SWAMI VIVEKANAND SUBHARTI UNIVERSITY
UGC Approved Meerut
NAAC A
AN ISO 21001: 2018 ORGANIZATION

OFFICE OF THE REGISTRAR
Gp Capt M Yakoob
M-in-D (Retd.), M.Tech.
REGISTRAR
registrar@subharti.org

Ref.No.U-508(i)/SVSU/2025/1563 Date:25.01.2025

NOTIFICATION

It is hereby notified for information of all the concerned that the Academic Council in its 34th meeting held on 25-07-2024 vide resolution No.34(7) has approved the ordinance relating to course curriculum & syllabus of degree of Four Year Degree Program (FYDP) of the following:

Ordinance No.V-126 (B8), relating to B.Sc.-Computer Science

The copies of all above are enclosed and shall be applicable from Academic Session 2024-25 onwards.

This issues with the approval of the Hon'ble Vice Chancellor.

25.01.2025
Registrar

Ref.No.U-508(i)/SVSU/2025/1563 Date: 25.01.2025

Copy forwarded to information of:

1. Hon'ble Vice-Chancellor
2. Controller of Examination
3. Dean-Academics
4. Director-IQAC
5. Dean-Faculty of Science (for compliance please)
6. CTO (with a request to upload the ordinance on University website)
7. Additional Registrar-Academics
8. Guard File

25.01.2025
Registrar

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

MEERUT

Keral Verma Subharti College of Science

Ordinance Number V 126 B-8

Bachelor of Science in Computer Science

All UG Courses offered by Department of Computer Application. KVSCOS (Session 2025-26 onwards)

Sem	I	II	III	IV	V	VI	VII	VIII	Total
Credit	20	20	20	20	20	20	20	20	160
Marks	700	700	700	600	600	700	500	300	4800

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

B.Sc CS Program offered by Department of Computer App;ication (Session 2025-26 onwards)

		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
1	Major	6	6	9	15	10	14	16	4	80
2	Minor	3	3	3	3	6	6	4	4	32
3	Multi Disciplinary	3	3	3						9
4	Ability Enhancement Course	2	2	2	2					8
5	Skill Enhancement Course	3	3	3						9
6	Value Added Course	3	3							6
7	Internship					4				4
8	Research								12	12
	Total	20	20	20	20	20	20	20	20	160

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

Course Name - B.Sc (Computer Science)

Batch:2025-26							SEM:I							
S.No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P								
THEORY and PRACTICAL SUBJECTS								Attendance (5)	quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)		
1	Major 1		Fundamentals of Computers	4	1	0	4	5	10	15	30	70	100	
2	Practical Major 1		Computer Lab	0	0	2	2	5	10	15	30	70	100	
3	Minor 1		To Be Choosen from the Bucket of Courses	4	1	0	3	5	10	15	30	70	100	
4	Multi Disciplinary		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
5	Ability Enhancement Course		English Communication Skill	2	1	0	2	5	10	15	30	70	100	
6	Skill Enhancement Course		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
7	Value Added Course		Office Automation	1	0	3	3	5	10	15	30	70	100	
8	IKS / Rastra bodh			2	1	0	2	5	5	10	20	30	50	Qualifying
TOTAL CREDITS / ASSESSMENT							**20**	**35**	**70**	**105**	210	**490**	**700**	

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

Course Name - B.Sc (Computer Science)

Batch:2025-26 | **SEM:II**

S.No.	Course Type	Course Code	Course	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P		Attendance (5)	quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)		
THEORY and PRACTICAL SUBJECTS														
1	Major 2		Programming in C	4	1	0	4	5	10	15	30	70	100	
2	Practical Major 2		Programming Lab	0	0	2	2	5	10	15	30	70	100	
3	Minor 2		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
4	Multi Disciplinary 2		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
5	Ability Enhancement Course 2		Environmental Science	2	1	0	2	5	10	15	30	70	100	
6	Skill Enhancement Course 2		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
7	Value Added Course 2		Digital Marketing	3	0	1	3	5	10	15	30	70	100	
8	IKS / Rastra bodh			2	1	0	2	5	5	10	20	30	50	Qualifying
TOTAL CREDITS / ASSESSMENT							**20**	**35**	**70**	**105**	210	**490**	**700**	

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application.

Course… B.Sc (Computer Science)

Batch:2025-26 | | | | | | | **SEM:III**

S.No.	Course Type	Course Code	Course	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P		Attendance (5)	quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)		
THEORY and PRACTICAL SUBJECTS														
1	Major 3		Data Structure using C	4	1	0	4	5	10	15	30	70	100	
2	Major 4		Mobile Computing	3	1	0	3	5	10	15	30	70	100	
3	Minor 3		To Be Choosen from the Bucket of Courses	4	1	0	3	5	10	15	30	70	100	
4	Multi Disciplinary 3		To Be Choosen from the Bucket of Courses	4	1	0	3	5	10	15	30	70	100	
5	Ability Enhancement Course 3 (Disaster Risk Management)		Course on Disaster Risk Management	2	1	0	2	5	10	15	30	70	100	
6	Skill Enhancement Course 3		To Be Choosen from the Bucket of Courses	1	0	3	3	5	10	15	30	70	100	
7	Practical 3 (Based on Major 3)		Data Structure Lab	0	0	2	2	5	10	15	30	70	100	
TOTAL CREDITS / ASSESSMENT							**20**	**35**	**70**	**105**	210	**490**	**700**	

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application.

Course… B.Sc (Computer Science)

Batch:2025-26 | **SEM:IV**

S.No.	Course Type	Course Code	Course	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P		Attendance (5)	quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)		
THEORY and PRACTICAL SUBJECTS														
1	Major 5		Object Oriented Programming with C++	3	1	0	3	5	10	15	30	70	100	
2	Major 6		Database Management System	3	1	0	3	5	10	15	30	70	100	
3	Major 7		Operating System	3	1	0	5	5	10	15	30	70	100	
4	Minor 4		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
5	Practical 4 (Based on major 5& 6)		Computer Lab of C++ and DBMS	0	0	4	4	5	10	15	30	70	100	
7	Ability Enhancement Course 3 (Course on NCC/NSS/NGO,s / Scout Guide / Sports)		Course on NCC/NSS/NGO'S/SCOUT GUIDE/SPORTS	2	1	0	2	5	10	15	30	70	100	
TOTAL CREDITS / ASSESSMENT							**20**	**30**	**60**	**90**	180	**420**	**600**	
			C++ Lab											

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application.

Course… B.Sc (Computer Science)

Batch:2025-26 | **SEM:V**

S.No.	Course Type	Course Code	Course	Teaching Load L	T	P	Credits	Internal Assessment: Attendance (5)	quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	External Assessment: End Sem Exam (70)	Total	Remark
THEORY and PRACTICAL SUBJECTS														
1	Major 8		Programming in Python	4	1	0	4	5	10	15	30	70	100	
2	Major 9		Software Engineering	4	1	0	4	5	10	15	30	70	100	
3	Minor 5		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
4	Minor 6		To Be Choosen from the Bucket of Courses	3	1	0	3	5	10	15	30	70	100	
5	Internship		Based on Pragroming Subjects	2	0	2	4	5	10	15	30	70	100	
6	Practical 5 (Based on Major (8 & 9)		Python & S/w Engg Lab	0	0	4	2	5	10	15	30	70	100	
TOTAL CREDITS / ASSESSMENT							**20**	**30**	**60**	**90**	180	**420**	**600**	

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application.

Course… B.Sc (Computer Science)

Batch:2025-26 | **SEM:VI**

S.No.	Course Type	Cours	Course	Teaching Load L	T	P	Credits	Internal Assessment	External	Total	Rema

		e Code										Assessment		rk
THEORY and PRACTICAL SUBJECTS								**Attendance (5)**	**quiz/PPT/ Assignment (10)**	**Mid Sem Test (15)**	**TOTAL**	**End Sem Exam (70)**		
1	Major 10		Design and Analysis of Algorithm	3	1	0	3	5	10	15	30	70	100	
2	Major 11		Computer Graphics	3	1	0	3	5	10	15	30	70	100	
3	Major 12		Java Programming	4	1	0	4	5	10	15	30	70	100	
4	Minor 7		To Be Choosen from the Bucket of Courses	4	1	0	3	5	10	15	30	70	100	
5	Minor 8		To Be Choosen from the Bucket of Courses	2	1	0	3	5	10	15	30	70	100	
6	Practical 6 (based on Major 10 and 11)		Computer Lab on Graphics and DAA)	0	0	4	2	5	10	15	30	70	100	
7	Practical 7 (Based on Major 12)		Java Programming Lab	0	0	4	2	5	10	15	30	70	100	
TOTAL CREDITS / ASSESSMENT							**20**	**35**	**70**	**105**	210	**490**	**700**	

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application.

Course… B.Sc (Computer Science)

Batch:2025-26							**SEM:VII**					
S.No.	**Course Type**	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Internal Assessment**	**External Assessment**	**Total**	**Remark**
				L	**T**	**P**					

THEORY and PRACTICAL SUBJECTS								Attendance (5)	quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)		
1	Major 13		Data ware Housing	5	1	0	5	5	10	15	30	70	100	
2	Major 14		Cloud Computing	5	1	0	5	5	10	15	30	70	100	
3	Major 15		VB .Net	4	1	0	4	5	10	15	30	70	100	
4	Minor 9		To Be Choosen from the Bucket of Courses	4	1	0	4	5	10	15	30	70	100	
6	Practical 7 (Based on Major 15)		VB .Net Lab	0	0	4	2	5	10	15	30	70	100	
TOTAL CREDITS / ASSESSMENT							**20**	**25**	**50**	**75**	150	**350**	**500**	

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application.

Course… B.Sc (Computer Science)

Batch:2025-26 | **SEM:VIII**

S.No.	Course Type	Course Code	Course	Teaching Load			CREDITS	Internal Assessment				External Assessment	Total	Remark
	THEORY and PRACTICAL SUBJECTS			L	T	P		Attendance (5)	Quiz/PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)		
1	Major 16		Data Science	4	1	0	4	5	10	15	30	70	100	
2	Minor 10		To Be Choosen from the Bucket of	4	1	0	4	5	10	15	30	70	100	

			Courses											
4	Research Project / Dissertation		Based on the programming Subjects	2	1	0	12	5	10	15	30	70	100	
TOTAL CREDITS / ASSESSMENT							**20**	**15**	**30**	**45**	90	**210**	**300**	

Bucket of Courses (Minor)

Year	Sem.	S.No	Course Code	Paper Title	Theory/ Practical	Credits
1	**I**	**1**	BMIC070101	Introduction to computer system	Theory	3
	II	**2**	BMIC070202	Data Entry with MS Office	Theory	3
2	**III**	**3**	BMIC070303	Digital Electronics	Theory	3
	IV	**4**	BMIC070404	M-Commerce	Theory	3
3	**V**	**5**	BMIC070505	Web Designing with HTML	Theory	3
		6	BMIC070506	Cyber Security	Theory	3
	VI	**7**	BMIC070607	Computer Network	Theory	3

		8	BMIC070608	Management Information Science	Theory	3
4	**VII**	**9**	BMIC070709	Artificial Intelligence	Theory	4
	VIII	**10**	BMIC070710	Deep Learning	Theory	4
					Total	**32**

Bucket of Courses (Multidisciplinary)						
Year	**Sem.**	S.No	**Course Code**	**Paper Title**	**Theory/ Practical**	**Credits**
1	**I**	**1**	BMDC070101	Internet Technology	Theory	3
	II	**2**	BMDC070202	Introduction to Android and its Application	Theory	3
2	**III**	3	BMDC070303	Research Methodology & IPR	Theory	3
					Total	**9**

Bucket of Courses (Skilled)						
Year	**Sem.**	S.No	**Course Code**	**Paper Title**	**Theory/ Practical**	**Credits**
1	**I**	**1**	BSEC070101	Advance Excel	Theory	3

	II	**2**	BSEC070202	Food and Nutrition or First Aid and health	Theory	3
2	**III**	3	BSEC070303	Automation and Robotics	Theory	3
					Total	**9**

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **B.Sc(Computer Science)**	Year: **First**	Semester: **First**
Subject: **Computer Science**		
Course Code:	Course Title: **Fundamentals of Computer**	

Course outcomes:

1. Understand computer system characteristics, including hardware and software components.
2. Familiarize with number systems: decimal, binary, octal, and hexadecimal, along with logic gates and truth tables.
3. Identify various input devices like keyboards, scanners, and pointing devices, and output devices such as printers and projectors.
4. Describe the components of a Central Processing Unit (CPU) and memory (RAM and ROM).
5. Understand office packages including Word, Excel and PowerPoint

Credits: **4**	**Major**
Max. Marks: **30+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Computer Systems and Types** Computer system: characteristics and capabilities. Computer Hardware and Software: Block Diagram of a Computer, Different Data Processing: Data, Data Processing System, Storing Data, Processing Data. Types of Computers: Analogue, Digital, Hybrid, General and Special Purpose Computers. Generation of Computers. Computer Systems: Micros, Minis & Main-frames. Limitations of Micro Computer.	7
II	**Number Systems and Logic Gates** Number systems: Decimal Number system, Binary number system, Octal & Hexadecimal number system, 1's & 2's complement Codes: ASCH, EBCDI Codes, Gray code & BCD. **Logic Gates:** AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates	8
III	**Input Devices and Computer Output** Introduction to Input Devices: Categorizing Input Hardware, Keyboard, Direct Entry — Card Readers, Scanning Devices — O.M.R., Character Readers, Thumb Scanner, MICR, Smart Cards, Voice Input Devices, Pointing Devices — Mouse, Light Pen, Touch Screen. Computer Output: Output Fundamentals, Hardcopy Output Devices, Impact Printers, Non-Impact Printers, Plotters, Computer output Microfilm/Microfiche (COM) systems, Softcopy Output Devices, Cathode Ray Tube, Flat Screen Technologies, Projectors, Speakers.	7

IV	**Central Processing Unit (CPU)** Central Processing Unit: The Microprocessor, control unit, A.L.U., Registers, Buses, Main Memory, Main Memory (RAM) for microcomputers, Read Only Memory (ROM).	8
V	**Unit 5: OFFICE PACKAGES** Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, Language setting; Printing of word document, Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, Printing of Spread Sheet, Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation.	10

Suggested Readings:

1. P. K. Sinha & Priti Sinha , "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **First**
Subject: **Computer Science**		
Course Code:	Course Title: **Computer Lab**	

Course outcomes:

1. To explore various features of MS-Word and its applications.
2. To explore various features of MS-Excel and its applications.
3. To design the presentation using MS-power Point.

Credits: **2**	**Major**
Max. Marks: **30+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **0-0-2**

Unit	Topic	No. of Lectures
I	MS-Office: Introduction, Overview of the office components, MS-Office files and folders, Opening, and saving files. MS-Word: Starting MS-Word, Creating and Formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto-text, Spell Check, Word Art, Working with Header, Footers and Footnotes, Working with Graphics, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.	
II	MS-EXCEL: Creating, Editing, Formatting: font name, size, color, alignment, changing, entering data, Sorting Data, Inserting, renaming and deleting Sheet, Inserting row, column, cell, picture, background, graph, symbol, hyperlink ,object, diagram, working with formulae, creating charts and using tools.	
III	MS-Power Point: Starting MS–Power Point, Creating a presentation using Auto-content Wizard, Blank Presentation, Creating, Saving and Printing a presentation, Adding a slide to presentation, Navigating through a presentation, Slide-sorter, Slide-show, Editing slides, Working with Graphics and Multimedia in PowerPoint (Inserting Photo, Video & Sound).	

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **First**
Course Code:	Course Title: **Internet Technologies**	

Course outcomes:

By the end of this course, students should be able to:

1. Understand the working principles of the internet and its protocols.
2. Understand about technologies used in Internet
3. Understand about Hardware used in Internet

Credits: **3**	**Multidisciplinary**
Max. Marks: **30+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **3-1-0**

Unit	Topic	No. of Lectures
I	Internet: The Giant Wide Area Network, Communicating over the Internet, Accessing the Internet, Internet Organisations, Cyber Ethics, Internet Applications: Internet services, Electronic Mail(E-Mail), File Transfer, Real-Time User Communication, Remote Login, Usenet, World Wide Web: The Web, The Working Web, Web Terminology,	7
II	Hypertext Transfer Protocol (HTTP):HTTP, HTTP Version, HTTP connections, HTTP Communication, Hypertext Transfer Protocol Secure, Hypertext Transfer Protocol State Retention: Cookies, Hypertext Transfer Protocol Cache, Hardware devices used in Internet.	8
III	Difference between Intranet and Internet, Working of Internet, Dynamic and Static Routing, Domain Name Server , networking tools - ipconfig, ping, netstat, traceroute.	7
IV	**Web Servers:** Introduction, Working, Configuring, Hosting and Managing a Web server. **Search Engines** - components, working, optimization, Crawling, BOTS	8

1. **Bayross, I. (2013). Web enabled commercial application development using HTML, JavaScript, DHTML and PHP. 4th edition. BPB Publication.**

2. D Comer. (2018). The Internet Book: Everything You need to know about Computer networking and how the internet works. 5th edition. CRC Press.

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **First**
Course Code:	Course Title: **English Communication Skills**	

Course outcomes:

Credits: **2**	**ABILITY ENHANCEMENT COURSE**
Max. Marks: **30+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **2-1-0**

Unit	**Topic**	**No. of Lectures**
I		
II		
III		
IV		

Semester-II

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **Second**
Course Code:	Course Title: **Programming in C**	

Course outcomes:

By the end of this course, students should be able to:

1. Understand the basic programming concepts and syntax of the C language.
2. Design and implement algorithms to solve simple programming problems.
3. Write, compile, and execute C programs using integrated development environments (IDEs).

Credits: **4**	**Major**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-**1-0**

Unit	Topic	No. of Lectures
I	Introduction to problem solving: Concept, Problem solving techniques, Algorithms and Flowcharts. Introduction to 'C' Language: History, Structures of 'C' Programming, Function as building blocks. Language Fundamentals: Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types.	11
II	Operators: Types of operators, Precedence and Associatively, Expression, Statement and types of statements. Build in Operators and function: Console based I/O and related built in I/O function, Concept of header files, Preprocessor directives: #include, #define. Control structures: Decision control structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; Other statements: break, continue, goto, exit statements, Bitwise operator.	11
III	**Arrays:** Definition, declaration and initialization of one dimensional array; Accessing array elements; Displaying array elements; Sorting arrays; Arrays and function; Two –Dimensional array: Declaration and Initialization, Accessing and Displaying, Memory representation of array. Strings: Definition, declaration and initialization of strings; standard library function. **Functions:** Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.	12
IV	**Pointers:** Definition, notation, pointers and arrays, array of pointers and functions- call by value and call by reference, pointers to pointers Structures: Definition and declaration; Variables initialization; Accessing fields and structure operations; Nested structures; Union: Definition and declaration; Differentiate between Union and structure. File handling.	6

V	**File Handling and Command-line Arguments** File operations: Opening, Reading, Writing, and Closing files, Random Access to files, Commandline arguments, File handling functions, Error handling.	6

Suggested Readings:

1. Yashwant Kanetkar, Let us C", BPB Publications.
2. E. Balagurusamy, "Programming in ANSI C", TMH.
3. Vikas Verma, Work Book on C, Cengage Publication.

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **Second**
Course Code:	Course Title: **Programming Lab**	

Course outcomes:

By the end of this course, students should be able to:

1. Understand the basic programming concepts and syntax of the C language.
2. Design and implement algorithms to solve simple programming problems.
3. Write, compile, and execute C programs using integrated development environments (IDEs).

Credits: **2**	**Major Practical**
Max. Marks: **30+70**	Min. Passing Marks:40
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-**0-2**	

Programming Lab

1. Write a C Program to read radius of a circle and to find area and circumference.
2. Write a C Program to read three numbers and find the biggest of three.
3. Write a C Program to check for prime.
4. Write a C Program to generate n primes.
5. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome.
6. Write a C Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
7. Write a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
8. Write a C Program to remove Duplicate Element in a single dimensional Array.
9. Program to perform addition, subtraction and multiplication of Matrices.
10. Program to perform transpose of two dimensional Matrices.
11. Write a C Program to find the length of a string .
12. Write a C Program to demonstrate string functions.
13. Write a C Program to demonstrate pointers in C.
14. Write a C Program to read, display and to find the trace of a square matrix .
15. Write a C Program to read, display and multiply two matrices using functions .

16. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.

17. Write a C Program to Reverse a String using Pointer.

18. Write a C Program to Swap Two Numbers using Pointers

19. Write a C Program to demonstrate student structure to read & display records of n students.

20. Write a C Program to demonstrate structure.

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **Second**
Course Code:	Course Title: **Computer Based Numerical Techniques**	

Course outcomes:

By the end of this course, students should be able to:

1. Understand the principles and importance of numerical techniques.
2. Apply numerical methods for solving mathematical problems.
3. Implement algorithms for numerical differentiation and integration.
4. Use interpolation techniques for data analysis and approximation.
5. Solve ordinary differential equations numerically.

Credits: **3**	**Minor**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-**1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Numerical Technique** Overview of numerical methods and their applications, Errors in numerical computations and methods to reduce them	6
II	**Solving Equations** Bisection method, Newton-Raphson method, Secant method, Root-finding techniques and convergence criteria.	7
III	**Interpolation and Approximation** Interpolation methods: Lagrange interpolation, Newton's divided difference, Curve fitting techniques: Least squares approximation.	8
IV	**Numerical Integration and Differentiation** Numerical integration methods: Trapezoidal rule, Simpson's rule, Numerical differentiation techniques.	6

V	**Linear Algebraic Equations and Eigenvalue Problems** Solving systems of linear equations: Gaussian Elimination, LU Decomposition, Eigenvalues and Eigenvectors using numerical methods.	5

Recommended Books:

1. "Numerical Methods: Principles, Analysis, and Algorithms" by Roland W. Freund and Gene H. Golub.
2. "Numerical Recipes: The Art of Scientific Computing" by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery.

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **Second**
Course Code:	Course Title: **Introduction to Android and its Application**	

Course outcomes:

By the end of this course, students should be able to:

1. Understand the fundamentals of Android application.
2. Understand the working of Android
3. Understand the application of Android.

Credits: **3**	**Multidisciplinary**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-**1-0**

Unit	Topic	No. of Lectures
I	INTRODUCTION TO ANDROID Overview of Android platform and its architecture, History, Features, Versions, OS Architecture Preview, Compilation & Execution Procedure, Tools Needed to start application development(Driver Setup, Emulator, Development Editor) ,Sample Application. (By default created by IDE)	6
II	APPLICATION STRUCTURE FILES Packages ,Activities, Manifest file , Gradle , Resources (Designs, String, Colors ,styles, R.java- file for maintaining ids) , Assets ,Raw , Drawable resources - Images and shapes	7
III	INTENTS Definition, Usage . Switching Screens , Switching Screens along with Data using bundles ,Intent Types. Example : Switch Screwens, Pass Data between screens	8
IV	FILE HANDLING Create File , File Writing and Reading, Example: Create, Write & Save text file. DAILOGS Toast and Dialogs . Example: Informative Message, Confirmation	6

	Dialog	
V	MENUS AND TYPES : Option menu ,Context menu ,Sub menu. Examples: Notepad	5

Recommended Books:

1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Chris Stewart.
2. "Head First Android Development" by Dawn Griffiths and David Griffiths.

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **Second**
Course Code:	Course Title: **Advanced Excel**	

Course outcomes:

By the end of this course, students should be able to:

1. Understand the fundamentals of Excel.
2. Understand the working of Advanced Excel

Credits: **3**	**Skill Enhancement**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): 3-**1-0**

Unit	Topic	No. of Lectures
I	**Basic Microsoft Excel**: Spreadsheet basics Creating, editing, saving and printing spreadsheets Working with functions & formulae Graphically representing data, Charts & Graphs - Analyzing data: Data Menu, Subtotal, and Filtering Data Working with functions & formulae Formatting worksheets, Securing & Protecting spreadsheets.	9
II	Formulas & Macros Formulas Use the Function Wizard, Common functions (AVERAGE, MIN, MAX, COUNT, COUNTA, ROUND, INT) Nested functions, Name cells/ranges/constants -Relative, Absolute, Mixed cell references: >, <= operators, Logical functions using IF, AND, OR, NOT The LOOKUP function, Date and time functions, Annotating formulas.	9
III	**Functions:** LOOKUP, VLOOKUP, HLOOKUP, COUNTIF, Referencing Linking Between Word/Excel/PPT SUMIF What-if-analysis GOAL SEEK NESTED IF Reporting Character Functions Date Functions Age Calculations Consolidation of Data Data Validation, **Pivot Tables** Enter the Pivot Table Data Create the Pivot Table-Adding	12

	Data to the Pivot Table Filtering the Pivot Table Data, Change the Pivot Table Data Analyze Data Columns in Pivot Tables Adjust Data to Analyze	

Recommended Books:

1. Excel basics in 30 Minutes (2nd Edition): The beginner's Guide to Microsoft Excel and google sheets Jan 2015.
2. www.udemy.com/course/learn-microsoft-excel-pivot-tables/

Programme/Class: B.Sc (Computer Science)	Year: **First**	Semester: **Second**
Course Code:	Course Title: **Digital Marketing**	

Course outcomes:

By the end of this course, students should be able to:

1. Identify the issues in drafting a digital marketing plan.
2. Apply your knowledge about metrics in digital marketing.
3. Measure the success of a digital marketing campaign.

Credits: **3**	**Value Aided**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-**1-0**

Unit	Topic	No. of Lectures
I	Introduction to Digital Marketing and its Significance; Traditional Marketing Vs Digital Marketing, Digital Marketing Process; The contemporary digital revolution, digital transformation framework. Types of websites, Keywords, Understanding Domain and Webhosting, Building Website/Blog using CMS WordPress, Using WordPress Plug-ins; Blog Creation: Including Headlines, Links, Posts ; Using various plug- ins like Elimentor.	9
II	Introduction to SEO; SEO Keyword Planner Tools; On Page SEO Techniques: Indexing and Key Word Placement, Content Planning & Optimization, Display Advertising, Various SEO Plug-in, Off –Page SEO Techniques; Email Marketing- Introduction and Significance, campaigns using Mail Chimp; Email Marketing Strategy and Monitoring.	9

III	Using Marketing Strategies & Analytics Tools, Understanding Digital marketing Strategies, Using Marketing analytics tools to segment, target, position; Online PR and reputation management, Digital Marketing Strategies and its ROI. Using Google Analytics and other social media analytics tools. Using Apps and Gamification.	12

Recommended Books:

1. "Digital Marketing: - Kamat and Kamat- Himalaya
2. "Digital Marketing: -S.Gupta, Mc Graw -Hill

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **Data Structure using C**	

Course outcomes: By the end of this course, students should be able to:
1. To impart the basic concepts of data structures and algorithms
2.To understand concepts about searching and sorting techniques
3.To Understand basic concepts about stacks , queues , lists , trees and graphs
4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

Credits: **4**	**MAJOR COURSE**
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**C-Language Programming** Data types, I/O functions, Logical Operators, Control structures of C, Conditional Statements, Switch Statement, Arrays.	10
II	Pointers, Functions, Recursion, Structures & Unions, Operations on bits, File Handling & C Preprocessor.	08
III	Introduction to Algorithm Design and Data Structure : Design & analysis of algorithm, Topdown and Bottom-up approaches to algorithm design, Analysis of algorithm, Frequency count, Complexity measures in terms of time and space.	12
IV	Arrays; Stacks and Queues : Representation of array (single & multi dimensional arrays), Address alculation using column & row major ordering, representation of stacks & Queues using arrays and their operations, circular queues, Applications of arrays, stacks & queues, conversions from Infix to postfix & prefix and evolution of prefix expressions using stack.Linked list: Singly linked list (Operations on list), Linked stacks and queues, polynomial representation and manipulation using linked list.	10
V	Trees : Logical level of binary search tree, BST transversal methods (Preorder, Postorder and Inorder), Recursive and non-recursive algorithms for traverse method, Insertion into and deletion from a BST and their implementation, preorder and Postorder, traversal, Insertion in Threaded tree, B-tree (Insertion and Deletion algorithms).Searching and Sorting: Sequential and binary searches, Indexed search, Hashing schemes, Sorting methods (Insertion, Selection, Bubble, Quick, Merge and Heap Sorts).	10

Suggested Readings:

1. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH
2. Classic Data Structures, 2/ e, Debasis , Sarnanta,PHI,2009
3.Fundamentals of Data Structure in C, 2le,' Horowitz, Sahni, Anderson Freed, University Prees

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **Data Structure Lab**	

Course outcomes:

1 : Analyze algorithms and algorithm correctness

2: summarize searching and sorting techniques

3: Describe stack, queue and linked list operation

4: Ability to have knowledge of tree and graphs concepts

5 To develop application using data structures

Credits: **2**	**MAJOR Practical**
Max. Marks: 3**0+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 0-**0-2**

List of Practicals

1. Write Programs to implement the Stack operations using an array.
2. Write Programs to implement the Queue operations using an array.
3. Write Programs to implement the Stack operations using Pointers.
4. Write Programs to implement the Queue operations using Pointers.
5. Write a program for arithmetic expression evaluation.
6. Write a program for Binary search Tree Traversals
7. Write a program to implement dequeue using a doubly linked list.
8. Write a program to search an item in a given list using (i) Linear Search (ii) Binary Search.
9. Write a program for (i)Bubble Sort (ii) Quick Sort (iii)Merge Sort.
10. Write a program for polynomial addition using SLL

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **Mobile Computing**	

Course outcomes:

1: Describe the basic principles of Mobile Computing.
2: Analyze the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities.
3: Analyze requirements and solve problems using systematic planning and development approaches.
4: Demonstrate mobile computing applications by analyzing their characteristics and requirements,.
5 : Define the concepts and features of mobile computing technologies and applications.

Credits: **3**	**MAJOR COURSE**
Max. Marks: **30+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, Bluetooth Technology, Wireless Multiple Access Protocols, Channel Allocation in Cellular Systems.	**10**
II	Data Management Issues: Mobility, Wireless Communication and Portability, Data Replication and Replication Schemes, Basic Concept of Multihopping, Adaptive Clustering for Mobile Network, Multicluster Architecture.	**10**
III	Location Management, Location Based Services, Automatically Locating Mobile Uses, Locating and Organizing Services, Issues and Future Directions, Mobile IP, Comparison of TCP and Wireless.	**10**
IV	Transaction Management, Data Dissemination, Cache Consistency, Mobile Transaction Processing, Mobile Database Research Directions, Security Fault Tolerance for Mobile N/W.	**10**
V	What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (ADDV)	**10**

Suggested Readings:

1. Mobile Communication 2nd edition by Jochen Schiller, Pearson education

2. Mobile Computing by Asoke Talukder, Roopa Yavagal (Tata McGraw Hill)

3. Kaveh Pahlavan, Prasanth Krishnamoorthy- “Principles of Wireless Networks”

4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober- “Principles of Mobile Computing”

5. Hazysztof Wesolowshi- “Mobile Communication Systems”

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **Digital Electronics**	

Course outcomes: By the end of this course, students should be able to:

1. Understand the architecture and organization of a computer system, including the CPU, memory, and I/O devices.
2. Comprehend the basic principles of digital electronics, including logic gates, flip-flops, and combinational and sequential circuits.
3. Analyze and design digital circuits using Boolean algebra and logic gate representations.
4. Explain the functioning of various computer components, such as registers, ALU, control unit, and memory hierarchy.
5. Evaluate the performance of computer systems and understand the trade-offs involved in hardware design.

Credits: **3**	**MINOR COURSE**
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Digital Electronics** Number systems and binary arithmetic, Boolean algebra and logic gates, Combinational logic circuits, Sequential logic circuits and flip-flops.	9
II	**Combinational Logic Design** Multiplexers and demultiplexers, Encoders and decoders, Adders, subtractors, and ALU design. Introduction to HDL (Hardware Description Language) for circuit design. Instruction Set Computer) architectures, Overview of emerging	9
III	**Sequential Logic Design** Latches and flip-flops, Counters and shift registers, Finite State Machines (FSMs) and their design.	8
IV	**Computer Organization and Architecture** Von Neumann architecture, CPU organization and instruction execution cycle, Memory hierarchy and caching, Input and output devices and interfaces.	9

Suggested Readings:

1. Mano, M. M., & Ciletti, M. D. (2017). Digital Design.
2. Patterson, D. A., & Hennessy, J. L. (2017). Computer Organization and Design: The Hardware/Software Interface.

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **E-Commerce**	

Course outcomes: By the end of this course, students should be able to:

1. Understand the fundamentals of e-commerce and its impact on business.
2. Analyze and evaluate different e-commerce models and technologies.
3. Design and develop e-commerce websites and applications.
4. Apply security and privacy measures in e-commerce systems.
5. Understand the legal and ethical considerations in e-commerce.

Credits: **3**	**MULTIDISCIPLINARY COURSE**
Max. Marks: **30+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to E-Commerce** Types of E-Commerce, E-Commerce business models. E-Commerce Framework	7
II	**E-Commerce Infrastructure and Payment Systems** Electronic payment systems and security, Mobile payment and digital wallets.	7
III	**E-Commerce Website Development** Building E-Commerce websites, Product catalogue management and online shopping cart, Customer registration and authentication.	7
IV	**E-Commerce Security and Legal Issues** Web security in E-Commerce, Legal and regulatory issues in E-Commerce, Consumer protection and privacy.	7
V	**E-Commerce Marketing and Emerging Trends** E-Commerce marketing strategies, Social media and E-Commerce, Emerging trends in ECommerce..	7

Suggested Readings:

1. "E-Commerce 2021" by Kenneth C. Laudon and Carol Traver.
2. "E-Commerce: Business, Technology, Society" by Kenneth C. Laudon and Carol Guercio Traver.

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **Course on Disaster Risk Management**	
Course outcomes:		
Credits: **2**	**ABILITY ENHANCEMENT COURSE**	
Max. Marks: 30+**70**	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 2-**1**-**0**		

Unit	**Topic**	**No. of Lectures**
I		
II		
III		
IV		
V		

Suggested Readings:

Programme/Class: **Degree**	Year: Second	Semester: Third
Subject: **Computer Science**		
Course Code:	Course Title: **Automation and Robotics**	

Course outcomes: By the end of this course, students should be able to:

1. Acquire knowledge about Automated systems, their need, functioning and pros and cons
2. Understand what is robot technology and how it is programmed.

Credits: **3**	**SKILLED ENHANCEMENT COURSE**
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 1-**0**-**3**

Unit	Topic	No. of Lectures
I	**Introduction to Programmable Automation** - The Manufacturing Process - Automation - Benefits of Automation - Automation Strategies.	7
II	**Introduction to Computer Numerical Control (CNC)** - Introduction to CNC Technology – CNC System Components - The Ten Steps of CNC Programming -Advantages and Disadvantages of CNC Technology.	7
III	**Introduction to Robotics Technology** - Industrial Robotics - Robot Hardware - Robot Applications - Robot Safety - Robot Selection Considerations.	7
IV	**Robot Programming** - Robot Programming Concepts - Programming Methods - Robot Programming Languages - Robot Program Development, Organization, and Structure - Robot Simulation.	7
V	**Introduction to Programmable Logic Controllers (PLC**s): Programmable Logic Control Overview - PLC Hardware Components - PLC Applications - Sensors and Actuators. TEXT BOOKS	7

Suggested Readings:

1. Daniel E. Kandray, “Programmable Automation Technologies An Introduction to CNC, Robotics and PLCs”, P.E., Industrial Press Inc., New York. 2010 (chapters 1,3,4,6,7,8)

2. Mike Wilson, “Implementation of ROBOT SYSTEMS An introduction to robotics, automation, and successful systems integration in manufacturing”, BH, Elsevier.

3. John J. Craig, “Introduction to Robotics Mechanics and Control”, Third Edition, Prentice hall, Pearson Education International.

Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code:	Course Title: **Object Oriented Programming with C++**	

Course outcomes: By the end of this course, students should be able to:

1. Understand the fundamental concepts of object-oriented programming.
2. Design and implement C++ programs using classes, objects, and inheritance.
3. Apply polymorphism and templates to develop reusable code.

   Utilize advanced features of C++ to develop efficient and modular programs.

Credits: **3**	**MAJOR COURSE**
Max. Marks: 30**+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 3-**1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Object-Oriented Programming (OOP)** OOP concepts: Abstraction, Encapsulation, Inheritance, Polymorphism, Procedural Vs. ObjectOriented Programming, Principles of OOP and their benefits.	7
II	**C++ Programming Basics** Program structure and basic syntax in C++, Namespaces, Identifiers, Variables, Constants, Enums, Operators and typecasting in C++.	7
III	**Classes and Objects** Classes and Objects in C++, Access specifiers: Public, Private, Protected, Constructors and Destructors in classes.	7
IV	**Inheritance and Polymorphism** Concept of Inheritance and its types, Polymorphism and function overloading, Virtual functions and abstract classes.	7
V	**Exception Handling and File I/O** Introduction to exception handling, try-catch blocks, Exception propagation, File input and output operations in C++.	7

Suggested Readings:

1. "C++ Primer" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo.
2. "Effective C++: 55 Specific Ways to Improve Your Programs and Designs" by Scott Meyers

Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code:	Course Title: **C++ Lab**	

Course outcomes:

1: Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
2: Develop solutions for a range of problems using objects and classes.
3: Programs to demonstrate the implementation of constructors, destructors and operator overloading.
4: Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism.
5: Understand generic programming, templates, file handling**.**

Credits: **2**	**MAJOR Practical**
Max. Marks: 30**+70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 0-**0-4**

List of Practicals:

1. Write a C++ program to find the sum of individual digits of a positive integer.
2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence.
3. Write a C++program to generate all the prime numbers between 1 and n , where n is a value supplied by the user.
4. Write a C++program to find the factorial of a given integer
5. Write a C++program to find the GCD of two given integers
6. Write a C++program to implement call by value and call by reference parameters passing
7. Write a C++ program to implement function templates
8. Write a program to implement Overloading and Overriding
9. Write C++programs that illustrate how the Single inheritance, Multiple inheritance
10. Multi level inheritance and Hierarchical inheritance forms of inheritance are supported
11. Write a C++program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class

Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code:	Course Title**: Database Management System**	

Course outcomes: By the end of this course, students should be able to:

1. Understands the basic concepts of data base management systems.
2. Design E-R diagrams for real world applications.
3. Formulate relational algebraic expressions using relational data models and languages.
4. Apply normalization transaction properties and concurrency control to design database.
5. Analyze the security algorithms for database protection.

Credits: **3**	**MAJOR COURSE**
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 3-**1-0**

Unit	Topic	No. of Lectures
I	**Overview of Database Management System** Elements of Database System, DBMS and its architecture, Advantage of DBMS (including Data independence), Types of database users, Role of Database administrator.	7
II	**Data Models** Brief overview of Hierarchical and Network Model, Detailed study of Relational Model (Relations, Properties, Key & Integrity rules), Comparison of Hierarchical, Network and Relational Model ,CODD's rules for Relational Model,E-R diagram.	7
III	**Normalization** Normalization concepts and update anomalies ,Functional dependencies,Multivalued and join dependencies. Normal Forms: (1 NF, 2 NF, 3NF, BCNF, 4NF, and 5NF)	7
IV	**SQL** SQL Constructs, SQL Join: Multiple Table Queries, Build-in functions, Views and their use, Overviews of ORACLE: (Data definition and manipulation)	7
V	**Database Security, Integrity and Control** Security and Integrity threats, Defense mechanism, Integrity, Auditing and Control, Recent trends in DBMS- Distributed and Deductive Database.	7

Suggested Readings:

1. Henry F. Korth and Abraham Silberschatz, "Database System Concepts," Second Edition,McGraw Hill, 1991.
2. AtulKahate, "Introduction to Database Management Systems," Pearson India, 2004.
3. Raghu Ramakrishnan and Johannes Gehrike, "Database Management Systems," ThirdMcGraw Hill, Edition, 2003.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6 Edition, Pearson Education,2013.
5. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition,McGraw Hill, 2010. C.J Date " An Introduction to Database Systems", Addison Wesley

Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code:	Course Title: **DBMS Lab**	

Course outcomes:

Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database. Use a desktop database package to create, populate, maintain, and query a database. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface

Credits: **2**	**MAJOR COURSE**
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 0-**0-4**

List of Practicals

1. The Order Tracking Database consists of the following defined six relation schemas.
Employees(eno,ename,zip,hdate)
Parts(pno,pname,qoh,price,level) (hint: qoh: quality on hand)
Customers(cno,cname,street,zip,phone)
Orders(ono,cno,eno,received date,shipped date)
Odetails(ono,pno,qty)
Zipcodes(zip,city)
Solve the following queries

2. Get all pairs of customer numbers for customers based on same zip code.

3. Get part numbers for parts that have been ordered by at least two different customers.

4. For each odetail row, get ono,pno,pname,qty and price values along with the total price for the item. (total price=price*qty)

5. Get customer name and employee pairs such that the customer with name has placed an order through the employee

6. Get customer names living in fort dodge or liberal.

7. Get cname values of customers who have ordered a product with pno 10506.

8. Get pname values of parts with the lowest price.

Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code: BCSMJC407	Course Title: **Operating System**	

Course outcomes: By the end of this course, students should be able to:

1. Understand role, responsibilities, features, and design of operating system.
2. Analyze memory management schemes and process scheduling algorithms.
3. Apply process synchronization techniques to formulate solution for critical sectionproblems.
4. Illustrate concept of disk scheduling.
5. Evaluate process deadlock handling techniques.

Credits: **5**	
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 5-**1-0**

Unit	Topic	No. of Lectures
I	**Introduction** Operating system and functions, Classification of Operating systems: Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multithreaded Systems, Operating System Structure, System Components, Operating System Services, Kernels, Monolithic and Microkernel Systems.	7
II	**Process Management** Process Concept, Process States, Process Synchronization, Critical Section, Mutual Exclusion, Classical Synchronization Problems, Process Scheduling, Process States, Process Transitions, Scheduling Algorithms Interprocess Communication, Threads and their management, Security Issues.	8
III	**CPU Scheduling** Scheduling Concepts, Techniques of Scheduling, Preemptive and Non-Preemptive Scheduling: First-Come-First-Serve, Shortest Request Next, Highest Response Ration Next, Round Robin, Least Complete Next, Shortest Time to Go, Long, Medium, Short Scheduling, Priority Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	8
IV	**Memory Management** Memory allocation, Relocation, Protection, Sharing, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing.	7
V	**I/O Management and Disk Scheduling** I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID.	8

VI	**File System:** File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	7
VII	**Shell introduction and Shell Scripting:** What is shell and various type of shell, Various editors present in linux, Different modes of operation in vi editor,	7
VIII	What is shell script, Writing and executing the shell script, Shell variable (user defined and system variables) System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr , uniq utilities), Pattern matching utility (grep)	8

Suggested Readings:

1. Andrew S. Tanenbaum and Herbert Bos,"Modern Operating Systems," Fourth Edition,Pearson, 2014.
2. Abraham Silberschatz, Greg Gagne, and Peter B. Galvin, "Operating System Concepts,"Tenth Edition, Wiley, 2018.
3. William Stallings, "Operating Systems: Internals and Design Principles," Seventh Edition,Prentice Hall, 2011.
4. Dhanjay Dhamdhere, "Operating Systems," First Edition, McGraw-Hill, 2008
   Milan Milankovic "Operating systems, Concepts and Design" McGraw Hill

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Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code:	Course Title: **Computer Network**	

Course outcomes: By the end of this course, students should be able to:

1. To develop understanding of computer networks and communication basics.
2. To understand design issues and services at different layers of reference models.
3. To learn various error detection/correction techniques, routing protocols, congestioncontrol algorithms, and connection establishment/release.
4. To describe and analyze related technical, administrative, and social aspects ofnetworking.

Credits: **3**	**MINOR COURSE**
Max. Marks: 30+**70**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-**1**-**0**

Unit	Topic	No. of Lectures
I	**Introduction**: Uses of networks, goals and applications. OSI reference model. Example Network-Novell Netware, ARPNET, NSFNET, The Internet.	7
II	**The Physical Layer**: Transmission media : Twisted pair, Baseband and Broadband coaxial cable, Fiber optics; Wireless Transmission : Radio transmission, Microwave transmission, Infrared and light wave transmission; ISDN services; Virtual Circuits verses circuit Switching. Transmission in ATM Networks, Paging Systems, Cordless Telephones, Cellular telephones; Communication Satellite.	7
III	**The Data Link Layer** : Framing, Error control, Flow control; Error detection and Correction; Protocols : Simplex stop and wait protocols, One bit sliding window, Using Go-Back n, Example: The Data Link Layer in the Internet.	7
IV	**The Network Layer** : Network layer design issues, shortest path routing. Flooding, Flow based routine, Broadcast routine, Congestion control and prevention policies; Internet working; connectionless Internet working, Tunneling Internet work Routing, Fragmentation, Firewalls, IP address, Internet control protocols.	7
V	**The Transportation Layer** : The transport service; Transport protocols : Addressing, Establishing and releasing a connection; The internet transport protocols : TCP. **The Application Layer** : Network Security, Electronic mail.	7

Suggested Readings:

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks," Fifth Edition,Pearson, 2014.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson, 2013. Behrouz A. Forouzan, "Data Communications and Networking," Fourth Edition,McGraw-Hill Higher Education, 2007

Programme/Class: **Degree**	Year: Second	Semester: Fourth
Subject: **Computer Science**		
Course Code:	Course Title: **Course on NCC/NSS/NGO'S/SCOUT GUIDE/SPORTS**	
Course outcomes:		
Credits: **2**	**ABILITY ENHANCEMENT COURSE**	
Max. Marks: 30+**70**	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): **2-1-0**		

Unit	Topic	No. of Lectures
I		
II		
III		
IV		
V		

Suggested Readings:

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Fifth**
Subject: **Programming in Python**		
Course Code:	Course Title: **Programming in Python**	

Course outcomes:

CO 1: To introduce the basic features of python programming and impart skills in an t Industry standard programming language.

CO 2: Understand fundamental programming concepts of Python programming and its Libraries..

CO3: Work with common Python data types, like integers, floats, strings as well as pandas Data frames.

CO4: Use basic flow control including for loops and conditionals.

CO5: Obtain basic summary statistics from data files.

Credits: **4**	**Major**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **3-1-0**

Unit	Topic	No. of Lectures
I	**Introduction of Python**: Installing Python in Windows/Linux/Mac OS, Using Python interpreter, Execute a Script, Structuring with Indentation, Editors. Data types and Variables: Variables, Variables v/s identifiers, Naming convention of variables, Keywords. Data Structure: List, Tuples, Sets, Dictionaries	08
II	**Input And Output:** Input function, Input with raw input(),Output with old string format, Python format function Control Flow: If/Else Statements, For/while Statements, Range() function, Break and continue statements, Else clauses on Loops.	10
III	**Functions:** Defining Function, Default Argument, Keyword Argument, Arbitrary Arguments List. File **Handling**: Reading from the file, Writing to the file, Methods of file objects. **Error And Expectation:** Syntax Errors, Exceptions, Handling Exceptions (try, except)	10

IV	**Module:** Creating Modules, import a module, Import the names, Executing modules as scripts. Class Concept: Class Syntax, Class Objects, Instance Objects, Method Objects, Class and Instance Variables.	12
V	**Advanced Modules: Regular Expressions, date time - date and time libraries, Dealing with Excel, GUI, Web Scrapping.** **Advanced Modules**: Regular Expressionsϖ date time - date and time libraries. Dealing with Excelϖ GUIϖ Web Scrappingϖ	10

Suggested Readings:

3. P. K. Sinha & Priti Sinha , "Computer Fundamentals", BPB Publications, 2007.
4. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
5. T. Budd, Exploring Python, TMH, 1st Ed, 2011
6. Python Tutorial/Documentation www.python.or 2010
7. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
8. Rober Sedgewick, K Wayne -Introduction to Programming in Python: An interdisciplinary Approach" Pearson India

Suggestive digital platforms web links-

https://www.pearsoned.co.in/prc/book/anita-goel-computer-fundamentals-1e- 1/9788131733097

http://docs.python.org/3/tutorial/index.html http://interactivepython.org/courselib/static/pythonds
http://www.ibiblio.org/g2swap/byteofpython/read/

Syllabus for B.Sc.: Subject: Computer Science

Programme /Class: **Certificate**	Year: **Third**	Semester: **Fifth**
Subject: **Python Lab**		
Course Code: BCSMJC508P	Course Title: **Python Lab**	

Course outcomes:

CO1: To be able to introduce core programming basics and various Operators of Python programming language

CO2: To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.

CO3: To understand about Functions, Modules and Regular Expressions in Pythonϖ Programming.

Credits: **2**	**Major practical**
Max. Marks: **30+70**	Min. Passing Marks: 50%

Total No. of Lectures-Tutorials-Practical (in hours per week): **0-0-4**

Unit	Topic	No. of Lectures
I	Write a python script to check whether a given number is even or odd.	01
II	Write a Python script to add two integers' values taken from user.	01
III	Write a python script to calculate area of circle where radius is taken from user	01
IV	Write a program to copy the content of one file to another file.	01
V	Write a Python Program to find the sum of series: 1 + 1/2 + 1/3.	01
VI	Write a program to find the sum of n natural numbers.	01
VII	Write a program to find factorial of a given number.	01
VIII	Write a program to find whether a given number is Armstrong number or not.	01
IX	Write a program takes a number and computes the prime factors of the integer	01
X	Program to check whether a given number is a palindrome.	01

Text Books:

1. Pooja Sharma, "Programming in Python",B.P.B. Publications.
2. Mark Summer field, "Programming in Python.
3. A Complete Introduction to the Python Language", Pearson Education.

Reference:

1. Mark Lutz,"Programming Python",O'Reilly Media.
2. Wesley J.Chun,"CorePython Programming", Prentice Hall.
3. Alex Martelli,"Pythonina Nutshell",O' Reilly Media.

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Fifth**
Subject: **Software Engineering**		
Course Code:	Course Title: **Software Engineering**	

Course outcomes:

CO1: Select and implement different software development process models.
CO2: Extract and analyze software requirements specifications for different projects.
CO3: Develop some basic level of software architecture/design.
CO4: Define the basic concepts and importance of Software project management concepts like cost Estimation, scheduling and reviewing the progress.
CO5: Apply different testing and debugging techniques and analyzing their effectiveness.

Credits: **4**	**Major**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction: Software-** Characteristics and Applications, Software Engineering, Software Engineering Layers, Software Process Framework, CMM, Software Quality Attribute and Metrics, Software Development Life Cycle, Software Process Models Water Fall Model, Prototyping Model, RAD Model, Spiral Model, Evolutionary Models, Component-based Development Model.	10
II	**Software Requirements Engineering and Analysis Modeling**: Software Requirements, Requirement Engineering Process, Elicitation Requirements, Analysis and Negotiating Requirements, Requirement Specification, System Modeling, Requirements Validation, Requirement Management, Creating a Software Requirements Specification Document, IEEE Standards for SRS, Feasibility Study, Elements of Analysis Model, Data Modeling- ER Diagram, Information Modeling- DFD, Behavioral Modeling, Control Specification, Process Specification, Data Dictionary, Software Quality Framework, Quality Metrics for Analysis Model.	10
III	**Software Design and Implementation:** Design Process, Principles, and Design Concepts-Abstraction, Architecture, Refinement, Modularity, Data Structure, Information Hiding, Functional Independence, Cohesion, Coupling; Design Documentation, Design Strategies-Top Down and Bottom Up Design; Design Model Data Design Elements, Architectural Design, User Interface Design, Component-Level Design, Deployment-Level Design, Implementation Issues and Programming Support Environment, Quality Metrics for Design Model and Source Code	10
VI	**Software Testing:** Verification, Validation, Testing Objectives, Unit Testing, Integration Testing, Validation Testing, System Testing, Acceptance Testing, Regression Testing, Test Characteristics, White Box Testing, Basic Path Testing, Control Structure Testing, Black Box Testing, Test Plan, Test Case Design, Quality Metrics for Testing.	10

V	**Software Maintenance**: Nature and Need of Maintenance, Types of Maintenance (Perceptive, Preventive, Adoptive, Corrective), Cost of Maintenance, Evolution of Software, Software Maintenance Process, Software Maintenance Techniques Reverse Engineering, Reengineering; Factors affecting Software Maintenance, Key Issues in Maintenance, Software Configuration Management, Version and Release Control, Change Control, Configuration Audit, Metrics for Maintenance	10

Suggested Readings:

Text Books:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Addison Wesley
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer

Reference:

1. K. K. Aggarwal & Yogesh Singh "Software Engineering", New Age International.
2. I. Sommerville, "Software Engineering", Pearson Education.
3. James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.
4. Subramanian Chandramouli, Saikat Dutt, ChandramouliSeetharaman, B. G Geetha, "Software Engineering", Pearson Education India

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Fifth**
Subject: **Graph Theory**		
Course Code:	Course Title: **Graph Theory**	

Course outcomes:

CO 1 Know some important classes of graph theoretic problems.
CO 2: Be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs.
CO 3: Be able to describe and apply some basic algorithms for graphs.
CO 4: Be able to use graph theory as a modelling tool..

Credits: **3**	**Minor**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction-**Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.	10
II	**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra"s shortest path algorithm, Floyd-Warshall shortest path algorithm.	10
III	**Trees-** Definitions and characterizations, Number of trees, Cayley"s formula, Kircho↵-matrix-tree theorem, Minimum spanning trees, Kruskal"s algorithm, Prim"s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury"s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.	10
VI	**Independent sets coverings and matchings**– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall"s Theorem, K¨onig"s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms..	10
V	**Vertex Colorings-** Basic definitions, Cliques and chromatic number, Mycielski"s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring	10

Suggested Readings:

T**EXT BOOKS:**

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

REFERENCE BOOKS:

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13 2. Introduction to Graph Theory, Douglas B. West, Pearson.

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Fifth**
Subject: **Cyber Security**		
Course Code:	Course Title: **Cyber Security**	

Course outcomes:

CO 1: Understand the various tools and methods used in cybercrime.
CO 2: Identify risk management processes, risk treatment methods, organization of information security.
CO 3: Classify cyber security solutions and information assurance.
CO 4: Examine software vulnerabilities and security solutions to reduce the risk of exploitation.
CO 5: Analyze the cyber security needs of an organization.

Credits: **3**	**Minor**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Ethical Hacking:** Key issues plaguing the information security world, incident management process, and penetration testing, **Foot printing and Recon naissance:** Various types of footprints, foot prints tools, and countermeasures.	10
II	**Scanning Network:** Network scanning techniques and scanning countermeasure.	10
III	**Enumeration & Vulnerability Analysis:** Enumeration techniques and enumeration countermeasure. Vulnerability Analysis using different tools.	10
VI	**System Hacking & Malware Threats:** System Hacking Methodology, Steganography, Steganalysis attacks and covering tracks. Different types of Trojan, Trojan analysis and Trojan countermeasures, working of viruses, Virus analysis, computer worms, malware analysis procedure and communication.	10
V	**Sniffing & Social Engineering:** Packet sniffing techniques , identify theft , and social engineering countermeasure	10

Suggested Readings:

Text Books:

1. 1.K. Kumar," Cyber Laws: Intellectual property & E Commerce, Security",1stEdition, Dominant Publisher,2011.
2. Rodney D. Ryder, "Guide To Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
3. Information Security policy &implementation Issues, NIIT, PHI.

Reference

1. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2ndEdition, PHI, 2003.
2. Justice Yatindra Singh, "Cyber Laws", Universal Law Publishing, 1stEdition,New Delhi, 2003.

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: **Design and Analysis of Algorithm**		
Course Code:	Course Title: **Design and Analysis of Algorithm**	

Course outcomes:

CO 1: Ability to analyze the performance of algorithms in terms of their time and space complexities.
CO 2: Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design).
CO 3: To understand the different algorithm designing technique for solving problems.
CO 4: Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
CO 5: Solve problems using algorithm design strategies like the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound etc.

Credits: **3**	**Major Compulsory**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction**: Algorithm Specification-Simple example of design and analysis of time complexity-Performance Analysis: Space Complexity and Time complexity, Asymptotic Notation - Polynomial Vs Exponential Algorithm	11
II	**Divide and Conquer algorithm:** Introduction to Divide and Conquer Algorithms - Master Theorem – Sorting - Insertion Sort, Merge Sort using links, Quick Sort- Analysis of linear and binary search algorithm. Horner's method of evaluation a polynomial at a given point, Strassen's Matrix Multiplication.	13
III	**Dynamic programming:** Design and analysis, Computing a Binomial Coefficient, Multistage graphs, Traveling salesman problem. Greedy approach: General method, Dijkstra's Algorithm, Knapsack problem, Minimum cost Spanning trees, Single source shortest path problem.	13
VI	**Back tracking:** General method - Sum of subsets - 4-Queen Problem using backtracking. Branch and Bound method- 4-queens - Least Cost Search, Traveling Salesman problem using Branch and Bound method.	12
V	**Limitations of Algorithm-** Introduction to lower bound theory, Decision trees, Introduction to P, NP and NP complete problems, NP hard problems.	11

Suggested Readings:

REFERENCES:

1. Ellis Horowitz, SartajSahniSanguthevarRajasekaran. Fundamentals of Computer Algorithms. Universities Press (India) Private Limited. Second edition.
2. AnanyLevitin. Introduction to the design and Analysis of Algorithms. Dorling Kindersley (India) Pvt.Ltd. Second edition
3. Gav PAI, Data Structures and Algorithms, Tata McGraw Hill, Jan 2008.
4. Donald E. Knuth. The art of Computer Programming,Volume 1: Fundamental Algorithms.Addison Wesley.

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: **Computer Graphics**		
Course Code:	Course Title: **Computer Graphics**	

Course outcomes:

CO 1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO 2: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis..
CO 3: Use of geometric transformations on graphics objects and their application in composite form.
CO 4: Extract scene with different clipping methods and its transformation to graphics display device.
CO 5: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
CO 6: Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

Credits: **3**	**Major Compulsory**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **3-1-0**

Unit	Topic	No. of Lectures
I	**Introduction:** Interactive Computer Graphics, Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Conceptual Framework for Interactive Graphics, Classification of Application Development of Hardware and software for computer Graphics.	08
II	**Scan Conversion:** Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses. Clipping: point clipping, Cohen-Sutherland line clipping Algorithm, Midpoint Subdivision Algorithm, polygon clipping (Sutherland-Hodgeman)	12
III	**Geometrical Transformation:** 2D Transformation (translation, rotation, scaling, reflection and shearing), Homogeneous Coordinates and Matrix Representation of 2D Transformations, Successive and composite 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.	10
VI	**Curves & Surfaces:** Polygon Surfaces and polygon meshes, Quadratic and super quadrics surfaces, Spline curve and representation.	10
V	**Computer Animation:** introduction, Application of animation, Morphing, Keyframe system, Motion specifications in Animation, Types of animation, Sequencing of Animation Design and Fundamental principles of animation.	10

Suggested Readings:

Referential Books:

1. Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000.
2. D.J. Gibbs & D.C. Tsichritzs: Multimedia programming Object Environment& Frame work, 2000
3. Ralf Skinmeiz and Klana Naharstedt, Multimedia: computing, Communication and Applications, Pearson, 2001
4. D. Haran & Baker. Computer Graphics Prentice Hall of India,1986.

Syllabus for B.Sc.: Subject: Computer Science

Programme /Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: **Computer Graphics Lab**		
Course Code: BCSMJC611P	Course Title: **Computer Graphics Lab**	

Course outcomes:

CO1: To learn various algorithms to scan, convert the basic geometrical primitives, transformations and clipping.
CO2: Learn algorithmic development of graphic primitives like line, circle, polygon

CO3: To understand the fundamentals of animation, graphic design applications and its related technologies..

Credits: **2**	**Core Compulsory**
Max. Marks: **30+70**	Min. Passing Marks: 50%

Total No. of Lectures-Tutorials-Practical (in hours per week): **0-0-4**

Unit	Topic	No. of Lectures
I	Program to create simple geometric objects. Program to implement the DDA technique to draw line.	02
II	Program to implement the Bresenham's technique to draw line. Program to implement the DDA technique to draw Circle.	02
III	Program to implement the midpoint circle algorithm. Program to implement 2 Dimensional basic transformations.	02
IV	Program to implement various attributes of Graphics primitives. Program to implement animation.	02
V	Implement blinking of eyes using Graphics	02

Reference / Text Books:

1. Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000.
2. D.J. Gibbs & D.C. Tsichritzs: Multimedia programming Object Environment& Frame work, 2000

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: **Java Programming**		
Course Code:	Course Title: **Java Programming**	

Course outcomes:

CO 1: Able to understand the use of OOPs concepts using JAVA
CO 2: Able to solve real world problems using JAVA Programing Language.
CO 3: Able to understand the use of abstraction.
CO 4: Able to understand the use of Packages and Interface in java.
CO 5: Able to develop and understand exception handling, multithreaded applications with Synchronization.

Credits: **4**	**Major Compulsory**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Java**-Features of Java-Basic Concepts of Object Oriented Programming-Java Tokens-Java Statements-Constants-Variables-Data Types Type Casting-Operators-Expressions-Control Statements: Branching and Looping Statements	12
II	**Classes, Objects and Methods:** Object Class, Defining Class, Adding Variables, Adding Methods, Creating Objects, Constructors, Types of Constructors, this & static keyword, Garbage Collection, Inheritance, Types of Inheritance, Creating Multilevel Hierarchy, Method Over Loading & Overriding, Dynamic Method Dispatching, final keyword, Abstract Class.	12
III	**Interfaces and Packages:** Defining Interfaces, Extending and Implementing Interfaces, Defining Packages, Access Protection, Importing Packages, Exception Handling: Exception Types, Multiple Catch Clauses, Nested Try Statements, Throw, Throws, Finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses. Multithreaded Programming: Thread Life Cycle, Creating Threads, Thread Methods, Thread Priority	12
IV	**Managing Errors and Exceptions**-Syntax of Exception Handling Code Using Finally Statement-Throwing Our Own Exceptions-Applet Programming Applet Life Cycle-Graphics Programming-Managing Input/Output Files: Concept of Streams-Stream Classes-Byte Stream Classes-Character Stream Classes – Using Streams-Using the File Class-Creation of Files-Random Access Files-Other Stream Classes	12

Suggested Readings:

Text Books:

2. E. Balagurusamy ,2004,Programming with JAVA-2 nd Edition, Tata McGraw-Hill Publishing Co.Ltd, New Delhi.
3. Herbert Schildt,The Complete Reference JavaTM , 2- 5 thEdition,Tata McGraw-Hill Publishing Co. Ltd,New Delhi.

Reference:

1. Y. Daniel Liang ,2003, An Introduction to JAVA Programming ,Prentice-Hall of India Pvt. Ltd.
2. Cay S. Horstmann and Gary Cornell,2005,Core JavaTM2 Volume I,Fundamental 7 thEdition,Pearson Education.

Syllabus for B.Sc.: Subject: Computer Science

Programme /Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: **Java Programming Lab**		
Course Code:	Course Title: **Java Programming Lab**	

Course outcomes:

CO1: To be able to introduce core programming basics and various Operators of Python programming language

CO2: To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.

CO3: To understand about Functions, Modules and Regular Expressions in Pythonϖ Programming.

Credits: **2**	**Core Compulsory**
Max. Marks: **30+70**	Min. Passing Marks: 50%

Total No. of Lectures-Tutorials-Practical (in hours per week): **0-0-4**

Unit	Topic	No. of Lectures
I	Write a program to enter a number from user and print the odd numbers between 1 to that number.	02
II	Write a Program to find perimeter of square if area is entered by user.	02
III	Write a program to handle Array index Out of Bounds exception	02
IV	Write a Java program to copy an array by iterating the array.	02
V	Write a program to demonstrate a divide by zero program exception.	02
VI	Write a Java program to get the character at the given index within the String.	02
VII	Write a program to find the sum of each row of a matrix.	02
VIII	Write a program to find area of rectangle using parameterized constructor	02

Reference / Text Books:

1. Patrick Naughton and Herbertz Schildt, “Java-2 The Complete Reference”, Mc. Graw Hill.
2. Balaguruswamy, “Programming with Java: A Primer”, Tata McGraw Hill Education.n.

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: **Internet of Things**		
Course Code:	Course Title: **Internet of Things**	

Course outcomes:

CO 1: To introduce the terminology, technology and its applications.
CO 2: To introduce the concept of M2M (machine to machine) with necessary protocols
CO 3: To introduce the Python Scripting Language which is used in many IoT devices.
CO 4: To introduce the Raspberry PI platform, that is widely used in IoT applications
CO 5: To introduce the implementation of web-based services on IoT devices

Credits: **3**	**Minor**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Internet of Things**- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.	10
II	**IoT and M2M**- Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER	10
III	**IoT Physical Devices and Endpoints**- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C) **Controlling Hardware**- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors	10
VI	**Sensors**- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor	10
V	**IoT Physical Servers and Cloud Offerings**– Introduction to Cloud Storage models and communication APIs Web Server – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API	10

Suggested Readings:

TEXT BOOKS:

2. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan

2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014

3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Syllabus for B.Sc.: Subject: Computer Science

Programme/Class: **Certificate**	Year: **Third**	Semester: **Six**
Subject: Management Information System		
Course Code:	Course Title: **Management Information System**	

Course outcomes:

CO 1: To introduce the terminology, Management and Information.
CO 2: To understand the concept of different type of System
CO 3: To able the planning of Management information system.
CO 4: To able the study of different Model

Credits: **3**	**Minor**
Max. Marks: **30+70**	Min. Passing Marks: 40%

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction**: Introduction to MIS, Function of MIS, Problems with MIS, Knowledge requirements for MIS(7 areas), General system concept, DSS, EIS, ES, 4GL, IT & MIS : What is IT? Is computer essential for MIS? - Office supporting system(Whole) - Computer and MIS - Computer & MIS Data Processing System - Characteristics of DPS - Scope of Trans. Processing - Example of Sales Processing.	10
II	**Information, Data & Communication** – Concepts, Classification of Information, Characteristics of Information - Communication System, Communication methods, Information in an organization, Case Study	10
III	**Planning:** Planning and Planning terms, Objectives, Problems, Type, Source of Planning Information System Concepts (ch.3 to ch.4) - Structure elements (CH.3) - Objectives & types (CH.4) - Tools of planning, Introduction to Pert-CPM (O-R-SD Sharma)	10
VI	Working with people, Model of Organization behavior , Social System & organization culture - Case Study - Industry - Academic - Employee Vs Employer - Employee Vs Organization, Industrial Behavior, formal and informal relationship, Job satisfaction, Change its resistance & management	10
V	Concept of controlling management, Control cycle, Different Feedback loops, Principles of controlling, Multiple control feedback, Scope of management control - Total Quality Management, Case Study – TQM	10

Suggested Readings:

REFERENCE BOOKS:

1. Management Information System : by T. Lucey, 8th Edition BPB Publication
2. Organizational & Management : By Agarwal, Tata McGraw Hill Publishing Company Ltd.
3. MIS – By W.S. Jawadekar, Tata McGraw Hill Publishing Company Ltd.

Syllabus for B.Sc. (Computer Science)

Programme/Class: **Degree**	Year: **Forth**	Semester: **Seven**
Subject: **Data Ware Housing**		
Course Code:	Course Title: **Data Ware Housing**	

Course outcomes:

CO 1: Understand the functionality of the various data mining and data warehousing component
CO 2: Appreciate the strengths and limitations of various data mining and data warehousing models.

CO3: Explain the analyzing techniques of various data.

CO4: Describe different methodologies used in data mining and data ware housing.

CO5: Compare different approaches of data ware housing and data mining with various technologies.

Credits: **5**	**Major**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): **5-1-0**

Unit	Topic	No. of Lectures
I	Introduction: Data Mining - Overview, Motivation, Definition & Functionalities, Major issues in Data Mining, Integration of Data Mining System with Data Warehouse System. Data Preprocessing: Descriptive Data Summarization, Data Cleaning-Missing Values, Noisy Data, Data Integration and Transformation, Data Reduction Data Cube Aggregation, Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, Discretization and Concept Hierarchy.	10
II	Association Rules: Introduction, Frequent Item sets, Closed Item sets, Methods to Discover Association Rules, Apriori Algorithm, Multilevel Association Rule Mining, and Rule Evaluation Metrics.	10
III	Classification and Prediction: Classification Techniques-Decision Tree, Rule-Based Classification, Bayesian Classification, k-Nearest-Neighbor Classifier, Linear Regression, Accuracy and Error Measures	10
IV	Cluster Analysis: Introduction, Types of Data, Partitioning Methods- k-Means and k-Medoids, Hierarchical Clustering- Chameleon, Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, Model Based Methods Neural Network Approach, Outlier Analysis	10
V	Recent Trends and Applications: Web Mining, Spatial Data Mining, Text Mining, Multimedia Data Mining, Applications of data mining in finance, business, social networks.	10

Suggested Readings:

Text Books:

1. Jiawei Han, Jian Pei, Micheline Kamber, “Data Mining: Concepts and Techniques”, Elsevier.

Reference:

1. Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education.

2. Arun K. Pujari, “Data Mining Techniques”, Universities Press.

3. Pieter Adriaans & Dolf Zantinge, “Data Mining”, Pearson Education.

Syllabus for B.Sc. (Computer Science)

Programme/Class: **Degree**	Year: **Forth**	Semester: **Seven**
Subject: **Cloud Computing**		
Course Code:	Course Title: **Cloud Computing**	

Course outcomes:

CO 1: 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.

CO 2: Apply the fundamental concepts in data centers to understand the trade-offs in power, efficiency and cost

CO 3: Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing

CO 4: Analyze various cloud programming models.

CO 5: Apply the models to solve problems on the cloud..

Credits: **5**	**Major Compulsory**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Cloud Computing Overview** – Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service , Broad network access , Location independent resource pooling , Rapid elasticity , Measured service	10
II	**Cloud scenarios** – Benefits: scalability , simplicity , vendors ,security. Limitations – Sensitive information - Application development – Security concerns - privacy concern with a third party - security level of third party - security benefits	10
III	**Cloud architecture:** Cloud delivery model – SPI framework , SPI evolution , SPI vs. traditional IT Model Software as a Service (SaaS): SaaS service providers – Google App Engine, Salesforce.com and google platfrom – Benefits – Operational benefits - Economic benefits – Evaluating SaaS Platform as a Service (PaaS): PaaS service providers – Right Scale – Salesforce.com – Rackspace – Force.com – Services and Benefits	10
IV	Infrastructure as a Service (IaaS): IaaS service providers – Amazon EC2 , GoGrid – Microsoft soft implementation and support – Amazon EC service level agreement – Recent developments – Benefits	10

	Cloud deployment model : Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing	
V	**Virtualization** : Virtualization and cloud computing - Need of virtualization – cost , administration , fast deployment , reduce infrastructure cost - limitations Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization	10

Suggested Readings:

Text Books:

1. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl
2. "Cloud Computing Explained" by John Rhoton
3. "Cloud Computing: A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti
4. "Cloud Computing: From Beginning to End" by Mr Ray J Rafaels

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Reference

1. RajkumarBuyya, "Mastering Cloud Computing", Tata McGraw-Hill Education.

2. RajkumarBuyya, James Broberg& Andrzej Goscinski, "Cloud Computing: Principles and Paradigms", Wiley.

3. Anthony T. Velte, Tobey J. Velte & Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill.

Syllabus for B.Sc. (Computer Science)

Programme/Class: **Degree**	Year: **Forth**	Semester: **Seven**
Subject: **VB.NET**		
Course Code:	Course Title: **VB.NET**	

Course outcomes:

CO 1: Explain the core concepts of the CLR , CLS , .NET features.

CO 2: Apply the fundamental concepts in .NET programing

CO 3: Apply the fundamental concepts of conditional statement in .NET programing

CO 4: Apply the fundamental concepts of in ASP.NET and ADO.NET programing

CO 5: Apply the fundamental concepts of SQL connectivity.

Credits: **4**	**Major**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to .net framework** -Features, Common Language Runtime (CLR), Framework Class Library(FCL). Common Language Specification (CLS), Common Type System (CTS), Intermediate Language (IL) and Just-In-Time (JIT) Compilation, Visual Studio.Net – IDE, Languages Supported, Components. VB.Net Features, IDE- Menu System, Toolbars, Code Designer, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window.	10
II	VB.Net Creating Applications with Visual Basic.NET, Variables, Constants, and Calculations, Making Decisions and Working with Strings, Lists, Loops, Validation, Sub Procedures and Functions, Multiple Forms, Standard Modules, and Menus, Arrays, Timers, Form Controls, File Handling, Exception Handling, Working with Databases, Advanced Database Programming using ADO.net, Classes, Generics, Collections, Inheritance, Custom Controls, Packaging & deployment, Using Crystal Reports.	10
III	Programming in Visual basic .Net Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements- If- Then, If-Then-Else, Nested If, Select Case, Looping Statement- Do loop, For Loop, For Each-Next Loop, While Loop, Arrays-Static and Dynamic. - Creating MDI Parent and Child, Functions and Procedures- Built-In Functions- Mathematical and String Functions, User Defined Functions and Procedures.	10

IV	ASP.NET Building a Web Application, Examples Using Standard Controls, Using HTML Controls, Validating Form Input Controls using Validation Controls, Understanding Applications and State, Applying Styles, Themes, and Skins, Creating a Layout Using Master Pages, Binding to Databases using Controls, Data Management with ADO.net, Creating a Site Navigation Hierarchy, Navigation Controls , Membership and Role Management, Login Controls, Securing Applicatio	10
V	Databases: Introduction, Using SQL to work with database, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site. Crystal reports. LINQ: Operators, implementations, LINQ to objects, XML, ADO.NET, Query Syntax. Stored Procedures	10

Suggested Readings:

Text Books:

1. Visual Basic.Net Black Book by Steven Holzner Dreamtech Press

2. The Complete Reference Visual Basic .NET Jeffery R. Shapiro Tata McGraw Hills

Reference Books:

1. Visual studio 2010 - A beginners guide - Joseph Mayo

2. Murach’s Beginning Visual basic .Net By Anne Bohem

3. Programming Visual Basic .NET Dave Grundgeiger Publisher: O'Reilly First Edition January 2002

Syllabus for B.Sc. (Computer Science)

Programme/Class: **Degree**	Year: **Forth**	Semester: **Eight**
Subject: **Data Science**		
Course Code:	Course Title: **Data Science**	

Course outcomes:

CO 1: Understand the fundamental concepts and principles of data science.
CO 2: Apply data manipulation techniques using appropriate tools and libraries.

CO 3: Analyze and visualize data to extract insights and make data-driven decisions.

CO 4: Apply statistical methods and machine learning algorithms to analyze data.

CO 5: Communicate data findings effectively through data visualization and storytelling.

Credits: **4**	**Major**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Data Science** Overview of data science and its significance, Data science process and lifecycle, Ethical considerations in data science	10
II	**Data Manipulation and Preparation** Data acquisition and data cleaning techniques, Data pre-processing: handling missing data, outliers, and data normalization, Exploratory data analysis and data profiling	10
III	**Data Analysis and Statistical Methods** Descriptive statistics and summary measures, Hypothesis testing and statistical inference, Regression analysis and correlation	10
IV	**Machine Learning for Data Science** Introduction to machine learning algorithms, Supervised and unsupervised learning techniques, Model evaluation and selection	10

V	**Data Visualization and Communication** Principles of data visualization and visual perception, Data visualization techniques and tools, Communicating data findings and storytelling	10

Suggested Readings:

Recommended Books:

1. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney.
2. "Data Science for Business: What You Need to Know about Data Mining and DataAnalytic Thinking" by Foster Provost and Tom Fawcett.

Syllabus for B.Sc. (Computer Science)

Programme/Class: **Degree**	Year: **Forth**	Semester: **Eight**
Subject: **Deep Learning**		
Course Code:	Course Title: **Deep Learning**	

Course outcomes:

CO 1: Understand the principles and architectures of deep neural networks.

CO 2: Implement and train deep neural networks using appropriate frameworks and libraries.

CO 3: Apply deep learning techniques to solve real-world problems in various domains.

CO 4: Evaluate and optimize deep learning models for performance and accuracy.

CO 5: Stay updated with the latest advancements and trends in deep learning research

Credits: **4**	**Minor**
Max. Marks: **30+70**	Min. Passing Marks:40

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**

Unit	Topic	No. of Lectures
I	**Introduction to Deep Learning** Overview of deep learning concepts and its significance, Basics of neural networks and gradientbased optimization, Activation functions and loss functions in deep learning	10
II	**Deep Neural Network Architectures** Feedforward neural networks and backpropagation algorithm, Convolutional neural networks (CNNs) for image processing, Recurrent neural networks (RNNs) for sequential data analysis	10
III	**Deep Learning Frameworks and Libraries** Introduction to popular deep learning frameworks (e.g., TensorFlow, PyTorch), Building and training deep neural networks using frameworks, Transfer learning and pre-trained models	10
IV	**Advanced Deep Learning Techniques** Generative adversarial networks (GANs) for data generation, Autoencoders and variational autoencoders (VAEs), Reinforcement learning with deep neural networks	10

V	**Applications of Deep Learning** Deep learning for image classification and object detection, Natural language processing and sentiment analysis with deep learning, Deep learning in recommendation systems and autonomous vehicles	10

Syllabus for B.Sc. (Computer Science)

Programme/Class: **Degree**	Year: **Forth**	Semester: **Eight**
Subject: **Research Project/Dissertation**		
Course Code:	Course Title: **Research Project/Dissertation**	
Course outcomes:		
Credits: **12**	**Minor**	
Max. Marks: **100**	Min. Passing Marks:40	
Total No. of Lectures-Tutorials-Practical (in hours per week): **4-1-0**		