 3**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of this course is to develop skills to solve real world problems using Mobile / MEAN stack / IoT / BI / Cloud technologies.
Course Objective	The objective of this course is to acquaint students for the development of software application based on Mobile / MEAN stack / IoT / BI / Cloud.
Course Outcomes	CO1 : Students will be able to develop projects using Mobile/ Mean Stack/ IoT/ BI/ Cloud Technologies. CO2 : Students will be able to apply Software engineering concepts to solve real world problems. CO3 : Students will be able to apply database related concepts to design database for the project.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be able to develop and demonstrate software applications based on Mobile / MEAN stack / IoT / BI / Cloud technologies.

Course : IT 907 : Part Time Project 3

Course Code	907
Course Title	Part Time Project3
Credit	3
Teaching Per Week	3 Hrs
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	The purpose of this course is to develop skills to solve real world problems using Mobile / MEAN stack / IoT / BI / Cloud technologies.
Course Objective	The objective of this course is to acquaint students for the development of software application based on Mobile / MEAN stack / IoT / BI / Cloud.
Prerequisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be able to develop and demonstrate software applications based on Mobile / MEAN stack / IoT / BI / Cloud technologies.
Course Content	The students are required to develop project usingMobile / MEAN stack / IoT / BI / Cloud technologies. The students must prepare documentation of the project completed 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 institution. The Project Presentation and Viva – Voce will be conducted as per the University exam schedule. The students have to submit the following reports atthe institution: 1. Project Joining Report 2. Project Title Report 3. Progress Report 4. Project Completion Certificate 5. Institution Certificate 6. Non-disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code) Note : If student's performance is not satisfactory then as per the direction of the internal project guide / external examiner student may have to do coding in the lab according to the project work submitted during internal submission / external examination.
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.T.) 10th Semester

Course: 1001: Project

Course Code	**1001**
Course Title	**Project**
Credit	25
Teaching per Week	-
Minimum weeks per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Effective From	June 2020
Purpose of Course	To acquaint students with technological practices followed in the IT industry by making them work on project for 6 months.
Course Objective	To familiarize students with IT projects development and management practices in industry.
Course Outcomes	CO1 : Students will be able to develop software applications in industry. CO2 : Students will be able to apply Software Engineering concepts to solve real world problems. CO3 : Students will be able to apply database related concepts to design database for projects.
Mapping between COs with PSOs	
Pre-requisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be ready to work as an IT professional.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : IT 1001 : Project

Course Code	1001
Course Title	Project
Credit	25
Teaching Per Week	-
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	To acquaint students with technological practices followed in the IT industry by making them work on project for 6 months.
Course Objective	To familiarize students with IT projects development and management practices in industry.
Prerequisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be ready to work as an IT professional.
Course Content	The students are required to do 6 months full time project preferably in industry. The students must prepare documentation of the project completed 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 institution. The Project Presentation and Viva – Voce will be conducted as per the University exam schedule. The students have to submit the following reports atthe institution: 1. Project Joining Report 2. Project Title Report 3. Progress Report 4. Project Completion Certificate 5. Institution Certificate 6. Non-disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code) Note : If student's performance is not satisfactory then as per the direction of the internal project guide / external examiner student may have to do coding in the lab according to the project work submitted during internal submission / external examination.
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment