DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
FACULTY OF TECHNOLOGY & ENGINEERING
THE M. S. UNIVERSITY OF BARODA

Scheme of Teaching & Examination of BE (Computer Sci. & Engg.) - 4 Years Degree Course

BE I (With Effect from 2019-20)

Subject Code	Subject	Teaching (Hours/Week)						
		L	Tu	Pr/Drg	Total	Marks	Tw &/or Practical incl. Viva	Total
BE-I Semester-I								
APH1101	Applied Physics I	3	1	2	6	100	50	150
AMT1101	Applied Mathematics I	3	1	-	4	100	0	100
MEC1101	Engineering Drawing	2	1	4	7	100	50	150
MME1101	Material Science	3	1	-	4	100	0	100
CVL1101	Funda. of Civil Engineering	3	1	2	6	100	50	150
MEC1102	Workshop	0	0	2	2	0	50	50
Total		**14**	**5**	**10**	**29**	**500**	**200**	700
BE-I Semester-II								
AMT1201	Applied Mathematics II	3	1	-	4	100	0	100
MEC1205	Engineering Mechanics	3	1	2	6	100	50	150
APH1201	Applied Physics II	3	1	2	6	100	50	150
ELE1206	Elect. Engg. & M/C	3	1	2	6	100	50	150
CSE1201	Programming in C and C++	3	1	2	6	100	50	150
Total		**15**	**5**	**8**	**28**	**500**	**200**	700

For tutorial and practical/drawing a batch of 20 students is considered

BE-II New Syllabus (Effective from 2019-20)

Subject Code	Subject	Teaching (Hours/Week)						
		L	Tu	Pr/Drg	Total	Marks	Tw &/or Practical incl. Viva	Total
BE-II Semester-I								
AMT1301	Applied Mathematics III	3	1	0	4	100	0	100
AMT1302	Combinatorial Methods	3	1	0	4	100	0	100
	Electronics Engineering**	3	1	3	7	100	50	150
CSE1301	Data Structures	3	1	2	6	100	50	150
CSE1302	Object Oriented Programming with Java	3	1	2	6	100	50	150
ENG1301L	English	0	0	2	2	0	50	50
Total		**15**	**5**	**9**	**29**	**500**	**200**	**700**
BE-II Semester-II								
AMT1403	Applied Mathematics IV	3	1	0	4	100	0	100
ELE1514	Analog & Digital Communication	3	1	3	7	100	50	150
CSE1401	Database Management System	3	1	2	6	100	50	150
CSE1402	Design and Analysis of Algorithms	3	1	2	6	100	50	150
CSE1403	Digital Logic & Design	3	1	2	6	100	50	150
Total		**15**	**5**	**09**	**29**	**500**	**200**	**700**

**** To be given for Electrical department**

BE-III New Syllabus (Effective from 2020-21)

Subject Code	Subject	Teaching (Hours/Week)						
		L	Tu	Pr/Drg	Total	Marks	Tw &/or Practical incl. Viva	Total
BE-III Semester-I								
CSE1501	Basics of Web Programming	3	1	2	6	100	50	150
CSE1502	Computer Graphics	3	1	2	6	100	50	150
CSE1503	Computer Organization	3	1	2	6	100	50	150
CSE1504	Theory of Computation	3	1	0	4	100	0	100
CSE1505	Engineering Economics	3	1	0	4	100	0	100
Total		**15**	**5**	**6**	**26**	**500**	**150**	**650**
BE-III Semester-II								
CSE1601	Compiler Design	3	1	0	4	100	0	100
CSE1602	Computer Networks	3	1	2	6	100	50	150
CSE1603	Operating System	3	1	2	6	100	50	150
CSE1604	Software Engineering	3	1	0	4	100	0	100
	Programming Elective-I	3	1	2	6	100	50	150
Total		**15**	**5**	**6**	**26**	**500**	**150**	**650**

Programming Elective-I

CSE1605 .NET Technologies
CSE1606 Advance Java Technologies

BE-IV New Syllabus (Effective from 2021-22)

Subject Code	Subject	Teaching (Hours/Week)				p		
		L	Tu	Pr/Drg	Total	Marks	Tw &/or Practical incl. Viva	Total
BE-IV Semester-I								
CSE1701	Microprocessor Architecture & Interfacing	3	1	2	6	100	50	150
	Core Elective-I	3	1	2	6	100	50	150
	Core Elective-II	3	1	2	6	100	50	150
	Programming Elective-II	3	1	2	6	100	50	150
CSE1702L	Minor Project-I	0	0	2	2	0	100	100
Total		**12**	**4**	**10**	**26**	**400**	**300**	**700**
BE-IV Semester-II								
CSE1801L	Major Project	0	0	2	2	0	600	600
	OR							
	Core Elective-III	3	1	2	6	100	50	150
	Core Elective-IV	3	1	2	6	100	50	150
	Core Elective-V	3	1	2	6	100	50	150
CSE1802L	Minor Project-II	0	0	2	2	0	150	150
Total		**9**	**3**	**8**	**20**	**300**	**300**	**600**

For tutorial and practical/drawing a batch of 15 students is considered

Programming Elective – II

CSE1709 Mobile Application Programming
CSE1710 Python Programming

Sem-VII	Sem-VIII
Core Elective – I CSE1703 Artificial Intelligence CSE1704 Linux Administration & Network Programming CSE1705 Statistics in Data Science	**Core Elective – III** CSE1803 Big Data Analytics CSE1804 Cloud Computing CSE1805 Real Time Systems
Core Elective – II CSE1706 Data Warehousing & Data Mining CSE1707 Distributed Systems CSE1708 Network Security	**Core Elective – IV** CSE1806 Computer Vision & Applications CSE1807 Machine Learning CSE1808 Natural Language Processing
	Core Elective – V CSE1809 Internet of Things CSE1810 Mobile Computing

COMPUTER SCIENCE & ENGINEERING DEPARTMENT,
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BE-I

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

Programme Name: B.E. (Computer Science and Engineering)

Programme Specific Outcome(PSO)

PSO 1: Learn Basics of Computer Science, Engineering and its applications.

PSO 2: Understanding and learning computer hardware and architecture.

PSO 3: Understanding and learning programming paradigms and software development technologies.

PSO 4: Understanding various data storage and data analysis technologies.

PSO 5: Learning fundamentals of digital communication and networking.

PSO 6: Understanding basics and advanced concepts of GUI, computer graphics, image processing, Computer Vision

PSO 7: Learning concepts of Operating Systems and Systems programming.

PSO 8: Understanding Advanced concepts of Computer Science & Engineering like AI, ML, DS, Embedded Systems, Data Science

PSO 9: Hands On to application development through Industry project / Group Project / Internship

PSO 10: Exposure to soft skills

PSO 11: Exposure to skill development, entrepreneurship, employability

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Computer Science and Engineering**	**Academic Year**	**2019-20**

B.E. (Computer Science and Engineering): Regular Programme

Year	**I**	**Core / ~~Elective / Foundation~~** **CSE1201:Programming in C and C++**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2019	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures, Tutorials and Practical		

Course Outcome (CO) CSE1201

CO1 Understand the need and types of programming languages in use.

CO2 Understand the fundamentals of a programming language.

CO3 Learn problem solving techniques.

CO4 Learn the object-oriented concept for a programming language.

CO5 Understand the concept of structured programming.

CO6 Understand dynamic memory management techniques.

CO7 Implement file handling mechanisms

CO8 Understand various user-defined data types in a programming language

CO9 Learn some advanced concepts of a programming language.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship	**Relevance to** Local (L)/ National (N)/ Regiona	**Relation to** Gender (G), Environment and

							(Ent)/ Skill Development (SD)	I(R)/Global (G)	Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction to programming: What is programming? Different types of programming languages, algorithm, flowchart, structure of a C program, variables and data types, Character set of C, C tokens, operators, storage classes	05	12	1,2	CO1 CO2	PSO1 PSO3	EMP SD	G	PE
2	Control of Flow, User-defined Data types: Branching statements like simple if, if..else, else..if , switch case, iterative statements like for, do..while, while, break, continue, goto, arrays, strings, functions, structure and union	08	20	1,2,3	CO3 CO5 CO8	PSO3			
3	Advanced Concepts of C Programming: Pointers, call by address, pointer arithmetic, pointer to pointer, Dynamic memory allocation, file management, the preprocessor, error handling	07	17	1,2,3	CO3 CO6 CO7 CO9	PSO3 PSO4			
4	Object Oriented Programming Concepts: Classes, objects, abstraction, encapsulation, memory allocation for objects, member functions, instance variable, static keywork, const keyword, access specifiers, constructors, destructors, type casting, function overloading, creating memory dynamically	07	18	1,2,3	CO2 CO3 CO4 CO8	PSO3			
5	Inheritance in C++: Types of inheritance, function overriding, operator overloading, dynamic memory dispatch, virtual function, abstract function, abstract class, friend function, polymorphism, reference variable	09	23	1,2,3	CO3 CO4	PSO3			

6	Advanced Concepts of C++ Programming: Working with files, exception handling, templates, basic introduction top standard template library	04	10	1,2,3	CO3 CO4 CO6 CO7 CO9	PSO4			

Reference Books

1.	Programming in C – E. Balagurusamy
2.	Programming in C - Stephen Kochan
3.	C Programming - Kernighan & Ritchie
4.	Let Us C - Kanetkar
5.	Object Oriented Programming with C++ – E. Balagurusamy
6.	Programming in C++ - Bjarne Stroustrup
7.	Object Oriented Programming in C++ - Robert Lafore
8.	How to Program C++ - Dietel & Dietle

BE-II

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THE M. S. UNIVERSITY OF BARODA

CSE1301 DATA STRUCTURES

FS BE– II

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Students should have an understanding of any basic programming language.

Objectives: Understanding of a structured programming language is required for the student to appreciate and understand the different data structures that can be used during programming. This subject discusses different data structures, their complexities and applications as compared to time and space management.

Outcome: After completion of this course the students will be able to decide which data structure is best suited for any given application.

Sr. No.	Topic	No. of Lectures	Weightage in %
	DATA STRUCTURES		
1	**Introduction and Overview** Introduction to data structures, basic terminology, elementary data organization, data structures , data structureoperations, algorithmic notations, complexity of algorithms, overview of array and string	03	08
2	**Linked Lists** Introduction to linked lists, representation of linked lists in memory, various operations onlinked lists, two way lists, circular linked lists, applications of linked lists	06	15
3	**Stacks** Introduction to stacks, array representation of stacks, operations on stacks, application of stacks	04	10
4	**Queues** Introduction to queues,representation of queue using arrays and linked lists, various operations on queues, circular queues, deques,priority queues, application of queues	05	10
5	**Trees** Terminologies, definition and concepts, binary trees, representing binary trees in memory,traversals and other operations on binary trees, threaded binary trees, binary search trees,heap trees; heap sort, height balanced binary	08	20

	trees (avl trees), weight balanced trees(huffman tree), general trees, b-trees & b+ trees		
6	**Graphs:** Introduction to graphs, representing graph in memory, operations on graph, traversing and searching, applications of graphs	05	15
7	**Sorting and Searching:** Introduction, insertion sort, selection sort, bobble sort, merging, merge-sort, quick sort, radix sort, searching and data modification	04	10
8	**Hashing:** Hash tables, hashing techniques and functions, collision resolution techniques – open addressing & chaining	03	07
9	FILE STRUCTURES: Concepts of fields, records and files, sequential, indexed and relative/random file organization, indexing structure for index files, hashing for direct files, multi-key file organization and access methods	02	05
	Total	**40**	**100**

References:

1. Data Structures by Lipschultz (Schaum Series)
2. An Introduction to Data Structures with Applicationsby Jean-Paul Tremblay and Paul G. Sorenson, Tata McGrawHill
3. Data Structures using C & C++ by Tanenbaum, Prenctice-Hall International
4. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia
5. Fundamentals of Data Structures in C++ by Sartaj Sahani
6. Data Structures: A Pseudo-code approach with C by Gilberg & Forouzan, Thomson Learning

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ELE ELECTRONICS ENGINEERING

FS BE– II

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Sr.No.	Topics	Lectures required	% Weightage
01	Diodes as Circuit Elements Half wave and Full wave rectifiers, Ripple factor, efficiency of rectification, Filters, L-type input and L-type filters	06	15
02	Bipolar Junction Transistors Operation of the Bipolar Transistor, circuit model for low speed, active region operation, the trnsistor as an amplifier, CB and CE configurations, cut-off and saturation region, typical values of junction voltage & current gain, CC configuration. Low frequency analysis of CC, CB and CE amplifier. High frequency analysis of Transistor amplifier	10	25
03	Bias Stability Bias stabilization of operating point, various stabilizing circuits, fixed bias, collector to base bias and self bias circuits and their analysis, Stability factor, thermal stabilization & compensation schemes	04	10
04	Logic Gates Characteristics of logic gates , saturating and nonsaturating gates , delay times , power dissipation , fan out etc. Families of logic gates such as DTL , HTL , TTL , RTL , DCTL etc. and comparisons of logic families	03	08
05	Differential and operational amplifiers Common mode and differential signals , differential amplifiers , common mode rejection ratio, cascaded different amplifiers, use of current sources in differential amplifiers, the ideal operational amplifiers and its properties. Types of operational amplifiers block diagrams and specification of typical OPAMPs, basics of OPAMP	08	20
06	Applications of OPAMP	06	14

	Use of OPAMPs as sign changers , inverting and noninverting adders, differentiators , integrators , logarithmic buffer , sample and hold , V to I and I to V convertor, precision diode , precision rectifiers , instrumentation amplifiers etc		
07	Analog integrated circuits Comparators , timers , wave form generator circuits , four quadrant multipliers , analog switches , ample and hold , typical IC s and their applications	03	8

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THE M. S. UNIVERSITY OF BARODA

CSE1302 OBJECT ORIENTED PROGRAMMING WITH JAVA

FS BE – II

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Students should have basic programming Knowledge.

Objectives: To understand platform independent object oriented programming and java as base language for advanced technology like three tier architecture applications, cloud computing and web development. And also for making commercial applications which are using Java Technologies.

Outcome: Students are able to learn: Object oriented programming concepts of java. Comprehend building blocks of OOPs language, inheritance, package and interfaces. Identify exception handling methods. Develop multithreading object oriented programs and event handling programs.

Sr. No.	Topic	No. of Lectures	Weightage in %
	OVERVIEW OF BASIC OOP CONCEPTS:		
1	Need for object-oriented paradigm ,Introduction to Java, History of Java, What is machine dependent code and platform independent code, advantages of Java, Platform independent feature of Java, What makes Java Platform Independent, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, classes and objects, constructors, methods, this keyword, garbage collection, arrays of objects, overloading methods and constructors, parameter passing, recursion, string handling, inheritance, super keyword, method overriding, polymorphism, runtime binding, abstract classes	15	25
	PACKAGES AND INTERFACES		
2	Defining, Creating and Accessing a Package, Understanding ,CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending, interfaces. Exploring packages – java.lang, java.util, java.io	6	20
	EXCEPTION HANDLING AND MULTITHREADING		
3	Concepts of exception handling, benefits of exception handling, Termination , exception hierarchy, usage of try, catch, throw, throws and finally, creating own exception sub classes. Differences between multi-threading and multitasking, thread life cycle, creating threads,	8	25

	synchronizing threads, inter thread communication, daemon thread.		
	AWT AND SWING		
4	Introduction to AWT, limitations of AWT, MVC architecture, components, containers, exploring swing Comparison between AWT and Swing.	6	15
	EVENT HANDLING		
5	Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels ,scrollpane, dialogs, menubar, graphics, layout manager , layout manager types – Flow, Border, Grid, GridBag and Card layout	5	15
	Total	**40**	**100**

References:

1. The complete Reference Java SE 8 ,Patrick Naughton, Herbert Schildt.
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition,Pearson Education
3. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
4. An Introduction to OOP, second edition, T. Budd, Pearson education.
5. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.
6. An introduction to Java programming and object oriented application development, R.A. Johnson-Thomson.

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CSE1401 DATABASE MANAGEMENT SYSTEM

SS BE –II

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Knowledge of Programming, Data Structure and Algorithms

Objectives: 1. To understand the different issues involved in the design and implementation of adatabase system.2. To study the physical and logical database designs, database modeling, relational,etc.3. To understand and use data manipulation language to query, update, and manage adatabase4. To develop an understanding of essential DBMS concepts such as: database security,integrity, concurrency,5. To design and build a simple database system and demonstrate competence with thefundamental tasks involved with modeling, designing, and implementing a DBMS.

Outcome: Students will be able to:

- Define and design data models for database systems, database schema and database instances.
- Identify the methodology of conceptual modeling through Entity Relationship model and Relational Model.
- Develop an understanding of the differences between OODBMS, ORDBMS and RDBMS and the practical implications of each approach.
- Analyze and design a real database application.
- Improve teamwork management skills; enhance negotiation and discussion skills by developing a project by working in a team.
- Will become proficient in SQL and PL/SQL.

Sr. No.	Topic	No. of lectures required	Weightage in %
1	Introduction to Database Management System and comparison of the advantages over the third generation languages. The basic properties and the architecture of Databases.	2	5
2	E-R Model and Extended E-R Model	4	10
3	The Relational Model – concept, properties and relational algebra	4	10
4	Structured Query Language(SQL)	4	10
5	Programming Language/Structured Query Language (PL/SQL)	6	15

6	Theory of Normalization - Functional dependencies, Armstrong's Axioms, Closure, Canonical cover, 1st, 2nd, 3rd, BCNF, 4th and 5th Normal Forms with their anomalies and conditions.	5	12.5
8	Transaction Control, Consistency and Concurrency	5	12.5
9	Storage Structures, Indexing	3	7.5
10	Backup and Recovery	2	5
11	Case Study: Oracle Internals	3	7.5
12	Brief description of Hierarchical Database Management System, Network Database Management System, Object-Relational / Object-Oriented Database Management System, etc.	2	5
	Total	**40**	**100**

References:

1. H.F. Korth , A. Silberschatz and Sudarshan : Database System Concepts
2. Elmasri&Navathe: Fundamentals of Database Systems
3. James Martin:Computer Database Organization
4. C.J. Date: An Introduction to Database Systems
5. Ivan bayross: SQL & PL/SQL
6. Oracle Press Reference books/manuals

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CSE1402 DESIGN AND ANALYSIS OF ALGORITHMS

SSBE-II

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Fundamentals of programming using C/C++/Java

Objectives: To enable students to:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Outcome: Upon completion of the course, the students will be able to:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Sr. No.	Topic	No. of Lectures	Weightage in %
1	Elementary Algorithmics: Problems & instances, efficiency of algorithms, average & worst case analyses, elementary operation, reasons for analyzing efficiency.	5	10%
2	Asymptotic Notation: Big ‘oh’ notation, other asymptotic notation, conditional asymptotic notation, asymptotic notation with several parameters, operations on asymptotic notation.	4	15%
3	Models of Computation: Random Access Machines, computational complexity of RAM programs, a stored program model, abstractions of RAM - straight-line programs,	4	10%

	Turing Machines, relationship between Turing Machines and RAM.		
4	Solving Recurrences: Intelligent guesswork, homogeneous recurrences and inhomogeneous recurrences, change of variable, range transformations, asymptotic recurrences, substitution method, iteration method, recurrence trees, master method & master theorem. Example analysis of heapsort & quicksort.	4	10%
5	Greedy Algorithms: General characteristics of greedy algorithms and examples, applications: Kruskal's and Prim's algorithms, shortest path problem, knapsack problem, scheduling	7	15%
6	Divide and Conquer: Characteristics, the general template, applications: binary search, merge sort, quick sort, matrix multiplication.	4	10%
7	Dynamic Programming: General characteristics and examples, principle of optimality, applications: binomial coefficients, making change, knapsack problem, floyd's algorithm, chained matrix multiplication. Approach using recursion, memory functions.	6	15%
8	Graph Algorithms: Depth-first search, breadth-first search, topological ordering & sorting, backtracking, application of backtracking: knapsack problem. Branch & bound, application: the assignment problem, general considerations.	3	7%
9	Computational Complexity: Introduction, information-theoretic arguments: complexity and sorting, complexity and algorithmics, introduction to NP completeness, the classes P and NP, polynomial reductions, NP complete problems.	4	13%
	Total Lectures	**40**	**100**

References:

1. Brassard & Bratley, Fundamentals of Algorithmics, Prentice Hall of India
2. Aho, Hopcroft, Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley
3. Cormen, Leiserson, Rivest, Introduction to Algorithms, Prentice Hall of India
4. Horowitz & Sahni, Computer Algorithms C++, Galgotia Publications

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CSE1403 DIGITAL LOGIC AND DESIGN

SS BE – II

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: NA

Objectives: - Understanding of principle, operation and analysis of digital electronics

Outcome: After learning the course the students should be able to:

- Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.
- Identify, formulate and solve a problem based on combinational and sequential circuits
- Select the appropriate hardware and software tools for combinational and sequential circuit design.

Sr. No.	Topic	No. of Lectures	Weightage %
1	Numbering System: Different Numbering System Decimal, Binary, Representation of signed numbers and Binary arithmetic in computers, Octal numbers, Hexadecimal numbering system	2	5
2	Binary Codes: (i) Classification of binary codes (ii) 8421 BCD code (iii) XS-3(Excess-3) code (iv) Gray code (v) Error detecting code and Error correcting code	1	2.5
3	Logic Gates: The AND gate, The OR gate, The NOT gate, Universal gates NAND and NOR gates, The Exclusive OR gate, The Exclusive NOR gate	2	5
4	Boolean Algebra -Logic operations (AND,OR,NOT,NAND,NOR,X-OR and X-NOR) -Laws of Boolean algebra	3	7.5

	-Reducing Boolean expressions -Boolean functions & their representation(SOP,POS form) -Karnaugh map		
5	Minimization of Switching Functions -Karnaugh map (Two variables, Three variables, Four variables, Five variables) -Don't care combination -Quine-McCluskey method(Tabular method)	2	5
6	Combinational Logic Design -Adders, Sub tractors(Half & Full) -Binary parallel adder -4 Bit parallel sub tractor & comparator	3	7.5
7	(a) Code converter -Design of a 4-Bit Binary to Gray, Gray to Binary, Binary to BCD, BCD to XS-3, BCD to Gray etc code convertors (b) Multiplexer, De-multiplexer, Decoder & Encoder	2 3	5 7.5
8	Flip-Flops -Classification of sequential circuit -Latches & Flip-Flops(S-R, J-K, T, D) -Excitation table of all Flip-Flops -Asynchronous inputs (,)	4	10
9	Shift Registers -Buffer register, Data transmission in shift register, Serial-In Serial-out, Serial-In Parallel out, Parallel-In Serial-out, Parallel-In Parallel-out and Bidirectional shift registers	3	7.5
10	Counters (a) Asynchronous Counters - Two bit ripple UP-DOWN counters using negative or positive edge triggering -Design of Mode-6,Mode-10 asynchronous counters -Effect of propagation delay in ripple counter (b) Synchronous Counters -Design of synchronous counters	 3 3	 7.5 7.5

	-Design of 3-bit up-down counter using JK FF, 3-bit UP counter, 3 bit DOWN counter -Design of Modulo-10 synchronous counter(UP/DOWN) (iii) 7490,7492,7493 (BCD, Binary Counters I-C)	1	2.5
11	Sequential Circuit -Finite State Model State diagram, state table, state reduction, state assignment, transition and output table -Memory elements D FF, T FF, SR FF, JK FF -Synthesis of synchronous sequential circuit	4	10
12	Sequential Circuit- II -Important Definition & Theorems -Finite state machine definition, state equivalence & machine minimization, Distinguishable state & distinguishable sequences - Minimization of completely specified sequential machine & incompletely specified machine	2	5
13	Introduction of Asynchronous Circuit	2	5
	Total Lectures	**40**	**100**

References:

1. Digital Logic and Computer Design, M.Morris Mano
2. Fundamentals of Digital Circuits by A. Anand Kumar (PHI Publication)

BE-III

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FACULTY OF TECHNOLOGY & ENGINEERING

THE M. S. UNIVERSITY OF BARODA

CSE1501 BASICS OF WEB PROGRAMMING

FS BE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Fundamentals of Programming and Networking

Objectives: This Subject is useful for Making own Web page and how to host own web site on internet. The subject covers the wide range of web technologies both client side and server side to provide the exposure to the students to develop Rich Internet Applications using them. It covers the basics WWW, client side technologies like HTML, CSS and DHTML including JavaScript.

Outcome: Upon successful completion of this course, the student will be able to Plan, design, create, and implement a website. Student will learn the concept of XML, CSS andDHTML. The student will be able to Develop a static and dynamicwebsites, establish the database connectivity over awebsite**.**

Sr. No.	Topic	No. of Lectures	Weightage in %
	INTRODUCTION TO HTML		
1	Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, Browser architecture and Web site structure, Overview and features of HTML5, Graphics tags, Media Tags, HTML API's.	5	10
	STYLE SHEETS, USER EXPERIENCE DESIGN		
2	Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, Overview and features of CSS3, CSS and Layouts, Responsive Webpage design, Work Flow for designing a web site User Experience Principles, Design Principles.	7	15
	XML		
3	Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and	5	15

	SAX, XSLT,DTD, XML Schema, XML Parsers.		
	JAVASCRIPT AND AJAX		
4	Introduction, HTTP request AND HTTP Methods, JavaScript, JavaScript Events, DOM, JQuery, using and Integrating JavaScript Functionality, JQuery widgets, XMHttpRequest, Introduction to AJAX, Implementing AJAX in Web Pages, JSON	6	20
	INTRODUCTION TO FRONT END FRAMEWORK AND WEBSERVICES		
5	Web Application Security, Web Page Performance, Introduction to Angular JS, Node JS, React JS or Current JS Framework , Using any one framework in websites ,Introduction to Web Services, Protocols used in Web Services SOAP,WSDL,REST and current standards and practices, Implementing Cross Language Web Services	10	20
	WEB SECURITY		
6	Web Security Principles and attacks, Payment processing mechanisms, Digital Certificates, Digital Signatures, SSL, TLS, SET, Electronic Money, Electronic Data Interchange, Introduction to middleware and component Technologies(CORBA, RMI,DCOM).	7	20
	Total	**40**	**100**

References:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. HTML 5, Black Book, dreamtech Press.
3. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill.
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson.
5. Web Technologies by Atul Kahate and Achyut Godbole, Tata McGraw Hill.
6. An Introduction to XML and Web Services, Anders Moller,Michael Schwartzbach , Addison Wesley Professional.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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THE M. S. UNIVERSITY OF BARODA

CSE1502 COMPUTER GRAPHICS

FSBE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	:150

Objective: Understanding the fundamental graphical operation and the implementation on a computer. The mathematics behind computer graphics. This course will introduce students to all aspects of computer graphics including hardware, software and applications. Students will gain experience by completing several programming projects.

Outcome: At the end of this course students should :Have a basic understanding of the core concepts of computer graphics. Be capable of creating interactive computer graphics and understand a typical graphics pipeline. The students will be able to describe the fundamentals of raster graphics, vector graphics and interactive graphics. To apply the algorithms to draw lines, circles, polygons and text. To describe file structure of display & graphics file formats. To scale, rotate and translate the object using transformation techniques. To select and enlarge visible portion of drawing using clipping methods. To develop the logic for drawing the natural objects using different algorithms for curved lines.

Sr. No.	Topic	No. of Lectures	Weightage %
1	Geometry & Line Generation : Lines, Vector Generation, Bresenham's Algorithms, DDA, Character Generation etc.	5	12
2	Graphics Primitive :Display devices, primitive operations, display-file interpreter, normalized device co-ordinates, display-file structure, display-file algorithms etc.	6	15
3	Polygons :Polygon representation, algorithms, initialization, antialiasing, Scan conversion – Generation, Display, Real Time onversion, Run-Length, Cell-Enoding, Polygon Filling- Scanconverting, Seed Fill, etc.	6	15
4	Transformations :Matrices, Scaling transformations, rotation, homogeneous co-ordinates and translation, other transformations, display procedures etc. .Three Dimensions: 3D Geometry, 3D Primitives, 3D Transformations, Rotation about an arbitrary axis, parallel projection, perspective projection.	6	15
5	Segments :The segment table, segment creation, closing/deleting/renaming a segment, some raster techniques etc.	4	10
6	Windowing &Clipping :The Viewing transformation, clipping, the Cohen-Sutherland Outcode Algorithm, Clipping of polygons, generalized clipping, multiple windowing etc. Hidden Surfaces & Lines :Back - Face	5	13

	removal back-face algorithms, Z - buffers, Scanline algorithms, the painter's algorithm, comparision techniques, hidden-line methods, binary space partition etc.		
7	Interaction :Hardware, Input device handling algorithms, event handling, sampled devices, the detectability attribute, simulating a locator with a pick a vice-versa, echoing etc.	4	10
8	Curves & Fractals: Curve Generation, interpolation, interpolating algorithms, polygons, fractal lines, fractal surfaces etc.	4	10
	Total Lectures	**40**	**100**

References:

1 Computer Graphics (A programming Approach) by Steven Harrington

2 Procedural Elements for Computer Graphics by David F Rogers

3 Mathematical Elements for Computer Graphics by David F Rogers

4 Computer Graphics (Principle & Practice) by Foley & Van Dam

5 Computer Graphics by Hearn & Baker

6 Principals of Interactive Computer Graphics by William M Newman, Robert F Sproull

7 Fundamentals of Interactive Computer Graphics by J D Foley, A Van Dam

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THE M. S. UNIVERSITY OF BARODA

CSE1503 COMPUTER ORGANIZATION

FS BE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Digital Logic & Design.

Objectives: This subject introduces design of circuits using MSI and LSI methods. This course will enable students to analyze and understand the design of a simple computer. To understand the aspects of computer architecture and program performance. To adopt an evolutionary approach to learning by presenting fundamental concepts first in the context of an easy-to-understand instruction set, and building more complex ideas from the simpler ones.

Outcome: After learning the course the students will understand the organization of the control unit, arithmetic and logical unit, memory unit and I/O unit. Apply knowledge of the processor's internal registers and operations by use of a PC based microprocessor simulator. Develop the ability to understand computer performance, computer design, and tradeoffs between cost and performance as well as between hardware and software. Students will formulate and solve problems, understand the performance requirements of systems, and communicate effectively and learn to think creatively and critically, both independently and with others

Sr. No.	Topic	No. of Lectures	Weightage in %
	COMBINATIONAL CIRCUITS		
1	Fast adders, Multipliers, Squaring circuits, Magnitude Comparator (7485), Design of PLA and PAL, Design of combinational circuits using MSI and LSI.	5	10
	REGISTER TRANSFER LOGIC		
2	Introduction, Interregister Transfer, Arithmetic logic and Shift Micro-operations, Conditional Control Statements, Fixed-Point Binary Data, Overflow, Arithmetic Shifts, Decimal Data, Floating-point Data, Non-Numeric Data, Instruction Codes, Design of Simple Computers	5	10
	PROCESSOR LOGIC DESIGN		
3	Processor Organization, Arithmetic Logic Unit, Design of Arithmetic Circuit, Design of Logic Circuit, Design of ALU, Status Register, Design of Shifter, Processor Unit, Design of Accumulator	5	10
	CONTROL LOGIC DESIGN		

4	Introduction, Control Organization, Hard-wired control, Microprogram Control, Control of Processor Unit, PLA control, Microprogram Sequencer	3	15
	COMPUTER DESIGN		
5	Introduction, System of Configuration, Computer Instruction, Timing and Control, Execution of Instruction, Design of Computer Registers, Design of Control, Computer Console	3	15
	MEMORY ORGANIZATION		
6	Types of Memory; Memory Hierarchies; Organisation of Static and Dynamic Semiconductor Memories; Associative Memory Organization; Cache Organisation, CPU- memory interaction, Cache memory and related mapping and replacement policies, Virtual memory	7	15
	INPUT-OUTPUT ORGANIZATION		
7	Device Interfacing and Selection; Memory and I/O Mapped I/Os; Modes of Data Transfer-Programmed; Interrupt and DMA Driven I/O-Interrupt Types and Priority Schemes; Synchronous and Asynchronous Data Transfer.	7	15
	PIPELINE AND VECTOR PROCESSING		
8	Flynn's taxonomy; Parallel Processing; Pipelining; Arithmetic Pipeline; Instruction; Pipeline; RISC Pipeline; Vector Processing; Array Processors	5	10
	Total	**40**	**100**

References:

1. M. Morris Mano, " Digital Logic and Computer Design", PHI
2. Hamacher, Vranesic, Zaky, "Computer Organization", McGraw Hill
3. Morris Mano, "Computer System Architecture", Pearson Education
4. Andrew S. Tanenbaum and Todd Austin, "Structured Computer Organization", Pearson Education
5. N D Jotwani, "Computer system organization", McGraw Hill

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THE M. S. UNIVERSITY OF BARODA

CSE1504 THEORY OF COMPUTATION

FSBE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:
Practical	: 0 Hrs.	Total	:100

Pre-requisites: -

Objectives: Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.

Outcome: At the end of this course students will be able to :

1) Construct finite state machines and the equivalent regular expressions.

2) Select appropriate machine for various types of languages.

3) Prove the equivalence of languages described by finite state machines and regular expressions.

4) Construct pushdown automata and the equivalent context free grammars.

5) Prove the equivalence of languages described by pushdown automata and context free grammars.

6) Construct Turing machines and Post machines.

7) Prove the equivalence of languages described by Turing machines.

Sr. No.	Topic	No. of Lectures	Weightage in %
1	Fundamental of Finite State Automata Review of Mathematical Terms and Theory, Basic Mathematical Notations and Set Theory, Logic Functions and Relations, Language Definitions, Mathematical Inductions and Recursive Definitions. Finite Automata: Deterministic And Non Deterministic Finite Automata, Ù-Transitions, Conversion from NFA to DFA, Kleene's Theorem, Regular and Non Regular Languages	10	25
2	Fundamental of Languages & Grammar CFG (Context Free Grammar): Introduction To CFG, CFG And Known Languages, Unions Concatenations And *'S Notations And CFL, Derivations Of Trees And Ambiguity, Unambiguous CFG And Algebraic Expressions, Normal	10	25

	Forms And Simplified Forms. Pushdown Automata, CFL and NFL: Introduction To PDA, Definition, DPDA, PDA Corresponding To CFG, CFG Corresponding To PDA, Introduction To CFL, Intersections And Complements Of CFL, Decisions Problems And CFL.		
3	Fundamental of Turing Machine Turing Machines, Recursive Language: Model Of Computation And Church Turning Thesis, Definition Of Turing Machine, Tm And Language Acceptors, Variations Of Tm, Non Deterministic Tm, Universal Tm, Enumerable And Language, Recursive And Non Recursive Enumerable Computation Functions, Measuring, Classifications And Complexity. Primitive Recursive Functions, Halting Problem, Recursive Predicates And Some Bounded Operations, Unbounded Minimizations And μ-Recursive Functions, Gödel Numbering, Computable Functions And μ-Recursive, Numerical Functions, Tractable And Intractable Problems.	10	25
4	Fundamental of NP Problem Growth Rate And Functions, Time And Speed Complexity, Complexity Classes, Tractable And Possibly Intractable Problems, P And NP Completeness, Reduction Of Time, Cook's Theorem, NP-Complete Problems.	10	25
	Total	**40**	**100**

References:

1. Introduction to Languages and Theory Of Computation, John C. Martin, TMH.
2. Automata Theory, Languages and Computation, Hopcroft, Motwani, Ullman, Pearson Education
3. Theory of automata, Languages and computation, Kumar, McGraHill,
4. The Theory of Computation, Moret, Pearson Education

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THE M. S. UNIVERSITY OF BARODA

CSE1605 .NET Technologies (Programming Elective-I)

SSBE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Studentshave already studied structured programming and object oriented programming using C and C++, respectively.

Objectives: To teach the fundamentals of windows-based and web programming of .NET using Visual basic and C# along with ASP.

Outcome: Students will be able to write the programs related to windows and web based systems.

Sr. No.	Topic	No. of lecture required	Weightage %
1	An Overview of .NET & its goal - Introduction to .NET - The role of .NET Enterprise Servers - Origins of .NET - An overview of .NET Framework and .NET Core	2	5
2	The .NET Framework's Common Language Runtime (CLR) - The Anatomy of .NET Application - Common Type System - Metadata - Managed Data – Assemblies - Compiling Managed Code - Organising Managed Code - Executing Managed Code Introduction to .NET Core – Understanding .NET Core -Differences between .Net Core and .NET Framework	6	10
3	C# Language – DataTypes, Console I/O, Anatomy of C# Program, Program Control Statements, Understanding Arrays and Strings, OOPs Concepts implementation in C#, Exception Handling, Delegates, Lambda Expressions, Linq and other language features	7	15
4	Class Library (FCL/Core FX) - System Namespaces - System. Collections - Input Output – Windows GUI based (desktop) applications (Introduction)	5	10
5	Threads –Serialization - Working with XML\JSON – Reflection.	2	5
6	Building Web Applications using .NET Technologies ASP.NET Core Based Web Application, MVC, Controllers and Action Methods, Views, Helpers, Model Binding, Validations and Data Annotations, Security, Routing, AJAX Introduction to containerized applications with .NET	8	25
7	Session Management Techniques,ADO.NET Fundamentals, Entity Framework Core	4	10

8	.NET Remoting (Introduction)– Interoperability - Web Services –Web API (Concepts and Implementation)	6	20
	Total Lectures	**40**	

References:

1. Understanding .NET- David Chappell
2. Microsoft Visual C# Step by Step, Ninth Edition, John Sharp, June 2018
3. Programming ASP.NET Core, Dino Esposito, Microsoft Press, May 2018
4. ASP.NET Core fundamentals | Microsoft Docs

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THE M. S. UNIVERSITY OF BARODA

CSE1606 Advanced Java Technologies (Programming Elective-I)

SS BE– III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Basics Object Oriented Concepts, Core Java Programming, Operating Systems, Database Systems and Computer Networks.

Objectives: This subject aims at teaching the evolution of Application Programming, Issues and Challenges related to design and implementation Network based Applications, Client-Server Applications, Web-based Applications and Distributed Applications. It enables the student to develop n-tier architecture based application programming.

Outcome: Students will learn about application development for Network, Client-Server, Web-based, Distributed Applications, implemented in optimized way using various Design Patterns.

Sr. No.	Topic	No. of Lectures	Weightage in %
1	**A REVIEW TO CORE JAVA CONCEPTS**		
	Introduction to Java 8, Lambda expressions, Method references ,Functional interfaces, Stream API, Default methods, Static methods in interface, Optional class, Collectors class, For Each() method, Annotations ,Parallel array sorting.	6	10
2	**GUI Pragramming, Event Handling & JAVA Swings**		
	Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window SWING Lists, Trees, Tables, Styled Text Components, Progress Indicators, Component Organizers, Extending GUI Features Using Swing Components, Introduction to JApplet Class	6	20
3	**Java Networking**		
	Concepts and APIs for IP Address, URL, ServerSocket, Socket, Datagram Socket, Socket Programming, UDP Programming, Multicasting, Concepts of Chat Server and	3	10

	Proxy Server and its implementation issues.		
4	**Java Database Connectivity**		
	The Design of JDBC. The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions, Advanced Connection Management, Introduction of LDAP	4	10
5	**Java RMI**		
	Concepts of Distributed Systems, Characteristics of Distributed Systems, RPC concepts, Purpose of RMI, RMI implementation using Stub and Skeleton, Naming Interface and RMI classes, Programming using RMI	4	10
6	**Java Servlets & JSP**		
	Concepts of Web-based Application Development, Difference between CGI and Servlets, Generic and HTTP Servlets, Programming and Executing the Servlet programs, Servlet Request and Servlet Response, Passing Parameters from Client to Servlets, Passing Initialization Parameters to Servlets, Accessing Request Information, Cookies and Session Handling, Database Communication from Servlets, Request Dispatcher, invoking another Servlet, Uploading and Downloading files using Servlets, HTTP Filter. Introduction to JSP, Difference between JSP and Servlets, Setting Up the JSP Environment, JSP Directives, JSP Action, JSP Implicit Objects, JSP Form Processing, Standard Tag Libraries, JSP Custom Tag, JSP Expression Language (UEL), JSP Exception Handling, JSP XML Processing, Annotations	8	20
7	**Java Mail, Web Services, REST APIs, Java Security APIs, JNLP, JMC**		
	Java Mail Environment Setup, Java Mail APIs, Sending, Receiving, Forwarding, Replying, Deleting Mails What is a Web Service, Components of Web Service, SOAP Web Service, RESTful Web Service, Comparison of SOAP & REST, Web Service APIs Concepts of javax.security package and its fundamental classes, Implementing Security through JNLP, Java Mission Control	6	10
8	**Design Patterns, Java Application Development Frameworks and Tools, Introduction to Hibernate, Introduction to JSF**		
	Concepts and Purpose of Design Patterns, Types of Java Design Patterns like Creational Patterns, Structural Patterns and Behavioral Patterns	3	10

	Total	**40**	**100**

REFERENCES

1. Sun Microsystems Press Java Series vol1 & 2 – Peter van der LINDEN
2. Java Programming Language – Ken Arnold, James Gosling, David Holmes, Sun Microsystems
3. Java Network Programming – Elliotte Harold, O'Reilly
4. Java Servlets and JSP – Marty Hall, Sun Microsystems
5. Headfirst Servlets and JSP – Bryan Basham, Kathy Sierra, Bert Bates, O'Reilly
6. A Programmers Guide to Java Certification: A Primer – Khalid Mughal, Pearson Education Inc.
7. Java Web Services Architecture – James McGovern, Sameer Tyagi, Michael Stevens, Sunil Mathews, Elsevier
8. Java Design Patterns – James W. Cooper, Addison-Wesley
9. Java API Reference through Online Java Docs

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THE M. S. UNIVERSITY OF BARODA

CSE1601 COMPILER DESIGN

SS BE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:0
Practical	: 0 Hrs.	Total	:100

Pre-requisites: Theory of Computation

Objectives: - To understand concept and design of language processor or translator. To understand the details of each phase of the translator.

Outcome: After studying this subject the students will be able to design their own translator for several programming language construct

Sr. No.	Topic	No. of Lectures	Weightage in %
1	Introduction: Language Processor, Structure of compiler, Evolution of programming languages, Two pass assembly Loaders & Link Editors, Front End & Back End, Compiler Construction Tools, What are the challenges in compiler design, Qualities of good compiler	3	10%
2	Lexical Analyzer: Role of lexical analyzer, Issues in lexical analyzer, Lexical error handling, Tokens, patterns, lexemes, Attributes of tokens, Input buffering, Definitions of 'Alphabet', 'String', 'Language', Kleene closures, Definition of regular language, Regular expressions, Recognition of tokens	3	5%
3	Finite state automata, Design of Finite state automata for given language, Language accepted by finite state automata, Nondeterministic finite state automata, Conversion NFA to DFA, NFA with epsilon transitions, Conversion NFA with epsilon transitions to DFA, Construction of an NFA from Regular Expressions, Comparisons between NFA & DFA	5	10%
4	Syntax Analysis: The Role of the parser, Syntax error handling, Different types of Grammars, Context Free Grammars, Context Free Languages, Design of context free	3	10%

	grammars for given languages, Identify the language accepted by the given grammars, Parse tree & derivations, Ambiguous grammars, Removal of useless symbols from the grammar, Elimination of left factoring, Elimination of left recursion		
5	Top-Down Parsing, Backtracking Problem in Top Down Parsing, Recursive Decent Parsing , Top-Down Predictive parsing, First & Follow methods, Construction of predictive parsing table, LL(1) grammar, Advantages & Disadvantages of LL(1) parsing	4	10%
6	Bottom up Parsing, Shift Reduce Parsing, Operator precedence parsing, LR Parsers, Construction of SLR parsing Tables, Conflicts during shift-reduce Parsing	5	10%
7	Syntax directed definitions, Synthesized Attributes, Inherited Attributes, Dependency Graphs, Evaluation order, Methods for evaluation semantic rules, Construction of syntax trees, Directed acyclic graphs for expressions, Value number Method, L-attributed definitions, Type checking(static v/s dynamic)	6	15%
8	Intermediate code generations: Three address code, Quadruples, Triples, Indirect Triples, Static Single Assignment form	3	10%
9	Run-Time Environment: Storage Organization, Static versus Dynamic Storage allocation, Activations Tree, Calling Sequences, Access link, Heap Management, The Memory Manager, Locality of programs, Managing and Coalescing Free Space	5	10%
10	Code generations: Issues in Code generations, Peephole optimization	3	10%
	Total Lectures	**40**	**100**

References:

1. Compiler Tools Techniques By : A.V.Aho, Ravi Sethi ,J.D.Ullman Publication : Addison Wesley
2. The Theory And Practice Of Compiler Writing By : Trembley J.P. And Sorenson P.G. Publication : Mcgraw-Hill

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THE M. S. UNIVERSITY OF BARODA

CSE1602 COMPUTER NETWORKS

SS BE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	:150

Objectives: -To enable students to understand and realize how devices are interconnected to form a network and used for information and resource sharing.Also help them in understanding internet/intranet concepts and other contemporary networks that use wireless technologies, etc

Outcome: After the completion of this course, students will have required knowledge to configure a network for a small organization and also have required knowledge for developing network applications.

Sr. No.	Topic	No. of Lectures	Weightage in %
1	Introduction : Introduction to Computer Networks, Network Architecture, OSI reference model, services, network standardization.	4	7.5
2	Physical Layer : Basics of data communication, Guided Transmission Media, Wireless Transmission, Switching	2	7.5
3	Data Link Layer : Design issues, Error detection and correction, Elementary Data Link Protocols, Sliding window protocols, Data Link Protocols in Internet	6	15
4	Medium Access Sub-layer : Channel Allocation, Multiple Access Protocols, IEEE standard 802 standards for Ethernet LAN, Wireless LANS, Broadband Wireless, Data Link Layer Switching	8	20
5	Network Layer : Design issues, Routing algorithms, Congestion control, Internetworking, Network layer in the Internet	12	30
6	Transport Layer : Design issues, Transport Service, Elements of Transport Protocol, Internet Transport Protocols – UDP & TCP	6	15
7	Application Layer :Domain Name System, Electronic mail, WWW	2	5

	Total	**40**	**100**

References:

1. Computer Networks:A. S. Tanenbaum
2. Computer Networking : Kurose & Ross
3. Data & Computer Communications : William Stallings
4. Internetworking with TCP//IP – Volume III Douglas Comer

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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THE M. S. UNIVERSITY OF BARODA

CSE1603 OPERATING SYSTEMS

SS BE – III

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	:150

Objectives: - The students should be able to appreciate various features of operating systems and evaluate critically their suitably in a given environment. The subject is basics for understanding system level programming.

Outcome: At the end of this course students will be able to

i) Understand various Operating System concepts and multiprocessing environment
ii) Analyze various scheduling algorithms, apprehend virtual memory management, paging and segmentation
iii) Analyze file systems from user and design perspective
iv) Analyze protection and security mechanisms of Operating System

Sr. No.	Topic	No of Lectures	Weightage in %
1	Functions of Operating Systems, processes, files, Different types of Operating Systems, Different Operating Systems Structures	5	10
2	Process management, Process states and transition, Inter Process Communication, Threads, Scheduling of Processes, Deadlocks	9	25
3	Memory Management, Swapping, Virtual Memory with Paging, Page replacement, Segmentation	8	25
4	Files, Directories, Implementation of Files, Files and Shared files, log-structured files, File System consistency, reliability and performance, Case Studies	7	20
5	Basic concepts of Input/Output, Interrupt handlers, device drivers, Disk arm scheduling algorithm, clocks and power management	5	10
6	Security and Protection, Design examples of security, User Authentication, Protection Mechanism, Access control list	6	10

References:

1. Modern Operating Systems by Andrew S Tanenbaum,PHI
2. Operating System Concepts by Silberschatz and Galvin, John Wiley and Sons
3. Operating Systems Concepts and Design by Milan Milenkovic, McGraw Hill

4. Operating Systems by William Stallings,

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THE M. S. UNIVERSITY OF BARODA

CSE1604 SOFTWARE ENGINEERING

SS BE – III

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: -
Practical	: -	Total	: 100

Prerequisites: Students should have an understanding of the basic programming. This course aims to enable students to understand the requirement of customers and how to design a plan before implementation.

Objectives: This is to provide student basic understanding of software product, software design and development process, software project management and design complexities etc. At the end of the student will be equipped with well understanding of software engineering concepts..

Outcome: Student will develop analytical skills to evaluate software and make improvements.Compile bugs into reports and recommend solutions.Effective professional communication skills. Detail oriented approach to software design. Creative minded professional. Extensive problem solving and critical thinking abilities. Excellent understanding of design principles and experience in their application. Background in quality assurance department. Extensive working knowledge of hardware, tools, and software languages. Ability to design and develop technical plans. Logical and structured way of interpreting information.

Sr. No.	Topic	No. of Lectures	Weightage in %
1.	**Fundamental of Software Engineering:** ● Introduction to Software Engineering. Basic issues in Software Engineering-Structural Programming. ● Software Development Life Cycle, Basics of Software life cycle-Waterfall model-Prototype and Spiral models. ● Requirement Analysis and Specification, Basic concepts in requirement analysis and specification-Formal Requirement specification-Algebraic Specification.	10	25
2.	**Basics in Software Design:** ● Software Design, Basics in Software Design-Overview of current design approaches-Function, and Oriented Software Design-DFDs-DFD model of a system-structured design-ER Modeling-Database Design. ● Object Oriented Design and Software Development, Revision of OO concepts-Object modeling using UML-Use Case Models-Class and interaction diagrams-Activity and Statechart diagrams-Sequence	10	25

	and Collaboration diagrams-Component and Deployment diagrams- Design patterns-Domain modeling		
3.	**UI Design & Software Testing:** ● User Interface Design, Basics in UI design-Types of UI-Component based GUI Development. ● Coding and Testing, Code Review-Black Box Testing-White Box Testing-Debugging, Interaction and System Testing. ● Software Project Management, Project Planning and estimation techniques-COCOMO Model-Staffing level estimation and Scheduling-CPM and PERT. ● Software Project Monitoring and Control, Organization and team structures-Risk management and software configuration management	10	25
4.	**Software Reliability & CASE Tools:** ● Software Reliability and quality management, Reliability issues-Statistical testing and Software quality management-ISO9000-SEI CMM. ● Software Maintenance and Reuse, Characteristics of software maintenance-Basics of software reuse-reuse approach. ● Computer Aided Software Engineering (CASE), Basic idea on CASE tools-Characteristics-Case study on CASE tools.	10	25
	Total	**40**	**100**

References:

1. Fundamentals of Software Engineering – Rajib Mall.
2. Software Engineering – A practitioner's Approach by Roger Pressman.
3. Software Engineering – Ian Sommerville

BE-IV

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

FACULTY OF TECHNOLOGY & ENGINEERING

THE M. S. UNIVERSITY OF BARODA

CSE1701 MICROPROCESSOR ARCHITECTURE & INTERFACING

FSBE – IV

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	: 150

Objectives: - To introduce the students with architecture of 8088/8086 microprocessor and addressing modes supported. The interfacing with memory and I/O is essential in designing and understanding the various applications of microprocessor. The students should be introduced Assembly language programming with 8086 microprocessor. Knowledge of these concepts is necessary in the field of Embedded Systems and IoT.

Outcome:

At the end of this course students will be able to

i) Understand the architecture and programming of 8086/8088 processor
ii) Interface various peripherals with 8086
iii) Understand the architectures of Pipelined and Superscalar Processors
iv) Design Multiprocessor based systems for various applications

Sr. No.	Topic	No of Lectures	Weightage in %
1	Internal architecture of Intel 8086/8088 microprocessor, Pin Configuration, Min Mode and Max Mode	5	10
2	Memory Segmentation, Study of 8284 Clock Generator, Bus Timing, Read and Write Timings, Interrupts, 8288 Bus Controller	5	10
3	Instruction set of 8086, Addressing modes, Assembly language programming	9	25
4	Memory Interfacing with 8088 and 8086: SRAM, ROM and DRAM Interface, I/O Interfacing, Peripheral IC 8255 and its applications, Interrupts processing, Peripheral IC 8259	9	20
5	Instruction level parallelism, Basic concepts of Pipelining, Types of Hazards, Superscaling, Multithreading, Branch prediction	6	20
6	Pentium and Multicore Architecture, Block diagram, Operating Modes, Protection Mode	6	15

References:

1. Microprocessor and Interfacing by Douglas Hall, Tata McGraw Hill

2. The Intel Microprocessors by Barray B Bey, Pearson
3. Microcomputer Systems: 8086/8088 family Architecture, Programming and Design by Liu & Gibson, PHI
4. Parallel Computers Architecture and Programming by V Rajaraman, C. Siva Ram Murthy, PHI
5. Computer Organization by Hamacher, Vranesic, Zaky, PHI

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THE M. S. UNIVERSITY OF BARODA

CSE1703 ARTIFICIAL INTELLIGENCE (CORE ELECTIVE-I)

FS BE– IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Objective: Artificial intelligence is the science that studies and develops methods of making computers more intelligent. The focus of this course is on core AI techniques for knowledge representation, search, reasoning, learning and designing intelligent systems. The course also aims to give an overview of other topics within AI and learn : Representation of world knowledge using symbolic logic. Deductive strategies employed in symbolic logic. Programming in prolog.

Outcome: After completing this course, students should be able to: Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem. Formalise a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).Design and perform an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

Sr. No.	Topic	No. of Lectures	Weightage %
1	Facts, Questions, Variables, Conjunctions, Rules, Syntax, Characters, Operators, Equality and Matching Arithmetic	6	14
2	Structures and Trees, Lists, Recursive Search, Mapping Recursive Comparison, Joining Structure together, Accumulators, Different Structures	3	08
3	Generating multiple solutions, The Cut, Common uses of the Cut, Preventing backtracking, Negation and Failure, Problems with the Cut. Reading and Writing Terms, Reading and Writing Files, Declaring Operators. Entering new clauses, Success and Failure, Classifying Terms	4	11
4	Treating clauses as Terms, Constructing and accessing components of structures, Affecting backtracking, Constructing Compound Goals, Equality, Input & Output, Handling Files, Evaluating Arithmetic Expressions, Comparing Numbers, Watching PROLOG at work	4	11

5	Operations on Data Structures, Representing and Sorting lists, List Processing, Representing Sets by Binary Trees, Insertion and Deletion in Binary Dictionary, Displaying Trees, Graphs.	5	12
6	Brief Introduction to Predicate Calculus and Horn Clauses. Declarative and Procedural meaning of PROLOG programs	3	08
7	Introduction to Artificial Intelligence, representing knowledge using facts and rules Expert System , Natural Language processing, Speech generation and Speech Synthesis	5	12
8	Problems, State Space and Search, Tree Representation, Search Strategies, Depth first Breadth first Best first, heuristic search, Pattern Matching, generate and test, , procedural vs declarative knowledge, forward vs backward reasoning,	5	12
9	Quantifying uncertainty, basic probability notations, probabilistic reasoning, representing knowledge in an uncertain domain, time and uncertainty, minimax, alpha-beta cut-off, refinements, iterative deepening,	5	12
	Total Lectures	**40**	

References:

1. Artificial Intelligence - Elaine Rich, Kevin Knight
2. Introduction of Artificial Intelligence - Charniak E.
3. Artificial Intelligence - Hunt E. D.
4. Understanding Artificial Intelligence - Henry C Mishkoff
5. Programming in PROLOG - W F Clockcin & C S Mellish
6. Prolog Programming for Artificial Intelligence - Ivan Bratko

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THE M. S. UNIVERSITY OF BARODA

CSE1704 LINUX ADMINISTRATION & NETWORK PROGRAMMING (CORE ELECTIVE-I)

FS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Studentsshouldhavean understandingofthe basic system programming. Also the student is expected to be familiar with core concepts of operating systems and computer networks**.**

Objectives: Linux is the operating system (OS) of choice for today's servers, network infrastructure, embedded systems and mobile devices. This course offers learning at all levels, from basic installation and tools to network administration, developing applications or services, kernel customization for advanced systems, creating and managing network infrastructure.

Outcome: After the completion of this course, students will be able to Install and administer network services, Use the command line interface for system administration, Install and manage disks and file systems and demonstrate strategies for planning/designing systems.

Sr. No.	Topic	No. of Lectures	Weightage in %
	LINUX ADMINISTRATION		
1	**Introduction:** History, evolution, design principles, system administrators role, root account	2	06
2	**Kernel:** Kernel basics, kernel architecture, compiling the kernel, modules, kernel tuning	3	08
3	**Resource Management:** Package Management: managing packages, compiling programs from source, shared libraries Process Management: process, signals, daemons, memory, process accounting Disk Management: files and directories, file systems, disk quotas, kernel file cache, distributed file system, RAID User Management: users and groups, passwords, removing a user, restrictions, logging in to linux	8	15
4	**Scheduling Tasks and Managing Backups:** Backup and restore, backup media, backup utilities	2	04

5	**Types of Servers & Server Setup in Linux:** File/FTP server, network server, mail server, web server, samba server, telnet server installation, setup and configuration, comparisons of various distributions	3	07
6	**Security:** Host security, vulnerabilities, network security, security policies, internet security resources, encryption, security tools, system logs, managing logs	2	10
	NETWORK PROGRAMMING		
7	**TCP/IP Networking:** Networking roadmap, packet addressing, IP addresses, routing, ARP, DHCP, security issues, basic network configuration	4	08
8	**Network Hardware:** Ethernet, wireless, network testing and debugging, network design issues	6	12
9	**Network File System:** Introduction, server-side NFS, client-side NFS, network information system	3	10
10	**Network Management and Debugging:** Network troubleshooting, packet sniffing, network management protocols, network management applications, NETFLOW	4	10
11	**Security:** How security is compromised, security philosophy, passwords and user accounts, effective use of chroot, security power tools, cryptographic security tools, firewalls, virtual private networks, certification and standards	3	10
	Total	**40**	08

References:

1. Unix and Linux System Administration Handbook by Evi Nemeth, Garth Snyder, Trent Hein, Ben, Whaley, Prentice Hall
2. Unix Network Programming By W. Richard Stevens, Bill Fenner, Andrew M. Rudoff
3. Linux Administration A Beginner's Guide by Wale Soyinka
4. Linux System Administration, By Paul Cobbaut
5. Operating System Concepts & Design : William Stallings, Unix : Sumitabha Das
6. Design of UNIX Operating Systems: Bach M.
7. Operating Systems Design & Implementation : Andrew S. Tanenbaum

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THE M. S. UNIVERSITY OF BARODA

CSE1705 STATISTICS IN DATA SCIENCE(CORE ELECTIVE-I)

FS BE – IV

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	: 150

Prerequisites: Familiarity with Math and statistics. Know the Basic concepts of object oriented programming like C, C++ or Java to ease the process of learning data science programming tools like Python and R.Having knowledge of SQL.Curious about playing with data

Objectives: This course will cover how student can gain knowledge in statistical thinking in designing data collection, derive insights from visualizing data, obtain supporting evidence for data-based decisions and construct models for predicting future trends from data.

Outcome: Data collection, analysis and inference.Data classification to identify key traits and customers.Conditional Probability-How to judge the probability of an event, based on certain conditions.How to use Bayesian modelling and inference for forecasting and studying public opinion.Basics of Linear Regression.Data Visualization: How to create use data to create compelling graphic.

Sr. No.	Topic	No. of Lectures	Weightage in %
1.	**Introduction to Data Science**	2	5
2.	**Statistical Thinking 1:** ● Examples of Statistical Thinking ● Basics of Statistics ● Frequency Distributions ● Different Types of Biases ● Numerical Measures of Data ● Probability and Probability Distributions ● Conditional Probability and Bayes Rule	20	50
3.	**Statistical Thinking 2:** ● Samples ● Sampling Methods and CLT ● Hypothesis Testing and testing techniques ● Chi-Square Testing ● Introduction to Linear Regression and Correlation ● Special Regression Models	12	30
4.	**Exploratory Data Analysis and Visualization:**	4	10

	● Time Series analysis and Forecasting ● Bayesian inference: combining models and data in a forecasting problem ● Bayesian hierarchical modeling for studying public opinion ● Bayesian modeling for Big Data		
5.	**Introduction to Machine Learning**	2	5
	Total	**40**	**100**

References:

1. Larry Wasserman's- All of Statistics: A Concise Course in Statistical Inference

2. Hastie, Tibshirani, and Friedman's -The Elements of Statistical Learning

3. David Barber's -Bayesian Reasoning and Machine Learning

4. Statistics for Data Science: Leverage the power of statistics for Data Analysis, Classification, Regression, Machine Learning, and Neural Networks by James D. Miller.

5. Practical Statistics for Data Scientists: 50 Essential Concepts by Peter Bruce , Andrew Bruce

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THE M. S. UNIVERSITY OF BARODA

CSE1706 DATA WAREHOUSING & DATA MINING (CORE ELECTIVE-II)

FSBE – IV

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: An introductory course on database systems. Basic concepts in probability and statistics

Objectives: - This course will introduce the concepts, techniques, design and applications of data warehousing and data mining. Some systems for data warehousing and/or data mining will also be introduced. The course is expected to enable students to understand and implement classical algorithms in data mining and data warehousing. Students will learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply. Then, they will be able to assess the strengths and weaknesses of the algorithms and analyze their behavior on real datasets.

Outcome: By the end of this course the student should be able to:

- Understand the functionality of the various data mining and data warehousing components
- Appreciate the strengths and limitations of various data mining and data warehousing models
- Compare the various approaches to data warehousing and data mining implementations
- Describe and utilize a range of techniques for designing data warehousing and data mining systems for real-world applications

Sr. No.	Topic	No. of Lectures	Weightage in %
	DATA WAREHOUSING		
1	Introduction to data warehousing- evolution of decision support systems- Modeling a data warehouse- granularity in the data warehouse- Data warehouse life cycle- building a data warehouse-Data Warehousing Components- Data Warehousing Architecture- Data Warehouses and Data Marts	5	15%
2	**ONLINE ANALYTICAL PROCESSING** On Line Analytical Processing, Multidimensional Data Model – OLAP Guidelines, Multidimensional versus Multirelational OLAP, Categorization of OLAP Tools	3	10%
	DATA MINING		
3	Motivation for Data Mining – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task	3	10%

	Primitives – Integration of a Data Mining System with a Data Warehouse – Issues in DM, KDD process.		
4	**DATA PREPROCESSING AND DATA MINING PRIMITIVES** Why Preprocess the Data? – Data Cleaning – Data Integration and Transformation – Data Reduction – Discretization and Concept Hierarchy Generation – Data Mining Primitives: What Defines a Data Mining Task?	5	13%
5	**CONCEPT DESCRIPTION** What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons	3	5%
6	**ASSOCIATION RULE MINING AND CLASSIFICATION** Association Rule Mining: Market basket analysis - basic concepts ,Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining	5	12%
7	**CLASSIFICATION** Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.	6	15%
8	**CLUSTERING AND TRENDS IN DATA MINING** Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.	6	15%
9	**ADVANCE TOPICS OF DATA MINING AND ITS** APPLICATIONS Mining Time-Series and Sequence Data – Mining Text Databases – Mining the World Wide Web – Data Mining Application	4	5%
	Total	**40**	**100**

References:

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Second Edition, 2006
2. Alex Berson,Stephen J. Smith, "Data Warehousing, Data Mining, & OLAP", Tata Mcgraw- Hill, 2004.

3. Introduction to Data Mining. Tan, Steinbach, Kumar. Addison-Wesley. 2006.
4. W. H. Inmon, "Building the Data Warehouse", 3rd edition.
5. Anahory and Murray .,Data warehousing in the real world , Pearson Education/Addison Wesley.
6. Margaret Dunham, Data Mining: Introductory and Advanced Topics, Published by Prentice Hall.
7. George M Marakas, Modern Data Warehousing , Mining

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THE M. S. UNIVERSITY OF BARODA

CSE1707 DISTRIBUTED SYSTEMS (CORE ELECTIVE-II)

FS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Studentsshouldhavean understandingofthe basic programming. Also the student is expected to be familiar with core concepts of operating system and computer networks**.**

Objectives: This course covers general introductory concepts in the design and implementation of parallel and distributed systems. It also covers the architecture and enabling technologies of distributed computing systems and their innovative applications.

Outcome: Students will learn about distributed systems and they will be able to write portable programs for distributed architectures. It also introduces the idea of peer to peer services and distributed file systems.

Sr. No.	Topic	No. of Lectures	Weightage in %
	DISTRIBUTED SYSTEMS		
1	**Introduction to Distributed Systems:** Introduction, distributed computing models, purpose of distributed system, types of distributed systems, design issues and challenges in distributed systems, architecture, comparison of parallel multiprocessor and multi-computer systems, Flynn's taxonomy, primitives od distributed communication (blocking, non-blocking, synchronous, asynchronous)	3	06
2	**Network Communication:** OSI model and internet protocols, LAN, WAN and ATM technologies for distributed systems, sockets and streams, message oriented communication, multicast communication	5	15
3	**Remote Communication:**	4	22

	Introduction to remote communication, RPC basics, RPC implementation, RPC communication and issues, RMI basics, RMI implementation in java		
4	**Synchronization:** Clock synchronization, logical clocks, global state, mutual exclusion, message ordering, group communication, deadlocks in distributed systems, deadlocks in message communication	6	10
5	**Distributed System Management:** Resource management, task management approach, load balancing approach, load sharing approach, process management, process migration, threads, fault tolerance	6	15
6	**Distributed Shared Memory:** Concepts, hardware DSM, design issues in DSM systems, implementation issues, heterogeneous and other DSM systems	4	08
7	**Distributed File Systems and Distributed Database:** Introduction to DFS, file models, distributed file system design, semantics of file sharing, DFS implementation, file caching, replication, introduction to DDMS, DDMS architecture, data storage in DDMS, naming concepts in DDMS, Distributed transactions and concurrency control	6	12
8	**Naming:** Identifiers, addresses, flat naming, structured naming, attribute based naming, system oriented names, object locating mechanisms, issues in designing human oriented names, name caches, naming and security, DNS	6	12
	Total	**40**	**100**

References:

1. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg, Pearson Education
2. Distributed Computing Principles, Algorithms and Systems, Ajay D. Kshemkalyani and Mukesh Singhal, CUP
3. Distributed Systems Principles and Paradigms, Andrew S. Tanenbaum, Marteen Van Steen
4. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University Press
5. Distributed Computing, Fundamentals, Simulations and Advanced topics, Hagit Attiya and Jennifer Welch, Wiley

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THE M. S. UNIVERSITY OF BARODA

CSE1708 NETWORK SECURITY (CORE ELECTIVE-II)

FSBE – IV

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	: 150

Objectives: -The subject focuses on basic concepts in Network Security. It aims to introduce the students to the fundamental techniques used in implementing secure network communications, and to give an understanding of common threats and attacks, and some practical experience in protecting network systems and personal data.

Outcome: At the end of this course students will have sufficient knowledge about what is required to secure a Personal System, an Organizational network and also Application data. They will be familiar with some of the good practices to be followed for keeping personal information secure.

Sr. No.	Topic	No. of Lectures	Weightage in %
1	Introduction to Network Security	2	5
2	Security Attacks & Measures : Concepts & Terminologies	2	5
3	Cryptography – Symmetric Key Cryptography and Public Key Cryptography	6	25
4	Message Digests, Digital Signatures, Authentication Systems, Key Management	8	25
5	Network Security Applications : - Electronic Mail Security, IP Security, Web Security, Network Management Security, E-Commerce Security etc.	12	15
6	Hacking & System Security – Intrusion Detection Systems, Malicious Software, Firewalls, VPN, etc	6	25
	Total	**40**	**100**

References:

1. Cryptgraphy&NetworkSecurity :William Stallings
2. Cryptgraphy&NetworkSecurity :Forouzan

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THE M. S. UNIVERSITY OF BARODA

CSE1709 MOBILE APPLICATION PROGRAMMING (Programming Elective-II)

FSBE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Programming using Java.

Objectives: To teach the fundamentals of Mobile application development using Android

Outcome:

- Understand the concept of open source mobile development.
- Describe Android architecture frame work.
- Design Android UI Layout
- Develop event driven programs.
- Develop applications using menus and dialog boxes.

Sr. No.	Topic	Lectures Required	Weightage %
1	Mobile technology : Overview of Android - An Open Platform for Mobile development, Open Handset Alliance, Use of Android for mobile app development, Android Marketplaces, Android Development Environment setup, Android Studio, Creating & setting up Android emulator, Android Project Framework and its applications	4	10
2	Android Architecture: Linux Kernel, Libraries, Android Runtime, Application Framework, Applications, Android Startup and Zygote, Android Debug bridge, Android Permission model, Android Manifest File	2	5
3	Design Android UI Layout Android application components: Intent, Activity, Activity Lifecycle, Broadcast receivers, Services and Manifest, Create Application and new Activities, Expressions and Flow control, Android Manifest, Simple UI -Layouts and Layout properties, Fundamental Android UI Design, Introducing Layouts, Creating new Layouts, Drawable Resources, Resolution and density independence (px,dp,sp)	8	20
4	Develop event driven Programming in Android: Event driven Programming in Android (Text Edit, Button clicked etc.), Creating a splash screen, Android Activity Lifecycle, Introduction to threads in Android	8	20
5	Develop application with menus and dialog boxes, Menu: Custom Vs. System Menus, Creating and Using Handset menu Button (Hardware), Android Themes, Dialog, create an Alter Dialogue, Toast & SnackBar in Android, List & Adapters, Android Manifest.xml File	8	20

6	Develop applications with database: SQLite: Open Helper and create database, Open and close a database, CRUD operation in database, Introduction to Firebase & database programming	6	15
7	Introduction to OpenCV programming using Android	4	10

Reference Books

1. Professional Android 2 Application Development Reto Meier Wiley India Pvt Ltd
2. Beginning Android Mark L Murphy Wiley India Pvt Ltd
3. Professional Android Sayed Y Hashimi and Satya Komatineni Wiley India Pvt Ltd
4. www.developers.android.com

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THE M. S. UNIVERSITY OF BARODA

CSE1710 PYTHON PROGRAMMING (PROGRAMMING ELECTIVE-II)

FS BE– IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Students should have an understanding of the basic programming skills.

Objectives: Python is a modern language useful for writing compact codes specifically for programming in the area of Server side Web development, Data Analytics, AI and scientific computing as well as production tools and game programming. This course covers the basics and advanced Python programming to harness its potential for modern computing requirements.

Outcome: After completing this course students will be able to write programs for various applications using python. They will also be aware about various available libraries that can be helpful while programming

Sr. No.	Topic	No. of Lectures	Weightage in %
	PYTHON PROGRAMMING		
1	**Introduction to Python:** The basic elements of python, installing and working with python, Understanding Python variables, Python basic Operators, Understanding python blocks, statements and comments, type conversion	03	08
2	**Datatypes:** declaring and using numeric data types, using string data type and string operations, list, tuple, set, dictionary, nested statements, indexing, slicing	04	10
3	**Flow Control:** Using if statement, using else statement, elif clause, while loops, for loop, break and continue, pass statement, looping	05	15
4	**Functions:** Python functions, arguments, recursion, anonymous function, lambda function, global, local, non-local, keyword arguments, default parameters, modules, packages	05	15
5	**Files and Exceptions:** Reading from text files, writing to text files, storing complex data in files, pickling, unpickling, shelving, handling	05	15

	exceptions, multiple exceptions, else clause		
6	**Object and Class** Creating classes, methods, objects, using constructors, destructors, attributes, class attributes, static methods, object encapsulation, private attributes, private methods, controlling attribute access, inheritance, types of inheritance in python, understanding polymorphism, importing modules & classes, operator overloading, iterators, generators	08	20
7	**GUI Developments:** Using a root window, labels, buttons, creating a GUI using a class, binding widgets, event handling, grid layout manager, check button, radio button, tkinter module	06	12
8	**Standard Libraries:** Operating system interface, file wildcards, command line arguments, string pattern matching, mathematics, internet access, date and time, data compression, performance measurement	04	05
	Total	**40**	**100**

References:

1. Introduction to Computation and Programming Using Python by John V Guttag, Prentice Hall of India
2. Core Python Programming by R. Nageswara Rao, dreamtech
3. Core Python Programming by Wesley J. Chun, Prentice Hall
4. Data Structures and Algorithms in Pyhon by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley
5. Fundamentals of Python –First Programs by Kenneth A. Lambert, Cenagepublication
6. Luke Sneeringer, “Professional Python”, Wrox

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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THE M. S. UNIVERSITY OF BARODA

CSE1803 BIG DATA ANALYTICS (CORE ELECTIVE-III)

SSBE – IV

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Students Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment

Objectives: - This course will make students to

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hodoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Outcome: By the end of this course the student should be able to:

- Build and maintain reliable, scalable, distributed systems with Apache Hadoop.
- Write Map-Reduce based Applications
- Design and build MongoDB based Big data Applications and learn MongoDB query language
- Learn difference between conventional SQL query language and NoSQL basic concepts
- Learn tips and tricks for Big Data use cases and solutions.
- Apply Machine Learning Techniques using R.

Sr. No.	Topic	No. of Lectures	Weightage in %
1	INTRODUCTION TO BIG DATA Introduction– distributed file system–Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce	6	10%
2	INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE Big Data – Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce -, Data Serialization,	8	20%

	IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets		
3	HDFS, HIVE AND HIVEQL, HBASE HDFS-Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL Querying Data, Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG, Zookeeper , how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper	8	20%
4	Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	4	15%
5	SPARK Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib.	4	10%
6	NoSQL What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL	5	15%
7	Data Base for the Modern Web Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language.	5	10%
	Total	**40**	**100**

References:

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015. References
2. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
3. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012
4. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
5. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
6. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
7. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
8. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
9. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

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CSE1804 CLOUD COMPUTING (CORE ELECTIVE-III)

SS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Basics of Computer Architecture and Organization, Networking.

Objectives: This course covers the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability. It also covers different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud

Software Defined Networks (SDN) and Software Defined Storage (SDS). Student will also learn security in cloud system, NoSQL databases and the variety of programming models.

Outcome: Uponsuccessfulcompletionofthiscourse,Students will be able to explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. Also thestudentwillbeableto perform large data processing in thecloud, Virtualization techniques andSecurity, Resource and Power Management in thecloud, Monitoring and SLAAssurance and Semantic Cloud andSaaS.

Sr. No.	Topic	No. of Lectures	Weightage in %
	INTRODUCTION		
1	Cloud-definition, benefits, usage scenarios, History of Cloud Computing – Cloud Architecture – TypesofClouds–BusinessmodelsaroundClouds–MajorPlayersinCloudComputing–issues inClouds–Eucalyptus–Nimbus–OpenNebula,CloudSim,RisksInvolvedinCloudComputing.	4	10
	CLOUD SERVICES		
2	Types of Cloud services: Software as a service – Platform as a Service – Infrastructure as a Service–databaseasaService–MonitoringasaService–Communicationasservices.Service providers – Google, Amazon, Microsoft Azure, IBM,Salesforce.	4	10
	CLOUD RESOURCE MANAGEMENT AND VIRTUALIZATION		
3	Virtualization Concepts, Purpose and its utility in cloud, Types of Isoloation, Para-virtualization and Full Virtualization,	6	20

	of levels of abstractions, Resource sharing in Virtualization, Space and Time sharing using physical and logical partitioning,Virtualization of CPU, Memory and I/O Devices; Storage Virtualization and Software Defined Storage (SDS), Software Defined Networks (SDN) and Network Virtualization. Implementations through VMWare, Xen		
	CLOUD STORAGE MANAGEMENT		
4	Organization of data and storage, Dataytpe classification, File System Classification, What is Big Data and Issues in Big Data Management,Introduction to Storage Systems, Cloud Storage Concepts, Distributed File Systems (HDFS, Ceph FS), Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB), Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph)	6	20
	SECURITY, STANDARDS AND APPLICATIONS		
5	Security in Cloud: Cloud security challenges – Software as a Service Security, Common Standards:TheOpenCloudConsortium–TheDistributedManagementTaskForce–Standards forapplicationDeveloper–StandardsforMessaging–StandardsforSecurity,Enduseraccessto cloud computing, Mobile Internet devices and thecloud.	6	10
	COLLABORATING USING CLOUD SERVICES		
6	Email Communication over the Cloud – CRM Management – Project Management – Event Management – Task Management – Calendar – Schedules – Word Processing – Presentation – Spreadsheet–Databases–Desktop–SocialNetworksandGroupware,WorkLoanManagement inCloud. CollaboratingviaWeb-BasedCommunicationTools-EvaluatingWebMailServices– EvaluatingWebConferenceTools–CollaboratingviaSocialNetworksandGroupware- Collaborating via Blogs andWikis.	6	10
	CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENTS		
7	Hadoop, GFS, Map Reduce, NoSQL systems, Big Table, HBase, Libvirt, OpenVswitch), Amazon (Iaas), Azure(PaaS), GAE (PaaS).	8	20
	Total	**40**	**100**

References:

1.CloudComputing,Implementation, JohnRittinghouseandJamesRansome,Management and Strategy, CRC Press,2010.

2. CloudComputing:Web-BasedApplicationsThatChangetheWay You Work and Collaborate Que Publishing, MichaelMiller,August2008.

3. ImplementingandDevelopingCloudApplication, DavidE.Y.Sarna,CRCpress2011.

4. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011.

5. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010.

6. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.

7. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010.

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CSE1805 REAL TIME SYSTEMS (CORE ELECTIVE-III)

SS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Students should have an understanding of the basic programming. Also the student is expected to be familiar with core concepts of operating systems and computer networks**.**

Objectives: Real-Time Systems are now being used almost everywhere. In the context, this course addresses some basic issues that are necessary to develop and understand real-time system. The specific issues addressed are scheduling real-time tasks, resource-sharing issues among real-time tasks, scheduling real-time tasks in multiprocessor and distributed systems, commercial real-time operating systems, real-time communication, and real-time databases.

Outcome: After the completion of this course, students will be able to understand unique challenges in the requirements and specifications for real-time systems and fundamental principles for programming of real time systems with time and resource limitations.

Sr. No.	Topic	No. of Lectures	Weightage in %
	REAL TIME SYSTEMS		
1	**Introduction:** Real time applications, hard vs soft real time systems, defining costs, deadline violation, cost functions, optimization formulation, real-time relationship to hardware, scheduling, operating systems	3	6
2	**Modeling Timing Constraints:** Graph representations, timing constraints, data dependencies, multirate scheduling, guarantee, workload characterization, periodic, aperiodic, sporadic, deterministic and stochastic	5	18
3	**Scheduling Real Time Tasks:** Types of schedulers, table-driven scheduling, cyclic schedulers, EDF, RMA, off-line scheduling algorithms, list-based, force-directed, criticality-based, clock-driven, on-line scheduling issues, priority-driven, admission control, priority inversion, task dependencies	5	20
4	**Handling Resource sharing among real-time tasks:** Priority inversion, priority inheritance protocol, highest locker	4	12

	protocol, priority ceiling protocol, issues in using resource sharing protocol, handling task dependencies		
5	**Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems:** Multiprocessor task allocation, dynamic allocation of tasks, fault tolerant scheduling of tasks, centralized clock synchronization, distributed clock synchronization	5	20
6	**Commercial Real-time operating systems:** General concepts, unix and windows as RTOS, time services, features of real time operating systems, POSIX, survey of commercial RTOS	8	08
7	**Real-Time Communication:** Model of real time communications, internet and resource reservation protocols, real time protocol, soft real time communications in a LAN, hard real time communications in a LAN, bounded access protocol, routing, multicast routing, traffic shaping and policing, scheduling mechanisms, QoS models	6	12
8	**Real-Time Databases:** Characteristics of temporal data, concurrency control in real-tile databases, commercial real-time databases	4	04
	Total	**40**	**100**

References:

1. Real-Time Systems: Theory and Practice, by Rajib Mall, Pearson, 2008.
2. Real-Time Systems, by Jane W. Liu, Pearson Education, 2001.
3. Real-TIme Systems, by Krishna and Shin, Tata McGraw Hill
4. Real-Time Systems: Design Principles for Distributed Embedded Applications, by Hermann Kopetz

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CSE1806 COMPUTER VISION & APPLICATIONS (CORE ELECTIVE-IV)

SS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Programming and Mathematic course

Objectives: Review image processing techniques for computer vision and to understand shape and region analysis. And also to understand Hough Transform and its applications to detect lines, circles.

Outcome: After learning the course the students should be able to:

1. To implement fundamental image processing techniques required for computer vision
2. Understand Image formation process
3. To perform shape analysis
4. Extract features form Images and do analysis of Images
5. Some applications of computer vision algorithms.

Sr. No.	Topic	No. of Lectures	Weightage in %
	IMAGE PROCESSING FOUNDATIONS		
1	Review of image processing techniques, Computer Vision and Computer Graphics , What is Computer Vision ,Low level, Mid-level, High-level ,Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality	7	10
	IMAGE FORMATION MODELS		
2	Geometric Image Features, Monocular imaging system , Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc., Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Construction of 3D model from images	6	25
3	**IMAGE PROCESSING AND FEATURE EXTRACTION**		
	Image preprocessing, Image representations (continuous and discrete) , Edge detection	4	15
4	**MOTION ESTIMATION**		

	Regularization theory , Optical computation , Stereo Vision , Motion estimation , Structure from motion	6	15
5	**SHAPE REPRESENTATION AND SEGMENTATION**		
	Binary shape analysis , connectedness , object labeling and counting ,size filtering , distance functions ,skeletons and thinning, deformable shape analysis ,boundary tracking procedures ,active contours ,shape models and shape recognition.	7	
	OBJECT RECOGNITION		
6	Line detection, Hough Transform (HT) for line detection , foot-of-normal method , line localization ,line fitting ,Shape correspondence and shape matching , Principal component analysis , Shape priors for recognition	4	15
	APPLICATIONS		
7	Photo album , Face detection, Face recognition ,Eigen faces ,Active appearance and 3D shape models of faces Application: Surveillance , foreground-background separation , particle filters , Chamfer matching, tracking, and occlusion ,combining views from multiple cameras ,human gait analysis Application: In-vehicle vision system: locating roadway, road markings , identifying road signs ,locating pedestrians	6	20
	Total	**40**	**100**

References:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall
3. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010

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THE M. S. UNIVERSITY OF BARODA

CSE1807 MACHINE LEARNING (CORE ELECTIVE-IV)

SS BE - IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Prerequisites: Familiarity with basic concepts of computer science (algorithms, data structures, and complexity), mathematical maturity commensurate in discrete math, matrix math , probability and statistics , and the ability to program algorithms in a language of your choice (e.g., C++ or Matlab)

Objectives: -This course is intended to introduce some of the basic concepts of machine learning from a mathematically well motivated perspective. This course will cover the different learning paradigms and some of the more popular algorithms and architectures used in each of these paradigms.

Outcome: By the end of the course, students should be able to develop an appreciation for what is involved in learning models from data. Student should be able Understand a wide variety of learning algorithms and how to evaluate models generated from data. Student will be able to apply the algorithms to a real-world problem, optimize the models learned.

Sr. No.	Topic	No. of Lectures	Weightage in %
	INTRODUCTION		
1	Well Posed Learning problems, Designing a Learning System	1	4
2	Perspectives and issues in machine learning, Probability Theory, Linear Algebra, Convex Optimization	4	10
	CONCEPT LEARNING AND THE GENERAL TO SPECIFIC ORDERING		
3	A concept learning task, concept learning as search, Finding a Maximally specific Hypothesis	2	6
4	Version Spaces and the Candidate Elimination Algorithm	1	5
	DECISION TREE LEARNING		
5	Decision Tree Representation, Appropriate problem for Decision Tree Learning	1	5
6	The Basic Decision tree Learning Algorithm, Hypothesis Space Search in Decision tree learning, Inductive Bias in Decision Tree Learning, issues in Decision tree learning	4	10

	Artificial Neural Network		
7	Neural Network representations, appropriate problem for neural network learning	1	5
8	Perceptrons, Multi-layer Network and back propagation algorithm	2	6
	BAYESIAN LEARNING		
9	Bayes theorem and concept learning, Bayes optimal classifier	2	6
10	Native bayes classifier, An Example to learn classifier text.	2	4
	INSTANCE BASED LEARNING		
11	Introduction, k-nearest neighbor learning, distance weighted nearest neighbor learning algorithm	3	5
	GENETIC ALGORITHMS		
12	Introduction of Genetic Algorithms, Hypothesis space search, Genetic Programming, Parallelizing Genetic Algorithms	5	10
	LEARNING SETS OF RULES		
13	Sequential Covering Algorithms, Learning Rule sets, Learning First Order Rules, Learning sets of First Order Rules, FOIL, Induction as Inverted Deduction, inverted Resolution	6	12
	SUPPORT VECTOR MACHINE		
14	Maximum margin linear separators, Quadratic Programming solution to finding maximum margin separators, kernels for learning non-linear functions	6	12
	Total	**40**	**100**

References:

1. Stephen Marsland, Machine Learning: An Algorithmic Perspective.
2. Christopher M. Bishop, Pattern Recognition and Machine Learning.
3. Tom Mitchell, Machine Learning.
4. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman

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CSE1808 NATURAL LANGUAGE PROCESSING(CORE ELECTIVE-IV)

SS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	:150

Pre-requisites: Basic knowledge of probabilities for the lectures and python for programming assignment.

Objectives: : In this program, you'll learn and put in practice the concepts behind natural language processing, including machine translation, part of speech tagging, and sentiment analysis.The course covers knowledge-based and statistical approaches to language processing for syntax (language structures), semantics (language meaning).

Outcome: By the end of the course, the student must be able to compose key NLP elements to develop higher level processing chains, assess / Evaluate NLP based systems, choose appropriate solutions for solving typical NLP sub problems (tokenizing, tagging, parsing). Student will be able to analyze NLP problems to decompose the min adequate independent components.

Sr. No.	Topic	No. of Lectures	Weightage in %
	UNIT-1		
1	ThestudyofLanguage, Evaluating Language, stages of NLP, Two Approaches to NLP.	2	5
2	Sequence Labeling and Noisy Channel,Argmax Based Computation, Noisy Channel Application to NLP.	3	7.5
3	Regular Expressions, Words, Corpora, Text Normalization, Minimum Edit Distance.	4	10
	UNIT-2		
4	N-Grams , Evaluating Language Models , Generalization and Zeros , Smoothing	3	7.5
5	AuxiliaryVerbsandVerbPhrases,Movement ,Phenomenon in Language, Handling questions in Context-Free Grammars.	3	7.5
	UNIT-3		
6	Naive Bayes Classifiers , Training the Naive Bayes Classifier ,Worked example , Optimizing for Sentiment Analysis , Naive Bayes for other text classification tasks , Naive Bayes as a Language Model	4	10

	UNIT-4		
7	Lexical Semantics , Vector Semantics , Words and Vectors ,Cosine for measuring similarity , TF-IDF: Weighing terms in the vector ,	3	7.5
8	Applications of the tf-idf vector model , Word2vec , Visualizing Embedding, Semantic properties of embeddings , Bias and Embeddings , Evaluating Vector Models	3	7.5
	UNIT-5		
9	Lemmatization, Part-of-Speech Tagging, Finite-State Analysis, HMM, Viterbi, Forward Backward Algorithm, Baum Welch Algorithm.	3	7.5
10	Statistical Methods, Probabilistic Language Processing, Estimating Probabilities,Part-of-Speechtagging.	3	7.5
11	ObtainingLexicalProbabilities,ProbabilisticContext-Free Grammars,	3	7.5
	UNIT-6		
12	Syntactic Parsing, Statistical Parsing, Dependency Parsing, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in LogicalForm, Semantic Parsing.	3	7.5
	UNIT-7		
13	Information Extraction,Named Entity Recognition,Relation Extraction , Extracting , Extracting Events and their Times , Template Filling, Semantic Role Labeling, Computing with Word Senses, Lexicons for Sentiment and Affect Extraction,	3	7.5
	Total	**40**	**100**

References

1. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Third Edition, Prentice Hall, 2008.
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
5. Radford, Andrew et. al., Linguistics, An Introduction, Cambridge University Press, 1999.

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CSE1809 INTERNET OF THINGS (CORE ELECTIVE-V)

SS BE – IV

Theory	: 3 Lectures	Marks (Theory)	:100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	:50
Practical	: 2 Hrs.	Total	: 150

Pre-requisites: Students should have an understanding of the basic programming.

Objectives: This course covers the fundamentals of Internet of Things, IOT protocols and also helps to build a small low cost embedded system using Raspberry Pi. And also to apply the concept of Internet of Things in the real world scenario

Outcome: Upon completion of this students should be able to: Analyze various protocols for IoT, Develop web services to access/control IoT devices, Design a portable IoT using Rasperry Pi, Deploy an IoT application and connect to the cloud and Analyze applications of IoT in real time scenario.

Sr. No.	Topic	No. of Lectures	Weightage in %
	INTRODUCTION		
1	IOT Architecture and different layers: Physical, Computing, Communication, Management etc.Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	4	10
	PLATFORM		
2	Open-source prototyping platforms. BasicArduino programming; Extended Arduino libraries; Arduino-based Internet communication; Raspberry pi; Sensors and Interfacing: Temperature, Pressure, Humidity, etc.	10	15
	PROTOCOLS		
3	RFID; Zigbee; IEEE 802.15.4e; ISA100.11a; Wireless HART; MiWi; Thread; 6LoWPAN; RPL;Constrained Application Protocol (CoAP); ExtensibleMessaging Protocol (XMPP) WebSocket; Advanced Message Queuing Protocol (AMQP); Message Queue Telemetry Transport (MQTT); Web Real Time Communications (WebRTC).	10	25
	OPERATING SYSTEM		
4	Various aspects of operating systems designed for the IoT environment; open source OS for IoT like TinyOS etc	4	10

	SECURITY AND PRIVACY ASPECTS		
5	Security architecture of IoT; Security threats; Security initiatives towards Iota	4	5
	IOT STACK		
6	IoT devices and connected physical things, Stack of IoT, IoT devices: sensors, actuators,Gateways,Platforms.	3	10
	IOT TOOLS		
7	Contiki ,cooja,Zeeta,	2	5
	APPLICATION SCENARIO		
8	Home Networking, Automotive Networks ,Industrial Networks, Interactive Toys, Remote Metering.	3	20
	Total	**40**	**100**

References:

1. Olivier Hersent, David Boswarthick, and Omar Elloumi, “The Internet of Things: Key

2. Applications and Protocols Paperback” – 25 Aug 2015 Wiley Press

3. ArshdeepBahga and Vijay Madisetti, “Internet of Things: A Hands-on Approach” (Paperback – 1 Jul 2015), Universities Press

4. CunoPfister, “Getting Started with the Internet of Things” (Paperback – 17 May 2011), O’Reilly.

5. Designing the Internet of Things (Paperback – 25 Jul 2015).

6. Massimo Banzi, “Getting Started with Arduino (Make: Projects)”, O'Reilly Media. 2008

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CSE1810 MOBILE COMPUTING (CORE ELECTIVE-V)

SSBE-IV

Theory	: 3 Lectures	Marks (Theory)	: 100
Tutorial	: 1 Hr	Marks (Pr/Tw/Viva)	: 50
Practical	: 2 Hrs.	Total	: 150

Objective: The Mobile Computing course is intended to teach students the issues involved in wireless technology and mobile computing

Sr. No.	Topic	No. of lecture required	Weightage %
1	Introduction to mobile communication and computing cellular network, cellular concepts, location management, handoffs	5	5
2	Wireless LANS and application overview WLAN ,Wireless application Mac issues(Hidden and exposed terminals, near and far terminals), Mobile IP, Mobile ad-hoc networks(MANET),TCP issues, Disconnected operations, Data broadcasting, Mobile agent	7	20
3	a.GSM: Air-interface, channel structure, timing, Mobile services(Bearer, Tele-and-supplementary services)System architecture ,Protocols ,Localization and calling Handover ,Value added services ,SMS ,Cell broadcast service ,MMS ,Location services b.WAP :Architecture ,Protocol stack ,Application environment, -application demo	7	20
4	Access technologies :Bluetooth, GPRS, 802.11, CDMA3,Mobile phone Technologies(1G,2G,2.5G,3G)	7	20
5	Database Issues :Hoarding techniques Caching invalidation mechanism ,Client server computing with adaption ,Power aware and context aware computing,Transactional model, query processing recovery and quality of service issues	8	20
6	Introduction to Peer to peer communication :Accessing telephony Hardware ,GTalk ,SMS	3	5
7	Introduction to Cloud computing Definition, cloud architecture, cloud storage Introduction to Enterprise Content Management	3	10
	Total Lectures	**40**	

Reference: Mobile Communications - By Jochen Schiller

Mobile Computing - By Asoke Talukdar & Roopa Yavagal