

ABEDA INAMDAR SENIOR COLLEGE PUNE

Three Year B.Sc. Degree Program

Computer Science (Faculty of Science & Technology)

T.Y.B.Sc. (Computer Science)

Choice Based Credit System Syllabus

To be implemented from Academic Year 2023-2024

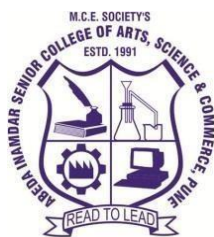
T.Y.B.Sc. (Computer Science)
Semester V (Total credits=22)

Course type	Paper Code	Paper title	Credits		Evaluation		
			T	P	IE	CA	TOTAL
DSEC- I	21SBCS351	Object Oriented Programming using Java	2	-	20	30	50
	21SBCS352	Computer Networks	2	-	20	30	50
	21SBCS359	Practical Course based on Java Programming		2	20	30	50
DSEC-II	21SBCS353	Web Technologies-I	2	-	20	30	50
	21SBCS354	Software Quality Assurance	2	-	20	30	50
	21SBCS3510	Practical Course based on Web Technologies-I		2	20	30	50
DSEC -III	21SBCS355	Foundations of Data Science	2	-	20	30	50
	21SBCS356	Theoretical Computer Science	2	-	20	30	50
	21SBCS3511	Practical Course based on Data Science		2	20	30	50
SECC -I	21SBCS357	Angular JS	2		20	30	50
SECC-II	21SBCS358	Practical Course based on Angular JS		2	20	30	50

Semester VI (Total credits=22)

Course Type	Paper Code	Paper Title	Credits		Evaluation		
			T	P	IE	CA	TOTAL
DSEC-IV	21SBCS361	Advanced Java	2	-	20	30	50
	21SBCS362	Software Testing	2	-	20	30	50
	21SBCS369	Practical Course based on Advanced Java		2	20	30	50
DSEC- V	21SBCS363	Web Technologies-II	2	-	20	30	50
	21SBCS364	Data Analytics	2	-	20	30	50
	21SBCS3610	Practical Course based on Web Technologies-II	-	2	20	30	50
DSEC -VI	21SBCS365	Android Programming	2	-	20	30	50
	21SBCS366	Compiler Construction	2	-	20	30	50
	21SBCS3611	Practical Course based on Android Programming	-	2	20	30	50
SECC-III	21SBCS367	Data Security	2		20	30	50
SECC-IV	21SBCS368	Project		2	20	30	50

SEMESTER V



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Object Oriented Programming using Java
Course Code	21SBCS351
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To prepare student to understand programming basics.
2.	To study various java programming concept like Interface, File and Exception Handling etc.
3.	To design User Interface using Swing and AWT

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To understand the concept of classes, object & packages.
2.	To develop GUI based application.
3.	To understand file concept in Java.
4.	To understand exception handling methods.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	An introduction to java	06
	<ol style="list-style-type: none"> 1. Object Oriented Programming Concepts, a short history of Java 2. Features of Java ,Java Environment 3. Simple Java Program 4. Java Tools – jdb, javap, javadoc Types of Comments 5. Data Types Final Variable 6. Declaring 1D,2D array accepting input (Command Line Arguments, BufferedReader, Scanner) 	
Unit II	Objects and Classes	07
	<ol style="list-style-type: none"> 1. Defining your own classes 2. access Specifiers (public, protected, private, default) , Array of Objects 3. constructors, overloading constructors and use of ‘this’ keyword static fields and methods 4. predefined classes 5. Object Class, Methods (equals(), toString(), hashCode(), getClass()) 6. String Class And StringBufferClass, Formatting String data using format() method 7. Creating , accessing and using packages 8. Wrapper Classes. 	
Unit III	Inheritance and interface	08
	<ol style="list-style-type: none"> 1. Inheritance Basics (extends Keyword) and Types of Inheritance Superclass, Subclass and use of Super Keyword Method Overriding and runtime polymorphism 2. Use of final keyword related to method and class Use of abstract class and abstract methods Defining and Implementing Interfaces 3. Runtime polymorphism using interface Concept of Marker and Functional Interfaces 	

Unit IV	Exception and file handling	05
	<ol style="list-style-type: none"> 1. Dealing with errors , Exception class, Checked And Unchecked Exception Catching Exceptions, Multiple Catch Block, Nested try block 2. Creating User Defined Exception Introduction to Files and Streams 3. Input-OutputStream: FileInputStream/OutputStream, BufferedInput/OutputStream, DataInput/OutputStream 4. Reader-Writer: FileReader/Writer, BufferedReader/Writer, InputStreamReader, OutputStreamWriter 	
UNIT V	User Interface with AWT and Swing	10
	<ol style="list-style-type: none"> 1. What is AWT? What is Swing? Difference between AWT and Swing The MVC Architecture and Swing 2. Layouts and LayoutManagers 3. Containers And Components – JFrame, JButton, JLabel, JText, JTextArea, JCheckBox And JRadioButton, JList, JComboBox, JMenu And relatedClasses 4. Dialogs (Message, Confirmation, Input), Event Handling: Event Sources, Listeners Adapters And Anonymous InnerClass 	

Reference Books:

1. Complete reference Java by Herbert Schildt (5th edition)
2. Java 2 programming black books, Steven Horlizer
3. Programming with Java, A primer, For the edition, By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press

Web Links

1. https://www.w3schools.com/java/java_classes.asp
2. <https://www.programiz.com/java-programming/class-objects>
3. <https://www.studytonight.com/java/java-awt.php>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Computer Networks
Course Code	21SBCS352
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To prepare students with basic networking concepts, data communication, protocols and standards, various topologies and applications of network.
2.	To understand different protocols of application layer.
3.	To Explore the different methods used for Network/INTERNET security.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To have a good understanding of the OSI and TCP/IP Reference Models and in particular have a good knowledge of Layers.
2.	To understand the working of various protocols.
3.	To analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
4.	To Identify information security goals.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction to Computer Networks	3
	1 Introduction 1.1 Network Goals 1.2 Application of Computer Networks 2 Elements of Data Communication 2.1 Data Representation 2.2 Data Flow 3 Network Software 3.1 Types of Services 3.2 Service Primitives	
Unit II	Network Models	5
	1 OSI Reference Model 2 TCP/IP Model 3 Comparison Of OSI and TCP/IP Model 4 Addressing	
Unit III	Physical Layer And Data Link Layer	10
	1. Task performed by Physical layer 2. Switching 3. Physical layer Device 4. Task Performed by Data Link layer 5. Services provided by data link layer 6. Framing 7. Error Control 7.1 Error Detection 7.2 Error Correction 8. Data Link Protocol 8.1 Simplex Protocol 8.2 Stop and Wait Protocol 8.3 Stop and wait automatic Repeat Request 9. Sliding Window Protocol 10. Data Link Layer Device	
Unit IV	Network Layer	6

	<ul style="list-style-type: none"> 1 Task Performed By Network Layer 2 Logical Addressing <ul style="list-style-type: none"> 2.1 IPv4Addresses <ul style="list-style-type: none"> 2.1.1 Datagram 2.1.2 Fragmentation 2.2 Classless Addressing 3 Network Layer Devices <ul style="list-style-type: none"> 3.1 Router 	
Unit V	Address Mapping And Transport Layer	8
	<ul style="list-style-type: none"> 1 ARP Packet Format 2 Concept Of RARP,BOOTP,DHCP 3 Task Performed By Transport Layer 4 UDP 5 TCP 	
Unit VI	APPLICATION LAYER	4
	<ul style="list-style-type: none"> 1 Task Performed By Application Layer 2 Domain Name System(DNS) 	
	<ul style="list-style-type: none"> 2.1 Name Space 2.2 Domain Name Space 2.3 Distribution Of Name Space 2.4 DNS In The Internet 2.5 Resolution 3 File Transfer Protocol(FTP) <ul style="list-style-type: none"> 3.1 Communication Over Control Connection 3.2 Communication over Data Connection 3.3 Anonymous 	

Reference Books:

4. Computer Networks-Andrew S. Tanenbaum, 5th Edition, PearsonEducation
5. Data Communication and Networking- BehrouzFourouzan, 5th Edition, McGraw Hill Pvt. Ltd
6. Cryptography and Network Security: Principles and Practice, William Stallings, 7th edition, PearsonEducation
7. Network Security Essentials: Applications and Standards (For VTU), William Stallings, 3rd edition, PearsonEducation

Web Links:

1. <https://www.geeksforgeeks.org/difference-between-lan-man-and-wan/>
2. <https://www.spiceworks.com/tech/networking/articles/what-is-network-software/#:~:text=Network%20software%20is%20an%20umbrella,element%20for%20any%20networking%20system.>
3. <https://www.geeksforgeeks.org/cryptography-and-its-types/>
4. https://www.tutorialspoint.com/internet_technologies/internet_security_overview.htm



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Web Technologies - I
Course Code	21SBCS353
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To Design dynamic and interactive Web pages.
2.	To Learn Core-PHP, Server Side Scripting Language
3.	To Learn PHP-Database handling

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To provide the knowledge of web page designing
2.	To understand how HTML, PHP can be used as an effective tools in web development
3.	To provide skills to design web pages
4.	To understand how to develop dynamic & interactive web pages.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction to HTML, HTTP and PHP	10
	<ol style="list-style-type: none"> 1. Overview of HTML and Basic Tags 2. Creating Forms, Tables, HTML5Semantics. 3. CSS basic concept ,Three ways to use CSS, 4. Introduction to Web server and Web browser 5. HTTP basics. 6. PHP Basics– <ol style="list-style-type: none"> i. Use of PHP ii. Lexical structure iii. Language basics. 	
Unit II	Function and String	08
	<ol style="list-style-type: none"> 1. Defining and calling a function 2. Default parameters 3. Variable parameters 4. Missing parameters 5. Variable function 6. Anonymous function 7. Types of strings in PHP 8. Printing functions 9. Encoding and decoding 10. Comparing strings 11. Manipulating and searching strings 12. Regular expressions 	
Unit III	Arrays	06
	<ol style="list-style-type: none"> 1. Indexed v/s Associative arrays 2. Identifying elements of an array 3. Storing data in arrays Multidimensional arrays 4. Extracting multiple values 5. Converting between arrays and variables 6. Traversing arrays 7. Sorting Action on entire array 	
Unit IV	Files and database handling	10

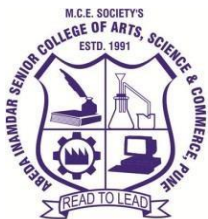
	<ol style="list-style-type: none"> 1. Working with files and directories 2. Opening and Closing file 3. Getting information about file 4. Read/write to file 5. Splitting name and path from file 6. Rename and delete files 7. Random access to file data 8. Getting information on file Ownership and permissions 9. Using PHP to access a database (PSQL Relational databases) 	
Unit V	Handling email with php	02
	<ol style="list-style-type: none"> 1. Email background 2. Internet mail protocol 3. Structure of an email message 4. Sending email with php 	

Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition Author: Thomas A.Powell
2. First published: 01 Jan2010.
3. Programming PHP By RasmusLerdorf and Kevin Tatroe, O'Reillypublication
4. Beginning PHP 5 , Wroxpublication
5. PHP web sevices, Wrox publication
6. Mastering PHP , BPBPublication
7. PHP cookbook, O'Reillypublication
8. PHP for Beginners, SPDpublication
9. Programming the World Wide Web , Robert W Sebesta(3rdEdition)
10. HTML 5 Black Book : Covers Css3, Javascript, XML, XHTML, Ajax, PHP And JQueryby
11. Kogent Learning Solutions Inc, Published November 2011 by DreamtechPress
12. Spurlock Jake, Bootstrap: Responsive Web development. O'Reilly Media,Inc

Web Links

1. www.php.net.in
2. www.W3schools.com
3. www.wrox.com
4. <https://coreui.io/docs/layout/grid/#grid-options>
5. <https://www.tutorialrepublic.com/twitter-bootstrap-tutorial/bootstrap-grid-system.php>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Software Quality Assurance
Course Code	21SBCS354
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To provide the knowledge of how to assure that all software engineering processes, methods, activities, and work items are monitored and comply with the defined standards.
2.	To understand how to apply software Engineering Techniques.
3.	To provide skills to evaluate quality of software.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To provide the knowledge of software quality testing techniques
2.	To understand how to measure quality of software.
3.	To provide skills to measure strength of software quality.
4.	To understand how to manage project.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction To Software Quality & Architecture	09
	<ol style="list-style-type: none"> 1. What is Quality 2. Types of quality 3. Need for Software quality 4. Quality challenges 5. Software quality assurance (SQA) – Definition and objectives 6. Software quality factors 7. SQA system and architecture 8. Software Project life cycle Components 9. Development and quality plans. 	
Unit II	SQA Components And Project Life Cycle	10
	<ol style="list-style-type: none"> 1. Software Development methodologies 2. Quality assurance activities in the development process- Verification & Validation 3. Software Testing 4. Software Testing implementations 5. Quality of software maintenance 6. Pre-Maintenance of software quality components 7. Quality assurance tools 8. CASE tools for software quality 9. Software maintenance equality 10. Project Management 	
Unit III	Software Quality Assurance Metrics	10
	<ol style="list-style-type: none"> 1. Software quality metrics 2. Total Quality Management (TQM) Quality Metrics 3. Software Quality Metrics Analysis 4. Objectives of quality measurement 5. Process metrics 6. Product metrics 7. Implementation 8. Limitations of software metrics 9. Cost of software quality 	

	10. Classical quality cost model 11. Extended model 12. Application of Cost model	
Unit IV	Software Quality Infrastructure	07
	1. Procedures and work instructions 2. Templates –Checklists 3. 3S development 4. Configuration management 5. Software change control 6. Configuration management audit 7. Documentation control 8. Storage and retrieval 9. Staff training and certification Corrective and preventive actions	

References Books:

1. Software Quality Assurance by Ivan Mistrik, Richard M Soley, Nour Ali, John Grundy, BedirTekinerdogan Released October2015
2. Software Testing and Quality Assurance: Theory and Practice by Priyadarshi Tripathy(Author), Kshirasagar Naik

Web Links:

1. <https://www.javatpoint.com/software-quality-assurance>
2. https://www.tutorialspoint.com/software_quality_management/software_quality_management_sqa_components.htm
3. <https://www.simplilearn.com/software-quality-management-verification-and-validation-rar100-article>
4. https://www.tutorialspoint.com/software_engineering/case_tools_overview.htm
5. <https://brainhub.eu/library/cost-of-quality-in-software-development>
6. <https://www.techtarget.com/whatis/definition/software-audit#:~:text=A%20software%20audit%20is%20an,one%20or%20more%20independent%20auditors>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Foundations of Data Science
Course Code	21SBCS355
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To provide students with knowledge and skills for data-intensive problem solving and scientific discovery
2.	To be prepared with a varied range of expertise in different aspects of data science such as data collection, visualization, processing and modeling of large data sets
3.	To acquire good understanding of both the theory and application of applied statistics and computer science based existing data science models to analyze huge data sets originating from diversified application areas.
4.	To be better trained professionals to cater the growing demand for data scientists in industry

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Perform Exploratory Data Analysis
2.	Obtain, clean/process, and transform data.
3.	Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization.
4.	Demonstrate proficiency with statistical analysis of data.
5.	Prepare data for use with a variety of statistical methods and models and recognize how the quality of the data and the means of data collection may affect conclusions

Syllabus

Unit Number	Title With Contents	No of Lectures
Unit –I	Introduction to Data Science <ol style="list-style-type: none"> 1. Introduction to data science 2. The 3 V’s: Volume, Velocity, Variety 3. Why learn Data Science? 4. Applications of Data Science 5. The Data Science Lifecycle 6. Data Scientist’s Toolbox Types of Data Structured, semi-structured, Unstructured Data, Problems with unstructured data Data sources Open Data, Social Media Data, Multimodal Data, standard datasets Data Formats Integers, Floats, Text Data, Text Files, Dense Numerical Arrays, Compressed or Archived Data, CSV Files, JSON Files, XML Files, HTML Files , Tar Files, Gzip Files, ZipFiles, Image Files: Rasterized, Vectorized, and/or Compressed 	06
Unit –II	Statistical Data Analysis <ol style="list-style-type: none"> 1. Role of statistics in data science 2. .Descriptive statistics Measuring the Frequency Measuring the Central Tendency: Mean, Median, and Mode Measuring the Dispersion: Range, Standard deviation, Variance, Interquartile Range 3. .Inferential statistics Hypothesis testing, Multiple hypothesis testing, Parameter Estimation methods 4. Measuring Data Similarity and Dissimilarity Data Matrix versus Dissimilarity Matrix, Proximity Measures for Nominal Attributes, Proximity Measures for Binary Attributes, Dissimilarity of Numeric Data: Euclidean, Manhattan, and Minkowski distances, Proximity Measures for Ordinal Attributes 5. Concept of Outlier, types of outliers, outlier detection methods 	10
Unit-III	Data Preprocessing	10

	<ol style="list-style-type: none"> 1. Data Objects and Attribute Types: What Is an Attribute?, Nominal , Binary, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes 2. Data Quality: Why Preprocess theData? 3. Data munging/wrangling operations CleaningData - Missing Values, Noisy Data (Duplicate Entries, Multiple Entries for a Single Entity, Missing Entries, NULLs, Huge Outliers, Out-of- Date Data, Artificial Entries, Irregular Spacings, Formatting Issues – Irregular between Different Tables/Columns, Extra Whitespace, Irregular Capitalization, Inconsistent Delimiters, Irregular NULL Format, Invalid Characters, Incompatible Datetimes) Data Transformation – Rescaling, Normalizing, Binarizing, Standardizing,Label and 	
	One Hot Encoding Data reduction Data discretization	
Unit –IV	Data Visualization	10
	<ol style="list-style-type: none"> 1. Introduction to Exploratory Data Analysis Data visualization and visual encoding 2. Data visualization libraries Basic data visualization tools “Histograms, Bar charts/graphs, Scatter plots, Line charts, Area plots, Pie charts, Donut charts 3. Specialized data visualization tools <ol style="list-style-type: none"> 3.1 Boxplots, Bubble plots, Heat map, Dendrogram, Venn diagram, Treemap, 3D scatter plots 3.2 Advanced data visualization tools- of geospatial data 3.3 Data Visualization types 	

References Books:

- 1) Data Science Fundamentals and Practical Approaches, Gypsy Nandi, Rupam Sharma, BPB Publications, 2020.2)
- 2) The Data Science Handbook, Field Cady, John Wiley & Sons, Inc,2017
- 3) Data Mining Concepts and Techniques, Third Edition, Jiawei Han, MichelineKamber, Jian Pei, Morgan Kaufmann,2012.
- 4) A Hands-On Introduction to Data Science, Chirag Shah, University of Washington Cambridge UniversityPress

Weblinks:

1. <https://www.javatpoint.com/data-science>
2. <https://www.simplilearn.com/what-is-statistical-analysis-article>
3. <https://monkeylearn.com/blog/data-preprocessing/>
4. <https://www.tableau.com/learn/articles/data-visualization>



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T.Y.B.Sc (Computer Science)

(CBCS Autonomy 21 Pattern)

Course/ Paper Title	Theoretical Computer Science
Course Code	21SBCS356
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the Finite Automata, Pushdown Automata and Turing Machine.
2.	To understand the Regular Language, Context Free Language, Context Sensitive Language and Unrestricted Language.
3.	To understand the relation between Automaton and Language

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To Understand the use of automata during language design.
2.	To Relate various automata and Languages.
3.	To understand different regular expression.
4.	To understand how to solve CNF ,GNF and CFG.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Finite Automaton	10
	<ol style="list-style-type: none"> 1. Introduction: Symbol, Alphabet, String, Prefix & Suffix of Strings, Formal Language, Operations on Languages. 2. Deterministic finite Automaton – Definition, DFA as language recognizer, DFA as pattern recognizer 3. Nondeterministic finite automaton – Definition and Examples. 4. NFA To DFA (Myhill Nerode Method) 5. NFA with ϵ- transitions Definition and Examples. 6. NFA with ϵ-Transitions to DFA & Examples 7. Finite automaton with output – Mealy and Moore machine, Definition and Examples. 8. Minimization of DFA, Algorithm & Problem using Table Method. 	
Unit II	Regular Expressions and Language	06
	<ol style="list-style-type: none"> 1. Regular Expressions (RE): Definition & Example 2. Regular Expressions Identities. 3. Regular language-Definition and Examples 4. Conversion of RE to FA-Examples 5. Pumping lemma for regular languages and applications. 6. Closure Properties of Regular Languages 	
Unit III	Context-Free Grammars and Languages	10
	<ol style="list-style-type: none"> 1. Grammar - Definition and Examples. 2. Derivation-Reduction - Definition and Examples. 3. Chomsky Hierarchy. 4. CFG: Definition & Examples. LMD, RMD, Parse Tree 5. Ambiguous Grammar: Concept & Examples. 6. Simplification of CFG: Removing Useless Symbols, Unit Production, ϵ-production and Nullable Symbol. 7. Normal Forms: Greibach Normal Form (GNF) and Chomsky Normal Form (CNF) 	

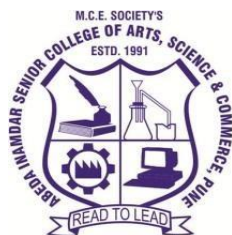
	8. Regular Grammar:Definition. 9. Left linear and Right Linear Grammar-Definition andExample 10. Equivalence of FA & RegularGrammar 11. Construction of regular grammar equivalent to a givenDFA. 12. Construction of a FA from the given right linear grammar	
Unit IV	Push Down Automata	05
	1. Definition of PDA and examples. 2. Construction of PDA using empty stack and final State method: Examples using stack method 3. Definition DPDA & NPDA, their correlation and Examples of NPDA 4. CFG (in GNF) to PDA: Method and examples	
UNIT V	Turing Machine	05
	1. The Turing Machine Model, Definition and Design of TM 2. Problems on language recognizers. 3. Language accepted by TM. 4. Types of Turing Machines (Multitrack TM, Two-way TM, Multitape TM, Non-deterministicTM) 5. Introduction to LBA (Basic Model) & CSG.(Without Problems)	

Reference Books

1. Introduction to Automata Theory, Languages and Computation, John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman, Third Edition, Pearson Education Publication, 2008
2. Introduction to Automata theory, Languages and computation By John E. Hopcroft and Jeffrey Ullman – Narosa Publishing House, 1995
3. Theory of Computer Science Automata, Languages and Computation, K.L.P. Mishra, N. Chandrasekaran, Publication- Prentice Hall of India, 2008
4. Introduction to Computer Theory Daniel I. A. Cohen – 2 nd edition – John Wiley & Sons, 1996
5. Introduction to Languages and The Theory of Computation John C. Martin The McGraw- Hill, Fourth Edition, 2011

Web Links:

1. <https://www.javatpoint.com/automata-tutorial>
2. <https://www.javatpoint.com/automata-regular-expression>
3. https://www.tutorialspoint.com/automata_theory/context_free_grammar_introduction.htm
4. <https://www.geeksforgeeks.org/turing-machine-in-toc/>
5. <https://www.tutorialspoint.com/what-is-push-down-automata-in-toc>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Angular JS
Course Code	21SBCS357
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To reduce the amount of code you write to build rich user interface applications.
2.	To increase the reliability and maintainability of UI by using data binding.
3.	To retrieve data from back-end server, manipulate it and display it with ease.
4.	To Modularize code with the custom services and directives

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To build native mobile apps for Android, iOS and using Angular 1.x 2.
2	To understand the fundamentals of Angular Forms and its architecture.
3.	To build forms and setting pages.
4.	To learn different types of controllers.

Syllabus

Unit Number	Assignment	No of Lectures
1	Introduction	5
	1. Introduction to AngularJS 2. MVCArchitecture 3. Conceptual Overview 4.Setting up theEnvironment 5. FirstApplication 6. Understandingattributes	
2	Expressions and Data Biding	4
	1.Number and StringExpressions 2. Object Binding and Expressions 3.Working withArrays 4. Forgiving Behavior 5.Understanding Data binding	
3	Working with Directive	4
	1.Conditional Directives 2.Styles Directives 3. Mouse and Keyboard Events Directives	
4	Controllers	8
	1. Understanding Controllers Programming Controllers & scope object 2. Adding Behavior to a Scope Object 3.Passing Parameters to the Methods 4. Having Array as members in Controller Scope. 5. Nested Controllers and Scope Inheritance. 6.Multiple Controllers and their scopes	
5	Filters	5
	1.Built-InFilters 2. Uppercase and LowercaseFilters 3. Currency and Number FormattingFilters 4. Order ByFilter 5. Creating CustomFilter	
6	Forms	10

	<ol style="list-style-type: none">1. Using Simple Form2. Working with Select and Options3. Input Validations4. Using CSS classes5. Form Events6. Custom Model update triggers7. CustomValidation	
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Reference Books:

1. Beginning Angular with Typescript (updated to Angular 5) by GregLim
2. Mastering Web Application Development with AngularJS by Pawel Kozlowski, Peter BaconDarwin

Web Links :

1. <https://www.tutorialsteacher.com/angularjs/angularjs-scope>



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NAAC accredited 'A' Grade

T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Practical course based on AngularJS
Course Code	21SBCS358
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To explore AngularJS Component
2.	To develop an AngularJS Single page Application
3.	To develop Client Side MVC in AngularJS.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To able to Understand Client Side MVC
2.	To able to build forms in Angular JS
3.	To able to understand how to filter forms in AngularJS.
4.	To able to understand how to use different controller.

Syllabus

Unit Number	Title With Contents	No of Practical
Assignment 1	AngularJs simple and clean Firebase Examples	3
Assignment 2	Assignment based on Directives	2
Assignment 3	Assignment based on different controller	2
Assignment 4	Assignment based on filter	2
Assignment 5	Assignment based on form	3



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Practical course based on Java Programming
Course Code	21SBCS359
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the Java Programming
2.	To study Object Oriented Concept
3.	To learn AWT

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To create Java Application.
2.	To design and implement JDBC.
3.	To read and make elementary modifications to Java programs that solve real-world problems.
4.	To Validate input in a Java program

Syllabus

Unit Number	Title With Contents	No of Practical
Assignment 1	Classes and object	2
Assignment 2	Inheritance	3
Assignment 3	Interface	2
Assignment 4	Files	2
Assignment 5	AWT	3



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Practical Course based on Web Technologies-I
Course Code	21SBCS3510
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To Design dynamic and interactive Web pages.
2.	To Learn Core-PHP, Server Side Scripting Language
3.	To Learn PHP- Database handling
4.	To apply statistical, data preprocessing and visualization techniques on data sets

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To understand how to develop dynamic and interactive Web Page
2.	To understand how to use function and string for creating dynamic webpages.
3.	To understand how to handle PHP files.
4.	To understand concept of Databases.

Syllabus

Unit Number	Title With Contents	No of Practical
Assignment 1	HTML and HTML5.0	2
Assignment 2	CSS, Box Model, Navigation Bar	2
Assignment 3	Function and String	2
Assignment 4	Arrays	2
Assignment 5	Files	3
Assignment 6	Databases (PHP-PostgreSQL)	2



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Practical Course based on Data Science
Course Code	21SBCS3511
Semester	V
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To Design dynamic and interactive Web pages
2.	To Learn PHP- Database handling
3.	To apply statistical, data preprocessing and visualization techniques on data sets

Expected Course Specific Learning Outcomes

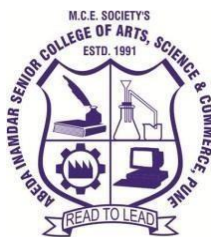
Sr. No.	Learning Outcome
1.	To understand how to collect data from different sources.
2.	To Prepare data for use with a variety of statistical methods and recognize how the quality of the data may affect conclusions.
3.	To Perform exploratory data analysis
4.	To understand how to visualize data with different data visualization tools.

Syllabus

Assignment Number	Title With Contents	No of Practical
Assignment -1	The Data Science environment	2
	Getting introduced to Python IDLE, command line, online tools like google colaboratory and essential packages like NumPy, SciPy, pandas, scikit-learn, matplotlib, jupyter, beautiful-soup, etc.	
Assignment -2	Loading the Dataset	2
	Select a dataset from a list of publicly available datasets at UCI Machine Learning Repository and load it using Pandas. (Import different data format files like .CSV,.htm,.json etc. Briefly describe what the dataset is about and size of the dataset (e.g. number of tables, number of instances and attributes, etc.)	
Assignment 3	Basic statistical operations	2
	Apply basic statistical operations on a dataset. For example– compute the mean, median, mode, range, quartiles, and variance for one or more attributes.	
Assignment 4	Data preprocessing	3
	Apply data preprocessing techniques that are likely required for the dataset. 1) Partition them into appropriate number of bins by equal-frequency as well as equal-width partitioning. 2) Use smoothing by bin means to smooth the data based on the above partitioning, 3) Normalize the attribute based on min- max normalization and z-score normalization. Comment on which method you would prefer to use for partitioning, smoothing, and normalization for the given attribute.	
Assignment 5	Data Visualization with matplotlib	3
	View the data using various 2-D, 3-D plots and charts, setting styles, saving the figures, customizing	

	the legends, multiple subplots	
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SEMESTER VI



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Advanced Java
Course Code	21SBCS361
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To prepare student to understand programming basics.
2.	To learn database programming using Java
3.	To study web development concept using Servlet and JSP
4.	To develop a game application using multithreading

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To access open database through Java programs using Java Data Base Connectivity (JDBC) and develop the application.
2.	To understand and Create dynamic web pages, using Servlets and JSP.
3.	To Work with basics of framework to develop secure web applications

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Collections	06
	<ol style="list-style-type: none"> 1. Introduction to the Collection framework 2. List –ArrayList, LinkedList Set –HashSet, TreeSet, 3. Map –HashMap andTreeMap 4. Interfaces such as Comparator, Iterator, ListIterator, Enumeration 	
Unit II	Multithreading	06
	<ol style="list-style-type: none"> 1. What are threads? Life cycle of thread 2. Creating threads – Thread class , Runnable interface Thread priorities 3. Running multiple threads 4. Synchronization and inter thread communication. 	
Unit III	Database programming	06
	<ol style="list-style-type: none"> 1. The design of jdbc 2. Types of drivers 3. Executing sql statements, query execution Scrollable and updatable ResultSet. 	
Unit IV	Servlet and JSP	12
	<ol style="list-style-type: none"> 1. Introduction to Servlet and Hierarchy of Servlet Life cycle of servlet 2. Handling get and post request (HTTP) Handling data from HTML to servlet Retrieving data from database to servlet. Session tracking – User Authorization, URL rewriting, Hidden form fields, Cookies and HttpSession 3. Introduction to JSP, Life cycle of JSP Implicit Objects 4. Scripting elements – Declarations, Expressions, Scriptlets, Comments JSP Directives – Page Directive, include directive 5. Mixing Scriptlets and HTML 	
UNIT V	Java Spring boot	06

	<ol style="list-style-type: none">1. What is spring boot? Features of spring boot, advantages and limitation of springboot.2. Spring boot v/s spring MVC ,Spring boot architecture,3. Spring boot dependency, spring boot annotations, Tool suit.4. Spring IoC, DI and beans.	
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Reference Books:

1. Complete reference Java by Herbert Schildt(5thedition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java, A primer, Forth edition, By E. Balagurusamy
4. Core JavaVolume-I-Fundamentals, Eighth Edition, CayS. Horstmann, GaryCornell, Prentice Hall, Sun Micro systems Press
5. CoreJavaVolume-II-AdvancedFeatures,EighthEdition,CayS.Horstmann,GaryCornell, Prentice Hall, Sun Microsystems Press
6. Getting started with Spring Framework: covers Spring 5 by J Sharma and Ashish SarinR7. Spring 4forDevelopingEnterpriseApplications:An End-to-End Approach by HenryH. Liu.

Web links:

1. <https://www.javatpoint.com/creating-spring-boot-project-using-sts><https://www.geeksforgeeks.org/collections-in-java-2/><https://www.tutorialspoint.com/jdbc/index.htm>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Software Testing
Course Code	21SBCS362
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To provide the knowledge of software testing techniques
2.	To understand how testing methods can be used as an effective tools in quality assurance of software.
3.	To provide skills to design test case plan for testing software.
4.	To provide knowledge of latest testing methods

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To provide the knowledge of software testing techniques
2.	To understand how testing methods can be used as an effective tools in quality assurance of software.
3.	To provide skills to design test case plan for testing software.
4.	To provide knowledge of latest testing methods

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction to Software Testing	10
	<ol style="list-style-type: none">1. Basics of Software Testing – faults, errors and failures Testing objectives2. Principles of Testing and debugging3. Strategic approach4. Integration Testing5. System Testing6. Load Testing7. Alpha Testing8. Beta Testing9. Usability and Accessibility Testing10. Configuration and Compatibility Testing	
Unit II	Software Testing Strategies & Techniques	15
	<ol style="list-style-type: none">1. How to identify errors, bugs in the given application.2. Design entry and exit criteria for test case, design test cases in excel3. Describe feature of a testing method used.4. Write Test Plan for given application with resources required.5. Write Test case for given application.6. Prepare Test report for test cases executed.7. Defect Life Cycle8. Classification of Defect9. Write Defect Report	
Unit III	Agile Testing	05
	<ol style="list-style-type: none">1. Agile Testing2. Difference between Traditional and Agile testing3. Agile principles and values4. Agile Testing Quadrants5. Automated Tests.	
Unit IV	Testing Tools	06

	<ol style="list-style-type: none">1. API Automation Tools2. Demonstration using POSTMAN3. UI Automation Tools4. Demonstration using Selenium	
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Reference Books:

1. Software Engineering – A Practitioners Approach, Roger S. Pressman, 7thEdition, Tata McGraw Hill, 20
2. Effective Methods of Software Testing, William E Perry, 3rd Edition, Wiley PublishingInc
3. Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing, Rex Black, Microsoft Press,1999
4. Agile Testing: A Practical Guide for Testers and Agile Teams, Lisa Crispin and Janet Gregory, 1st Edition, Addison-Wesley Professional,2008
5. Software Testing Principles and Practices By SrinivasanDesikan, Gopaldaswamy Ramesh, Pearson

Web Link

1. https://www.tutorialspoint.com/software_testing/index.htm
2. <https://www.geeksforgeeks.org/software-testing-basics/>
3. <https://www.javatpoint.com/software-testing-tutorial>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Web Technologies – II
Course Code	21SBCS363
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To Learn different technologies used at client Side Scripting Language
2.	To Learn XML and XML parsers.
3.	To One PHP framework for effective design of web application.
4.	To Learn Java Script to program the behavior of web pages.
5.	To Learn AJAX to make our application more dynamic.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To Build dynamic website.
2.	To use MVC based framework easy to design and handling the errors in dynamic website.
3.	To build websites using PHP and AJAX.
4.	To build dynamic website by using CodeIgniter.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction to Web Techniques	06
	<ol style="list-style-type: none"> 1. Variables 2. PHP error Server information 3. Processing forms 4. Setting response headers 5. Maintaining state handling 	
Unit II	XML	06
	<ol style="list-style-type: none"> 1. What is XML? 2. XML document Structure 3. PHP and XML 4. XML parser 5. The document object model 6. The simple XML extension 7. Changing a value with simple XML 	
Unit III	Java Script and Jquery	10
	<ol style="list-style-type: none"> 1. Overview of JavaScript 2. Object Orientation and JavaScript Basic Syntax(JS datatypes, JS variables) 3. Primitives, 4. Operations and Expressions 5. Screen Output and keyboard input(Verification and Validation) 6. JS Control statements and JS Functions 7. JavaScript HTML DOM Events (onmouseup, onmousedown, onclick, onload, onmouseover, onmouseout). 8. JS Strings and JS String methods 9. JS popup boxes(alert, confirm,prompt). 10. Jquery library , Including jquery library inpage 11. Jquery selector, 12. DOM manipulation using jquery 	
Unit IV	AJAX	06

	<ol style="list-style-type: none"> 1. Introduction of AJAX 2. AJAX web application model 3. AJAX –PHP framework 4. Performing AJAX validation 5. Handling XML data using php and AJAX 6. Connecting database using php and AJAX 	
Unit V	PHP framework CodeIgniter	08

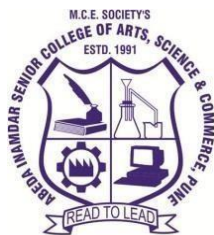
	<ol style="list-style-type: none"> 1. CodeIgniter–Overview, 2. Installing CodeIgnite Application Architecture 3. MVC Framework, 4. Basic concept of CodeIgniter, 5. Libraries 6. Working with databases 7. Load external JS and CSS page & redirecting from controller , Adding JS and CSS , Page redirection. 8. Loading dynamic data on page &session management, cookies management 	
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Reference Books:

1. Programming PHP By RasmusLerdorf and Kevin Tatroe O'Reillypublication
2. Beginning PHP 5, Wroxpublication
3. AJAX Black Book Kogent solution
4. Mastering PHP BPBPublication
5. Professional Codeigniter By Thomas Myer ,WroxPublication,
6. Codeihniter 2 CookBook By Rob Foster ,PACKT Publication,
7. JQueryCookBook, O'reillyPublication.

Web Link

1. www.php.net.in
2. www.W3schools.com
3. <https://www.tutorialspoint.com/codeigniter/index.htm>
4. <https://api.jquery.com/>
5. <http://codeigniter.com/docs>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Data Analytics
Course Code	21SBCS364
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To deploy the Data Analytics Lifecycle to address data analytics projects.
2.	To develop in depth understanding of the key technologies in data analytics.
3.	To apply appropriate analytic techniques and tools to analyze data, create models, and identify insights that can lead to actionable results.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To use appropriate models of analysis, assess the quality of input, and derive insight from results.
2.	To analyze data, choose relevant models and algorithms for respective applications.
3.	To understand different data mining techniques like classification, prediction, clustering and association rule mining
4.	To apply modeling and data analysis techniques to the solution of real world business problems

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction to Data Analytics	06
	<ol style="list-style-type: none"> 1. Concept of data analytics 2. Data analysis vs. Data analytics 3. Types of analytics: Diagnostic Analytics, Predictive Analytics , Prescriptive Analytics, Exploratory Analysis, Mechanistic Analysis 4. Mathematical models –Concept Model evaluation: metrics for evaluating classifiers – Class imbalance – AUC, ROC (Receiver-Operator Characteristic) curves, Evaluating value prediction models 	
Unit II	Machine Learning Overview	06
	<ol style="list-style-type: none"> 1. Introduction to Machine Learning, deep learning, Artificial intelligence 2. Applications for machine learning in data science 3. The modeling process Engineering features and selecting a model, Training the model, Validating the model, Predicting new observations 4. Types of machine learning Supervised learning, Unsupervised learning, Semi- supervised learning, ensemble techniques 5. Regression models Linear Regression, Polynomial Regression, Logistic Regression. 6. Concept of classification, clustering and reinforcement learning. 	
Unit III	Mining Frequent Patterns, Associations, and Correlations	12

	<ol style="list-style-type: none">1. What kind of patterns can be mined2. Class/Concept Description: Characterization and Discrimination, Mining Frequent Patterns, Associations, and Correlations, Classification and Regression for Predictive Analysis, Cluster Analysis, Outlier Analysis3. Mining frequent patterns – Market Basket Analysis. Frequent Item sets, Closed Item sets, and Association Rules Frequent Item set Mining Methods4. Apriori Algorithm5. Generating Association Rules from Frequent	
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	<p>Item sets</p> <p>6. Improving efficiency of apriori algorithm</p> <p>7. Frequent pattern growth (FP-growth) algorithm</p>	
Unit IV	Social Media and Text Analytics	12
	<p>1. Overview of social media analytics Social Media Analytics Process, Seven layers of social media analytics, accessing social media data</p> <p>2. Key social media analytics methods</p> <p>3. Social network analysis Link prediction, Community detection, Influence maximization, Expert finding, Prediction of trust and distrust among individuals</p> <p>4. Introduction to Natural Language Processing</p> <p>5. Text Analytics : Tokenization, Bag of words, Word weighting : TF-IDF, n-Grams, stop words, Stemming and lemmatization, synonyms and parts of speech tagging, Sentiment Analysis</p> <p>6. Document or text summarization Trend analytics</p> <p>7. Challenges to social media analytics</p>	

Reference Books:

- 1) Data Science Fundamentals and Practical Approaches, Gypsy Nandi, Rupam Sharma, BPB Publications,2020.
- 2) The Data Science Handbook, Field Cady, John Wiley & Sons, Inc,2017
- 3) Data Mining Concepts and Techniques, Jiawei Han, MichelineKamber, Jian Pei, Morgan Kaufmann, Third Edition,2012.
- 4) A Hands-On Introduction to Data Science, Chirag Shah, University of Washington Cambridge UniversityPress
- 5) The Data Science Design Manual, Steven S. Skiena, Springer,2017

Introducing data science: big data, machine learning, and more, using Python tools,
Cielen D., Meysman A. D., & Ali M., Manning Publications Co., 2016

Web Links:

1. <https://www.edureka.co/blog/what-is-data-analytics/>
2. <https://careerfoundry.com/en/blog/data-analytics/what-is-data-analytics/#:~:text=Data%20analytics%20is%20the%20process,and%20drive%20smart%20business%20decisions.>
3. <https://monkeylearn.com/machine-learning/>
4. <https://www.javatpoint.com/machine-learning>
5. <https://www.digitalocean.com/community/tutorials/an-introduction-to-machine-learning>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Android Programming
Course Code	21SBCS365
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the Android Operating System and develop application using Android open source platform.
2.	To study Android Apps Development Cycle
3.	To develop android Apps.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To Create simple GUI applications, use built-in widgets and components on the Android Platform
2.	To Design and implement mobile applications involving data storage in SQLite database
3.	To Demonstrate their skills of using Android software development tools
4.	To understand the concepts of SQLite Database.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction To Android Programming	06
	<ol style="list-style-type: none">1. Overview2. History and Versions3. Features of Android4. Architecture of Android5. Components of an Android Application, Manifest file6. Android Environment Setup- Tools – (JDK, SDK, Eclipse/Android Studio, ADT, AVD, Android Emulator)7. First Hello World Program	
Unit II	Activity, Intent and Layout	07
	<ol style="list-style-type: none">1. Introduction to Activities2. Activity Life cycle3. Service Life cycle4. Fragments, Life cycle of fragments5. Adding Fragments dynamically6. Introduction to Intents7. Types of Intent8. Linking Activities using Intents	
Unit III	Android User Interface	08
	<ol style="list-style-type: none">1. Layout Manager2. View and ViewGroup3. Linear Layout4. RelativeLayout5. AbsoluteLayout6. TableLayout7. GridLayout8. Constraint Layout9. FrameLayout10. Scroll Layout	
Unit IV	Designing User Interface with Views	08

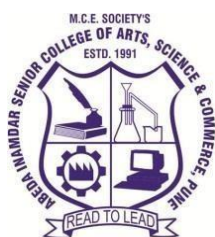
	<ol style="list-style-type: none"> 1. Basic Views 2. Button(Push Button, Check Box, Radio Button, Toggle Button, Image Button) All components (e.g Button , Slider, Image view, Toast) 3. Text Fields 4. Spinner 5. ListView 6. Toast 7. ScrollView 8. Progress BarView 9. Auto Complete TextView 10. Alert Dialog 11. DatePickerDialog. 12. TimePickerDialog 13. CustomDialog 14. Using Menus with Views – Options Menu, Context Menu and Pop up menu 	
UNIT V	Databases – SQLite	07
	<ol style="list-style-type: none"> 1. Introduction to SQLite 2. SQLiteOpenHelper and SQLiteDatabase 3. Creating , opening and closing database 4. Working with cursors, Insert, Update, Delete 5. Building and executing queries 	

Reference Books

1. Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication
2. Professional Android 4 Application Development, By Reto Meier WROX Publication

Web Links

1. –<https://developer.android.com>
2. <https://www.javatpoint.com/android-tutorial>
3. <https://www.tutorialspoint.com/android/index.htm>
4. <https://www.geeksforgeeks.org/introduction-to-android-development/>



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T.Y.B.Sc (Computer Science)

(CBCS- Autonomy 21 Pattern)

Course/ Paper Title	Compiler Construction
Course Code	21SBCS366
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand design issues of a lexical analyzer and use of LEX tool.
2.	To understand design issues of a parser and use of YACC tool.
3.	To understand and design code generation and optimization techniques.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To understand the process of scanning and parsing of source code.
2.	To learn the conversion code written in source language to machine language.
3.	To understand tools like LEX and YACC
4.	To understand the different types of Parser.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction	04
	<ol style="list-style-type: none"> 1. Definition of Compiler, Aspects of compilation. 2. The structure of Compiler 3. Phases of Compiler – Lexical Analysis, Syntax Analysis, Semantic Analysis, Intermediate Code generation, code optimization, code generation. 4. Error Handling. 5. Introduction to one pass & Multipass compilers, cross compiler, Bootstrapping. 	
Unit II	Lexical Analysis (Scanner)	04
	<ol style="list-style-type: none"> 1. Review of Finite automata as a lexical analyzer 2. Applications of Regular Expressions and Finite Automata (lexical analyzer, searching using RE), Input buffering, Recognition of tokens. 3. LEX: A Lexical analyzer generator (Simple Lex Program) 	
Unit III	Syntax Analysis (Parser)	14
	<ol style="list-style-type: none"> 1. Definition, Types of Parsers 2. Top-Down Parser – Top-Down Parsing with Backtracking: Method & Problems 3. Drawbacks of Top-Down parsing with backtracking 4. Elimination of Left Recursion (direct & indirect) 5. Need for Left Factoring & examples 6. Recursive Descent Parsing: Definition 7. Implementation of Recursive Descent Parser Using Recursive Procedures 8. Predictive LL (1) Parser (Definition, Model) 9. Implementation of Predictive Parser [LL(1)] 10. FIRST & FOLLOW 11. Construction of LL (1) Parsing Table, Parsing of a String using LL (1) Table 12. Bottom-Up Parsers 13. Operator Precedence Parser – Basic Concepts 	

	<ul style="list-style-type: none"> 14. Operator Precedence Relations form, Associativity& Precedence 15. Operator Precedence Grammar 16. LEADING & TRAILING (with example) 17. Operator Precedence Parsing (with example) 18. Precedence Functions 19. Shift Reduce Parser 20. Reduction, Handle, Handle Pruning 21. Stack Implementation of Shift Reduce Parser (with examples) 22. LR Parser: Model, Types [SLR (1), Canonical LR, LALR]- Method &examples. 23. YACC –program sections, simple YACC program for expression evaluation 	
Unit IV	Syntax Directed Definition	07
	<ul style="list-style-type: none"> 1. Syntax Directed Definitions(SDD) 2. Inherited & Synthesized Attributes 3. Evaluating an SDD at the nodes of a Parse Tree, Example 4. Evaluation Orders for SDD's 5. Dependency Graph 6. Ordering the Evaluation of Attributes 7. S-Attributed Definition 8. L-Attributed Definition 9. Application of SDT 10. Construction of syntax trees 11. Translation Schemes- Definition, Postfix Translation Scheme 	
UNIT V	Code Generation and Optimization	07

	<ol style="list-style-type: none"> 1. Compilation of expression – Concepts of operand descriptors and register descriptors with example 2. Intermediate code for expressions – postfix notations, Triples, Quadruples and Expression trees. 3. Code Optimization – Optimizing transformations – compile time evaluation, elimination of common sub expressions, dead code elimination, frequency reduction, strength reduction. 4. Three address code 5. DAG for Three address code-The Value-number method constructing DAG's 6. Definition of basic block, Basic blocks, and flow graphs 7. Directed acyclic graph (DAG) representation of basic block. 8. Issues in design of code generator 	
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Reference Books

1. Compilers: Principles, Techniques, and Tools, Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, 2004
Introduction to Computer Theory Daniel I. A. Cohen – 2 nd edition – John Wiley & Sons,1996
2. Principles of Compiler Design By: Alfred V. Aho, Jeffrey D. Ullman, Narosa Publication House,2002
3. LEX & YACC, 2 nd edition, O'reilly Publication,2012

Web Links

1. <https://www.javatpoint.com/compiler-phases>
2. <https://www.guru99.com/compiler-design-lexical-analysis.html>
3. <https://www.geeksforgeeks.org/construction-of-ll1-parsing-table/>
4. <https://ecomputernotes.com/compiler-design/syntax-directed-definition-and-its-types>
5. <https://www.gatevidyalay.com/code-optimization-techniques/>



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Data Security
Course Code	21SBCS367
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To prepare student to understand security basics.
2.	To understand cryptography and comprehensive study of the principles and practices of computer system security.
3.	To understand operating system security, network security, software security and web security.
4.	To understand common attacking techniques and common security policies.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To understand the common threats faced today.
2.	To understand the foundational theory behind information security.
3.	To understand the basic principles and techniques when designing a security system.
4.	To understand the attacks and the defenses work in practice.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	Introduction to Data Security	06
	<ol style="list-style-type: none">1. Introduction to security, Attacks, Security mechanism, Cyber-crimes2. Data Protection and Privacy3. Principles of Data Protection4. Personal Data Protection Bill and its compliance	
Unit II	Cryptography and Network Security	10
	<ol style="list-style-type: none">1. Introduction to Cryptography, Substitution cipher, Transposition Cipher, Block cipher, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.2. Overview of Firewalls- Types of Firewalls, VPN Security.	
Unit III	Program Security	10
	<ol style="list-style-type: none">1. Program Security, Program Errors, Malicious Codes, Virus, Trapdoors, Salami Attacks, Man-in-the- middle attacks, Threats, Covert Channels, Control against Program, Program security issues, Protecting Programs.2. Protection in OS: Memory and Address Protection, Access Control, File Protection, User Authentication.	
Unit IV	Security in Networks	10

	<ol style="list-style-type: none">1. Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, and Traffic flow security.2. Big Data Security issues and challenges, Social media security issues	
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Reference Books:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography and Network Security Principles and Practice, Fourth or Fifth Edition, William Stallings, Pearson
3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

Web Links:

1. <https://nayakuch.files.wordpress.com/2015/08/cryptography-network-security-atul-kahate.pdf>
2. <https://www.fortinet.com/resources/cyberglossary/data-security>
3. <https://www.geeksforgeeks.org/cryptography-and-its-types/>
4. <https://www.techtarget.com/searchsecurity/definition/cryptography>
5. <https://www.checkpoint.com/cyber-hub/network-security/what-is-network-security/>
6. <https://www.ibm.com/in-en/topics/network-security>
7. <http://eti2506.elimu.net/Introduction/Books/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf>



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T.Y.B.Sc (Computer Science)
(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Project
Course Code	21SBCS368
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand concepts of Project Management
2.	To know how various tools for development and management of software projects are used to carry out various tasks involved
3.	To learn the importance of project documentation.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
	After Completion of this course students will able to-
1.	To demonstrate a sound technical knowledge of selected project topic.
2.	To Apply techniques for project management
3.	To Create various documents used during the development of the project and a project report.
4.	To Implement the skills using working project.

Sr. No.	Guidelines
1	Students shall choose any topic for project work in consultation with project guide, Project In-charge and head of the department
2	The students shall work on a Project in a group of not more than three students.
3	Students are expected to work on the chosen project during the entire semester.
4	Students shall undertake application oriented/web-based/database-oriented/research based work.
5	Students shall successfully implement the chosen work. Only a hypothetical / theoretical study shall not be accepted
6	Students shall choose any appropriate programming language/ platform, computational techniques and tools in consultation with the guide, In-charge and the head of the department
7	The faculty members from affiliated college shall act as a project guide for each project group with equal distribution of groups amongst each eligible faculty.
8	The guide shall track and monitor the project progress on a weekly basis by considering the workload of 3 laboratory hours per week.
9	The project work shall be evaluated based on the novelty of the topic, scope of the work, relevance to computer science, adoption of emerging techniques/technologies and its realworld application etc
10	<p>Students shall prepare a project report with the following contents:</p> <ul style="list-style-type: none"> a) TitlePage b) Certificate c) Index Page detailing description of the following with their sub sections:-- <ul style="list-style-type: none"> -Title: A suitable title giving the idea about what work is proposed. – -Introduction: An introduction to the topic giving proper - Background of thetopic. -Requirement Specification: -Specify Software/hardware/data requirements. - System Design details:Methodology/Architecture/UML/DFD/Algorithms/protocols used(whichever is applicable) - System Implementation:Code -Results: Test Cases/Tables/Figures/Graphs/Screen shots/Reports etc - Conclusion and Future Scope: Specify the Finalconclusionand futurescope - References: Books, web links, research articlesetc.



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Practical course based on Advanced Java Programming
Course Code	21SBCS369
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the Advanced Java Programming
2.	To study Servlet and JSP
3.	To learn Spring Boot

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To create Java Application
2.	To design and implement Spring tool
3.	To understand and Create dynamic web pages using Servlets and JSP.
4.	To create collections.

Syllabus

Unit Number	Title With Contents	No of Practical
Assignment 1	Collections	2
Assignment 2	Multithreading	2
Assignment 3	Servlet	3
Assignment 4	JSP	2
Assignment 5	Spring	3



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T.Y.B.Sc (ComputerScience)
(CBCS-Autonomy 21 Pattern)

Course/ Paper Title	Practical Course based on Web Technologies-II
Course Code	21SBCS3610
Semester	VI
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To Learn different technologies used at client Side Scripting Language
2.	To Learn XML and XML parsers.
3.	To One PHP framework for effective design of web application.
4.	To Learn Java Script to program the behavior of web pages.
5.	To Learn AJAX to make our application more dynamic.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To understand how to develop dynamic and interactive Web Page
2.	To Build dynamic website.
3.	To use MVC based framework easy to design and handling the errors in dynamic website.
4.	To understand how to handle PHP using AJAX.

Syllabus

Unit Number	Title With Contents	No of Practical
Assignment 1	Self-Processing Forms, Sticky Forms, File Upload.	2
Assignment 2	COOKIES and SESSIONS.	2
Assignment 3	XML documents and DOM	2
Assignment 4	JavaScript	3
Assignment 5	Ajax	3



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T.Y.B.Sc (Computer Science)

(CBCS-Autonomy 21 Pattern)

Course/Paper Title	Practical course based on Android Programming
Course Code	21SBCS3611
Semester	VI
No. of Credits	2

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the Android Operating System
2.	To study Android Apps Development Cycle
3.	To learn to create Android Applications.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	To create mobile applications on the Android Platform.
2.	To design and implement mobile applications involving data storage in SQLite database
3.	To handle Emails through mobile application.

Syllabus

Unit Number	Title With Contents	No of Practical
Assignment 1	Activities, Fragments and Intents	2
Assignment 2	Android User Interface	2
Assignment 3	Designing User Interface with Views	3
Assignment 4	Database-SQLite	3
Assignment 5	Messaging and Email	2