GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

School of Computing Science and Engineering

Program: B. Tech Computer Science and Engineering

Scheme: 2018 – 2022

Curriculum

Program : B. Tech Computer Science and Engineering (2018-2022) **Total Credits: 163**

Semester I									
Sl. No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BCSE1101	Introduction to Computer Science & Engineering	0	0	2	1	20	30	50
2	BCSE1102	Computer Programming and Problem-Solving using C	0	0	4	2	20	30	50
3	MATH1005	Calculus	3	0	0	3	20	30	50
4	MATH1007	Exploration with CAS-I	0	0	2	1	20	30	50
5	PHYS1001	Engineering Physics	3	0	0	3	20	30	50
6	PHYS1002	Engineering Physics lab	0	0	2	1	50	-	50
7	CHEM1001	Engineering Chemistry	3	0	0	3	20	30	50
8	CHEM1002	Engineering Chemistry lab	0	0	2	1	50	-	50
9	BEEE1002	Basic Electrical and Electronics Engineering	3	0	0	3	20	30	50
10	BEEE1003	Basic Electrical and Electronics Engineering lab	0	0	2	1	50	-	50
11	SLBT1011	English Proficiency and Aptitude Building - 1	0	0	4	2	20	30	50
		Total	**12**	**0**	**18**	**21**			

Semester II									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BCSE1201	Application Oriented Programming using Python	0	0	6	3	20	30	50
2	PSSO1001	Psychology and Sociology	2	0	0	2	20	30	50
3	ENVS1001	Environmental Science	3	0	0	3	20	30	50
4	MATH1006	Linear Algebra and Differential Equations	3	0	0	3	20	30	50
5	MATH1008	Exploration with CAS-II	0	0	2	1	50	-	50
6	PHYS1004	Physics of Semiconductor Devices for CSE, ECE, EEE	3	0	0	3	20	30	50
7	PHYS1005	Advance Physics Lab	0	0	2	1	50	-	50
8	BTME1002	Product Design using Graphics	0	0	4	2	20	30	50
9	UHVE1001	Universal Human Values and Ethics	0	0	4	2	20	30	50
10	SLBT1012	English Proficiency and Aptitude Building - 2	0	0	4	2	20	30	50
		Total	**11**	**0**	**22**	**22**			

Semester III									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	SLBT2021	English Proficiency and Aptitude Building - 3	0	0	4	2	20	30	50
2	BCSE2310	Digital Design and Computer Architecture	3	0	0	3	20	30	50
3	MATH2007	Discrete Structures	4	0	0	4	20	30	50
4	BTME2002	Engineering Thermodynamics	3	0	0	3	20	30	50
5	BCSE2320	Data Structures using C++	3	0	0	3	20	30	50
6	BCSE2330	Introduction to Cryptographic Fundamentals	3	0	0	3	20	30	50
7	BCSE2340	Theory of Automata & Formal Languages	3	0	0	3	20	30	50
8	BCSE2311	Digital Design and Computer Architecture Lab	0	0	2	1	50	-	50
9	BCSE2321	Data Structures using C++ Lab	0	0	2	1	50	-	50
10	BCSE2331	Introduction to Cryptographic Fundamentals Lab	0	0	2	1	50	-	50
11	BCSE2071	Industry Oriented Java – I	0	0	2	1	50	-	50
12	BCSE2072	Industry Oriented Python – I	0	0	2	1	50	-	50
		Total	**19**	**0**	**14**	**26**			

Semester IV									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	MATH2003	Probability and Statistics	3	0	0	3	20	30	50

2	BCSE2010	Operating Systems	2	0	2	3	20	30	50
3	BCSE2011	Data Base Management System	2	0	2	3	20	30	50
4	BCSE3029	AI ML using Python	2	0	2	3	20	30	50
5	BCSE2012	Data Communication and Networking	2	0	2	3	20	30	50
6	SLBT2022	Soft Skill - 4 (English Proficiency and Aptitude Building - 4)	0	0	4	2	50	-	50
7	BECE9009	Transducer Sensor & Embedded System	3	0	0	3	20	30	50
8	BCSE3071	Industry Oriented Java – II	0	0	4	2	50	-	50
9	BCSE3072	Industry Oriented Python - II	0	0	4	2	50	-	50
		Total	**15**	**0**	**20**	**24**			

Semester V

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	SLBT3031	English Proficiency and Aptitude Building - 5	0	0	4	2	20	30	50
2	BCSE3510	Design & Analysis of Algorithms	3	0	0	3	20	30	50
3	BCSE3520	Compiler Design	3	0	0	3	20	30	50
4	BCSE3530	Software Engineering	3	0	0	3	20	30	50
5	BCSE3540	Introduction to Cyber Security	3	0	0	3	20	30	50
6	BCSE3550	Advanced Java Programming	1	0	6	4	20	30	50
7	BCSE3541	ITS-1	0	0	2	1	50	-	50
8	BCSE3591	Swayam / MOOC	0	0	4	2	20	30	50
9	BCSE3521	Compiler Design Lab	0	0	2	1	50	-	50
10	BCSE3531	Software Engineering Lab	0	0	2	1	50	-	50
		Total	**13**	**0**	**20**	**23**			

Semester VI

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	SLBT3032	Campus to Corporate	0	0	4	2	20	30	50
2	BCSE3610	Computer Graphics	3	0	0	3	20	30	50
3	BCSE3620	Web Technologies	3	0	0	3	20	30	50
4	BCSE3631	ITS-2	0	0	2	1	50	-	50
5		Program Elective-1	3	0	0	3	20	30	50
6		Program Elective-2	3	0	0	3	20	30	50
8		Management Course	3	0	0	3	20	30	50
9	BCSE3611	Computer Graphics Lab	0	0	2	1	50	-	50
10	BCSE3621	Web Technologies Lab	0	0	2	1	50	-	50
		Total	**15**	**0**	**10**	**20**			

Semester VII

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
2	BCSE4791	Swayam / MOOC	0	0	4	3	20	30	50
3	BCSE4781	**Capstone Design- 1**	**0**	**0**	**6**	**3**	50	-	50
4		Program Elective-3	3	0	0	3	20	30	50
5		Program Elective-4	3	0	0	3	20	30	50
		Total	**6**	**0**	**10**	**12**			

Semester VIII

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C			
1	BCSE4881	Capstone Design - 2	**0**	**0**	**6**	**12**	50	-	50
		Total	**0**	**0**	**6**	**12**			

List of Electives

Program Elective-1

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCSE9010	Introduction to Cloud Computing	3	0	0	3	20	30	50
2	BCSE9001	Cloud Architecture and Computing	0	0	6	3	20	30	50
3	BCSE9020	Cloud Storage and Computing	3	0	0	3	20	30	50
4	BCSE9002	Cloud Application Development	0	0	6	3	20	30	50
5	BCSE9030	Cloud Security	3	0	0	3	20	30	50

Program Elective-2

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCSE9040	Foundations of Data Science	3	0	0	3	20	30	50
2	BCSE9003	Big Data Technology	0	0	6	3	20	30	50
3	BCSE9004	Programming for Data Analytics	0	0	6	3	20	30	50
4	BCSE9005	Big Data Analytics for IoT	0	0	6	3	20	30	50
5	BCSE9050	Algorithms for Advanced Analytics	3	0	0	3	20	30	50

Program Elective-3

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCSE9006	Internet of Things: Sensing and Actuator Devices	0	0	6	3	20	30	50
2	BCSE9060	Connecting Networks	3	0	0	3	20	30	50
3	BCSE9007	Scaling Networks	0	0	6	3	20	30	50
4	BCSE9008	Routing and Switching Essentials	0	0	6	3	20	30	50

Program Elective-4

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCSE9009	Artificial Intelligence and Intelligent Systems	0	0	6	3	20	30	50
2	BCSE9070	Deep Learning	3	0	0	3	20	30	50
3	BCSE9080	Augmented Reality	3	0	0	3	20	30	50
4	BCSE9090	Genetic Algorithms and Machine Learning	3	0	0	3	20	30	50

Detailed Syllabus

Name of the Course	Introduction to computer science & engineering			
Course Code	BCSE1101			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

To understand the basic computer fundamentals and its roles in problem solving. To understand and develop well-structured programs and to learn the basic data structures, information system and IoT.

Course Outcome

CO1	Understand the Fundamental of Computer and Programming Languages.
CO2	Understand when and how to take decisions, to compare and iterate, to how chose their career and line of action for future studies.
CO3	Recognize the Domain of Computers like grid, distributed, cloud and fog computing.
CO4	To know about the Information system gateway and terminology.
CO5	Introduction about Data and Data Analysis with business process.

Text Book (s)

1. Computer Fundamental – By P. K. Sinha
2. Cloud Computing: Concepts, Technology & Architecture – By ERL
3. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
4. Introduction to Information Security and Cyber Law – By Surya Prakash Tripathi, Ritendra Goel, Praveen Kumar Shukla

Reference Book (s)

1. E. Balagurusamy 7th Edition, Programming ANSI C, McGraw-Hill
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
3. Cloud Computing: Business Trends and Technologies, Igor Faynberg, Kui-Lan Lu, and Dor Skuler, Wiley, 2015

Course Content:

Unit-1: Computer Fundamental **6 hours**
Block Diagram of Computer System, Component of system, Instruction, Instruction flow. Introduction of Software, Classification of software, Languages and its Generations, Flow Diagram, Algorithm, Pseudo codes. Evolution of Computer hardware and their effect in the fields with relevance of size, speed and output.
Unit II: Domains of Computing **6 hours**
Computers Application, Different era and field of computation with time, Advancement in computer field, Introduction to computing-grid, distributed, cloud, fog, Virtualization Green Computing , Operating system, difference between windows and Unix family, Basic Linux command-ls, cd, mv, man, mkdir, rmdir, touch, cat. Introduction to open source software.
Unit III : Information System **4 Hours**
Introduction to Standards, Types of Standards; Open Standard, Closed Standard, Information Technology, Introduction to data communication and networking, standards and protocols. SMTP, POP3, DNS, HTPS, IPV4, IPV6, cyber Security, Viruses.
Unit IV : Data Analysis **5 Hours**

Data, Different types of Data and data Analysis, Business Analysis, Big-Data, Business and healthcare, Banking IT Infrastructure. Demonstration of Web Page analysis using goggle Page speed like pingdoom.com.
Unit V : Internet of Things **5 Hours**
Internet, Introduction to IOT, Internet technologies, Advancement and applications in IOT, Professional society and association in computing, ethics

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Computer Programming and Problem Solving Using C			
Course Code	BCSE1102			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objective

1. To understand computer programming and its roles in problem solving.

2. To understand and develop well-structured programs using C language.

3. To learn the basic data structures through implementing in C language.

Course Outcome

CO1	The student would learn the basic concepts of Computer and acquire various problem solving techniques such as algorithms and flowchart.
CO2	To understand the basic terminology used in programming and able to write, compile and debug programs in 'C' programming language and to develop program logics using decision structures and loop structures.
CO3	To develop program logics using the concept of arrays and arrays of characters.
CO4	To understand the modular techniques such as functions and difference between call by value and call by reference methods.
CO5	Implement and develop small projects using the concept Structures in C programming language.

Reference Book (s)

1. Alexis Leon and Mathews Leon, Introduction to Information Technology, Tata McGraw-Hill, 2001.
2. Let Us C 15 Edition, Yashavant Kanetkar, Bpb Publications, 2016.
3. R.G. Dromey, How to Solve it by Computer, Prentice Hall of India,2002.
4. Brian W. Kernighan and Dennis Ritchie, C programming Language, 2nd Edition, Pearson Education
5. E. Balagurusamy 7th Edition, Programming ANSI C, McGraw-Hill,2017.
6. Byron Gottfried, Programming with C, Schaum's Outline, 3 Edition, 2017.

List of Experiments	
1	Write a C program to swap the two numbers.
2	Write a C program to find the roots of a quadratic equation.
3	Write a C program to compute the factorial of a given number.
4	Write a C program to find the series of prime numbers in the given range.
5	Write a C program to generate Fibonacci numbers in the given range.
6	Write a C program to check for number palindrome.
7	Write a C program to generate Pascal Triangle.
8	Implement the following operations on matrices using C a) Sum of Two Matrices b) Product of Two matrices c) Transpose of Matrix
9	Write a C program to find Factorial, GCD, fibonacci, towers of hanoi, sum of digits, base conversions, reversal of numbers. (Using recursion).
10	Write a C program to implement all string operations(strlen(), strcpy(), , strcmp(), strcat(), strrev(), strstr(), strchr()) without using standard string library functions.
11	Write a C program to find the student grade by using structures.
12	Write a C program to perform the operations addition, subtraction, multiplication of complex numbers using structures.
13	Write a C program to copy the file contents from one file to another file(pass file names as command line arguments).

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	Calculus			
Course Code	MATH1005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems. To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.

Course Outcome

CO1	Explain the convergence of a series and Summarize some important series expansions of a single variable function.
CO2	Explain some of the fundamental theorems of differential calculus and Utilize them for some of the applications.
CO3	Explain improper integrals and Utilize it to develop two special functions.
CO4	Explain the methods of finding derivatives and integrals of multivariable scalar functions and apply it to solve the problems of optimization, and finding areas and volumes.
CO5	Explain the three elements of vector differential calculus, construct the methods for evaluation of integrals of vector valued functions and make use of the three important theorems to solve the problems of integrations.

Text Book (s)

1. Robert T. Smith and Roland B. Minton, Calculus, 4th Edition, McGraw Hill Education.
2. George B. Thomas and Ross L. Finney, Calculus, 9th Edition, Pearson Education

Reference Book (s)

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 4th Edition, Narosa publishers.
2. Michael D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education

Course Content:

Unit-1: Sequences and series **8 hours**
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem. Harmonic analysis.
Unit-2: Differential Calculus (Single Variable): 8 Hours
Evolutes and involutes, Rolle's Theorem, Mean value theorems, Taylor's theorem with remainders; indeterminate forms and , Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.
Unit-3: Differential Calculus(Multivariable): 9 Hours
Functions of several variables, Limits and continuity, Partial derivatives, Total differential, Derivatives of composite and implicit functions, Extreme values and saddle points, Lagrange's method of undetermined multipliers.
Unit-4: Multiple Integrals: 10 Hours
Double integrals in Cartesian and Polar coordinates, Change of order of integration, change of variables (Cartesian to polar), Applications of double integrals to find area and volume, Triple integrals in Cartesian, Change of variables in triple integrals(cylindrical and spherical coordinates), Aapplications of triple integral.
Unit-5: Vector Calculus: 10 Hours

Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl and their physical interpretations, line integrals, path independence, potential functions and conservative fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorems (without proof).

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Exploration with CAS-I**			
Course Code	**MATH1007**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objective

Open source software tools like Scilab also demands an open and free learning resource. LearnCAx brings to you a free course which will introduce you to the basics of programming using Scilab along with examples and supporting material. Register now if you are curious about Scilab and want to get started with programming in Scilab.

Course Outcome

CO1	**Describe** the SCILAB code for solving mathematical problem and **utilize** different function loops (if else, while , for) in SCILAB code.
CO2	**Write** a SCILAB code of matrix with different operations and **find** a inverse & transpose of a matrix.
CO3	**Write** a SCILAB code for plotting a graph of 2 dimensional & 3 dimensional figures.
CO4	**Write** a SCILAB code of expansion of function in Taylor's series & Fourier Series with different wave forms.
CO5	**Write** a SCILAB code for computing double and triple integrals in Cartesian coordinates and **identifying** the critical points of 2-D and 3-D. surface.

1.	Introduction to Scilab and Basic syntax, Mathematical Operators, Predefined constants, Built in functions at **SCILAB** platform.
2.	**SCILAB -CODE** for find addition, subtraction, multiplication and division of two matrices , transpose of a matrix and inverse of a non singular matrix.
3.	**SCILAB -CODE** for programming -Functions - Loops - Conditional statements - Handling .sci files.
4.	**SCILAB -CODE** for 2-D : circle, parabola, ellipse and hyperbola and 3-D surfaces: Planes, Sphere, Cylinder, Parabolioid, Ellipsoid, Hyperboloid, cone.
5.	**SCILAB -CODE** to find expansion of functions in Taylor series.
6.	**SCILAB -CODE** for Fourier series expansion of different wave forms and comparison with the original function.
7.	**SCILAB -CODE** for identifying the critical points of 2-D and 3-D. surface.
8.	**SCILAB -CODE** for computing double integrals in Cartesian coordinates.
9.	**SCILAB -CODE** for computing triple integrals in Cartesian coordinates.
10	**SCILAB –CODE** for computing and plotting grad of scalar point function .
11	**SCILAB –CODE** for computing and plotting divergence of vector point functions.
12	**SCILAB –CODE** for computing and plotting curl of Vector point functions.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	0	50	100

Name of the Course	Engineering Physics			
Course Code	PHYS1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

Course Outcome

CO1	Distinguish Classical and quantum physics and solve Schrodinger wave equations
CO2	Illustrate the phenomenon of Interference and Diffraction of light
CO3	Discuss the principle, components and working of Laser
CO4	Describe Maxwell's equations and their significance in electromagnetics
CO5	Categorize the magnetic materials.

Text Book (s)

1. Arthur Beiser, S RaiChoudhury, ShobhitMahajan, (2009), Concepts of Modern Physics, 6th Edition, Tata-McGraw Hill. ISBN- 9780070151550.
2. Dr. N. Subrahmanyam, BrijLal and Dr. M. N. Avadhanulu (2010) A Text book of Optics, 24th Edition, S. Chand Higher Academy. ISBN 8121926114
3. B.K Pandey and S. Chaturvedi (2012) Engineering Physics, Cengage Learning, ISBN 9788131517611

Reference Book (s)

1. Robert Kolenkow, David Kleppner (2007), An Introduction to Mechanics, 1st Edition, Tata-McGraw Hill.
2. B.B. Laud, Lasers and Non-Linear Optics (2011), 3rd Edition, New Ages International.
3. William Silfvast (2002), Laser Fundamentals, Cambridge University Press.
4. David. J. Griffiths (2009), Introduction to Electrodynamics, 3rd Edition, PHI Learning.

Course Content:

Unit-1: Quantum Mechanics **8 hours**
Wave-Particle duality, de-Broglie waves, Davisson & Germer Experiment (Experimental verification of de-Broglie waves), Heisenberg Uncertainty Principle and its Applications, Schrodinger's wave equations, Particle in a Box.
Unit-2: Optics **8 Hours**
Interference- Interference of Light, Bi-prism experiment, interference in thin films, Newton's rings; Diffraction-Single slit, Diffraction grating, Grating spectra, Rayleigh's criterion and resolving power of grating.
Unit-3: LASER **8 Hours**
Einstein's coefficients, Population Inversion, Three level and four level laser, Laser characteristics, He-Ne laser and applications.
Unit-4: Electromagnetics **8 Hours**
Displacement current, Maxwell's Equations (Integral and Differential form), Equation of continuity, EM-Wave equations and its propagation characteristics in free space, Poynting theorem and Poynting vectors.
Unit-5: Magnetism **8 Hours**
Origin of magnetization, Orbital and spin magnetic moment, Classification and properties of magnetic materials, Hysteresis curve, soft and hard magnetic materials.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	ENGINEERING PHYSICS LAB			
Course Code	PHYS1002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

Course Outcome

CO1	Understand the physical principle involve in the various instruments and relate them to new applications.
CO2	Operate CRO and various optical instruments such as- spectrometer, travelling microscope and spherometer.
CO3	Calculate the physical constants by various methods such as- Planck's constant, wavelength of monochromatic light, angle of prism and realize the accuracy in measurements.
CO4	Develop the individual and team work for the performance of scientific works.
CO5	Develop the skill for making scientific graphs, error analysis and measurement technology used in engineering.

Reference Book (s)

1. Practical Physics, 1st Edition, C. L. Arora, S Chand Publications.
2. "Engineering Physics: Theory and Practical", A. K. Katiyar and C. K. Pandey, Willey Publications, 2012.
3. "LABORATORY MANUAL IN APPLIED PHYSICS"-Second edition H. Sathyaseelam -New age International.

1	To draw the hysteresis curve (B-H curve) of a given sample of ferromagnetic material and to determine retentivity, coercivity and hysteresis loss.
2	To determine the frequency of alternating current (AC) mains using Sonometer.
3	To calibrate a voltmeter and an ammeter using a DC potentiometer.
4	To determine Planck's constant using Light Emitting Diode (LED).
5	To find the wavelength of monochromatic light with the help of a plane transmission diffraction grating and spectrometer.
6	To Verify the Stefan's law by electrical method.
7	To determine the wavelength of sodium light by Newton's rings.
8	To determine the wavelength of He-Ne laser source using Diffraction grating.
9	To determine the resolving power of telescope and to verify the Rayleigh's criterion of resolution.
10	To draw the characteristics of solar cell and to estimate Fill Factor (FF) of solar cell.
Beyond the syllabus experiment:	
11	To study the polarization of light by reflection and to verify the Brewster's law.
12	To find the wavelength of monochromatic light with the help of Fresnel's Biprism.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	Engineering Chemistry				
Course Code	CHEM1001				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objective

- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- To acquaint the students with the basics of nano materials, their properties and applications.

Course Outcome

CO1	Describe the atomic structure and trends in modern periodic table.
CO2	Determine the properties and shape of molecules by various theories of chemical bonding.
CO3	Differentiate nuclear reactions and apply nuclear chemistry to calculate age of samples.
CO4	Demonstrate the concepts of thermodynamics and chemical kinetics.
CO5	Explain the structure and properties of biomolecules and describe the photochemical reactions.

Text Book (s)

1. Darrell *Ebbing*, Steven *Gammon, General Chemistry*, Cengage Learning, *2012, ISBN* 978-1-285-05137- 6, *10th Edition*
2. William R. *Robinson*, Jerome D. *Odom*, Henry Fuller *Holtzclaw*. General Chemistry, Houghton Mifflin Harcourt Publishing Company, 1996, Edition 10, ISBN 066935483X, 9780669354836.
3. ArunBahl, B. S. Bahl and G.D. Tuli, Essential of Physical Chemistry, S. Chand and Company Ltd., New Delhi, 2009, ISBN 81-219-2978-4, Ed 2009.
4. M. Siberberg, The Molecular Nature of Matter and Change, McGraw-Hill Education; 7 ***edition, 2014, ISBN***-10: 0021442541

Reference Book (s)

1. T.W. Graham Solomons and Craig Fryhle, Organic Chemistry, John Wiley and Sons, Inc., 2011, ISBN: 0470556597, 10th Ed.
2. Julio De Paula, Peter Atkins, Physical Chemistry, Oxford University Press, 2011, ISBN-13: 9780199599592
3. Lehninger, Principles of Biochemistry [David L. Nelson, Michael M. Cox] on W H Freeman & Co., February 1, 2008, | ISBN-10: 071677108X | ISBN-13: 978-0716771081 | Edition: 5th.
4. Mehrotra R. C, Singh Anirudh Organometallic Chemistry: a unified approach, New Age International, New Delhi, 2007, ISBN: 9788122412581.
5. J. House, Inorganic Chemistry, Imprint Academic Press, 2012, ISBN 9780123851109

Course Content:

Unit-1: Introduction to Atomic Structure	**12 hours**
Structure of the Atom, Introduction to Periodic Table, Evolution of Atomic Theory, Thomson's plum pudding model, Rutherford's model and Rutherford-Geiger-Marsden Experiment, Black body radiation; Planck-Einstein Relationship, Planck's constant; Bohr's Model; Bohr's postulates; Matter-Energy interactions involving hydrogen atom; Rydberg Equation; Bohr-Sommerfield Model; Hydrogen Spectral Series (Balmer Series); Wave- Particle duality (de-Broglie's rule); Heisenberg's Uncertainty Principle; Quantum-Mechanical Model of the Atom; Quantum numbers; s, p, d, f, orbitals; Stern-Gerlach Experiment; Aufbau Principle; Pauli's Exclusion Principle; Hund's Rule; Electronic configuration based on Quantum States.	
Unit-2: Introduction to Chemical Bonding	**9 Hours**
Covalent Bond; sigma and pi bond; single, double and triple bonds; Ionic Bond; Octet stability; Lewis dot structure ; VSEPR Theory; LCAO-MO; H2; CO; Valence Bond Theory; Periodic trends of chemical properties; Inter-molecular and Intra-molecular bonding (Hydrogen Bonding, Van Der Waals forces, London Forces, etc); dipole moment; polarizibility of molecules; Metallic bonding. Band theory of solids; conductors; semiconductors; insulators.	
Unit-3: Nuclear Chemistry	**6 Hours**
Nuclear Fission, Nuclear Fusion, Half Life, Mass Defect, Astro-chemistry (Reactions in Stars, Mechanism of decay of Stars); Carbon Dating, Related Numerical.	
Unit-4: Thermodynamics and Chemical Kinetics	**6 Hours**
First Law, Second Law, Third Law and Zeroeth Law of Thermodynamics, Enthalpy, Entropy, Gibbs Free Energy, First, second and zero order reactions; Arrhenius Equation	
Unit-5: Photochemistry and Biochemistry	**8 Hours**
Introduction to Photochemistry; Photochemical reactions of organic molecules (Electrocyclic reactions, Norrish reactions; photoisomerization, Zimmerman's Rearrangement), Introduction to Carbohydrates, Lipids and Proteins. DNA structure.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Engineering Chemistry lab			
Course Code	CHEM1002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry

Course Outcome

CO1	Employ the volumetric titrations techniques used in chemistry laboratory for analysis.
CO2	Analyse to differentiate between hard and soft water using complexometric titration.
CO3	Calculate the percentage of dissolved oxygen in water sample.
CO4	Identify the viscosity of liquid using Ostwald viscometer.
CO5	Analyse the Carbohydrate and protein in given organic compound.

Reference Book (s)

1. Vogel's Textbook of Quantitative Chemical Analysis, Revised by G.H. Jeffery, J. Bassett, J.
2. Mendham and R.C. Denney.
3. Applied Chemistry: Theory and Practice by O.P. Vermani and A.K. Narula.
4. Laboratory Manual on Engg. Chemistry by S. K. Bhasin and Sudha Rani.

List of Experiments
1. To determine the strength of ferrous ions in the given sample of Mohr's salt by using $KMnO_4$ as a self indicator.
2. To estimate the total permanent Hardness of the given hard water sample. An approximately 0.01M solution of EDTA are provided.
3. Estimate the amount of Nickel ion in the given sample solution by complex- metric titration.
4. To Determine the Alkalinity of a given Water Sample.
5. To estimate the amount of Zinc in the given solution by using a standard solution of Potassium Ferro cyanide
6. Estimate the amount of ferrous iron in the whole of the given ferrous Solution using external indicator
7. To estimate the amount of Copper present in the given solution using a standard solution by provided hypo solution.
8. To find out the viscosity of a given liquid using Ostwald's viscometer.
9. To find out the amount of dissolved oxygen in the given sample of water.
10. Qualitative analysis of carbohydrates, lipids and proteins.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	**Basic Electrical and Electronics Engineering**				
Course Code	**BEEE1002**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objective

- To understand the fundamentals of electronic circuit constructions.
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them.
- To study the basic principles of electrical machines and their performance.
- To study the different energy sources, protective devices and their field applications.
- To understand the principles and operation of measuring instruments and transducers

Course Outcome

CO1	Define current, voltage and power flow in circuit and Apply the circuit theorems to find out the electrical parameters in networks.(K1 and K3)
CO2	Outline the AC source and analyse steady state response of RL, RC and RLC phasors. (K2 and K4)
CO3	Summrize digital number system and boolean algebra through logic gates and small combinational circuit designs procedure. (K2 and K4)
CO4	Illustrate the operation and characteristics of PN junction diode, Zener diode and BJT with application of it.(K2)
CO5	Demostrate the working of DC machines, Three phase induction motor and transformer. (K2)

Course Content:

Unit-1: Elementary Circuit Analysis 7 hours
Ohm's law, KCL, KVL, series and parallel circuits, current division and voltage division, star-delta conversion, Node voltage and Mesh current analysis with independent source, Thevenin's Theorem, Norton's Theorem, Maximum power transfer and superposition theorem.
Unit-2: Analysis of AC Circuits 7 Hours
Alternating signals, derivation of Root Mean Square (RMS) value, average value, peak or crest factor, form factor, Inductive and capacitive reactance, phasor representation-lagging and leading power factor concept, steady state analysis of series and parallel circuits, AC power calculations.
Unit-3: Digital Systems 7 Hours
Basic logic circuits concepts, basic Gates and Universal Gates, representation of numerical data in binary form-Binary to decimal, octal, Hexadecimal, Boolean algebra, combinational logic circuits-Half adder, full adder, synthesis of logic circuits, maximization of logic circuits using Karnaugh Map.
Unit-4: Semiconductor Devices 5 Hours
Basic diode concept, ideal diode model, different types of rectifier circuits, zener diode voltage regulation concept, bipolar junction transistors, current and voltage relationship, and common emitter characteristics.
Unit-5: Electromagnetic Energy Conversion 5 Hours
Basic construction, working principle and applications of transformer EMF equation of transformer, Phasor diagram of transformer, construction, working principle and applications of alternator and DC motor, Types of DC generator and motor construction, working principle and applications of three phase induction motor, slip of induction motor.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Basic Electrical and Electronics Engineering Lab			
Course Code	BEEE1003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

- To understand the fundamentals of electronic circuit constructions.
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them.
- To study the different energy sources, protective devices and their field applications.

Course Outcome

CO1	Understand the basic electrical components/Equipments.
CO2	Realize and verify basic theorems in electrical network and circuits.
CO3	Verify the truth tables of different logic gates.
CO4	Analyze characteristics of basic diodes.
CO5	Understand the characteristics of basic transistors.

List of Experiments	Cos
1. Bread board Connection and Resistance color coding.	CO1
2. To verify (i) Kirchoff's current law (ii) Kirchoff's voltage law.	CO2
3. Verification of Thevenin's Theorem.	CO2
4. Verification of Norton's Theorem.	CO1
5. Verification of Maximum power transfer Theorem.	CO1
6. Verification of Truth table for logic Gates- AND, OR, NOT, NAND, NOR, XOR and XNOR logic circuit.	CO1
7. Study of P-N Junction Diode characteristics.	CO1
8. Study of ZENER Diode characteristics.	CO4
9. Study of common emitter characteristics of a Bipolar Junction Transistor (BJT).	CO3
10. Study of characteristics of Field Effect Transistor (FET).	CO5

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	**English Proficiency and Aptitude Building - 1**				
Course Code	**SLBT1011**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	**0**	**4**	**2**	

Course Objective

1. To enhance knowledge of English grammar.
2. To help improve English communication skills.
3. To use quantitative methods for problem solving.

Course Outcome

CO1	Construct grammatically correct sentences for effective communication.
CO2	Build confidence in public speaking.
CO3	Enhance self awareness for the purpose of self improvement.
CO4	Attaining initial knowledge of Quantitative Aptitude for problem solving.

Text Book (s)

1. SLLL's own text book

Unit-1: Introduction and Greetings	**2 hours**
• Orientation and Ice- breaking Activities • SWOT Analysis	
Unit-2: English Grammar	**4 Hours**
• Parts of Speech – Orientation • Parts of Speech (LSRW) • Speaking Skills	
Unit-3: Quantitative Aptitude	**6 Hours**
• Vedic Mathematics • Shortcuts to Calculations • Number Systems	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Semester 2

Name of the Course	**Application Oriented Programming using Python**			
Course Code	**BCSE1201**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	**6**	**3**

Course Objective

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

Course Outcome

CO1	Gain knowledge of Basic Programming with Python
CO2	Learn to create and use functions and modules.
CO3	Familiarize with python string handling techniques and user defined functions
CO4	Understand and use data structures like Lists, tuples and dictionaries.
CO5	Understand text and csv File handling

References

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Shroff/O'Reilly; Second edition, 2016.
2. Tony Gaddis, Starting Out with Python, 3rd edition, Pearson, 2014.
3. Y. Daniel Liang, Introduction to Programming Using Python, Pearson, 2013.
4. Budd T A, Exploring Python , 2011, Tata McGraw Hill Education, 2011.
5. Downey, Allen B., Think Python: How to Think Like a Computer Scientist. O'Reilly, 2012
6. Python Programming: An Introduction to Computer Science (Second Edition) John Zelle, ISBN 978-1-59028-241-0-9, Franklin, Beedle & Associates Inc., 2004.

List of Experiments
1. Implement Python script to read person's age from keyboard and display whether he is eligible for voting or not.
2. Implement Python script to find biggest number between two numbers.
3. Implement Python Script to generate prime numbers series up to n
4. Implement Python Script to check given number is palindrome or not.
5. Implement Python script to print factorial of a number.
6. Implement Python Script to perform various operations on string using string libraries
7. Implement Python Script to check given string is palindrome or not.
8. Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.

9. Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.
10. Define a function which generates Fibonacci series up to n numbers
11. a) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program:34,67,55,33,12,98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34', '67', '55', '33', '12', '98'). b) With a given tuple (1,2,3,4,5,6,7,8,9,10), write a program to print the first half values in one line and the last half values in one line.
12. a) Write a python script to perform basic dictionary operations like insert, delete and display. b) Write a python script to find frequency of words in a file using dictionaries.
13. a) Write Python script to display file contents. b) Write Python script to copy file contents from one file to another.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	Psychology and Sociology			
Course Code	PSSO1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective

Objective of this course is to develop social-psychological skills among the students to meet out the challenges of industry and society**.**

Course Outcome

CO1	Understanding of the basic facts of psychology and their application
CO2	develop an ability to work in the work groups and communicate effectively
CO3	Develop sociological understanding of Social process, Social Institutions, Social inequality, stratification, mobility, Social change and Movement.
CO4	Demonstrate scientific understanding of major social themes & social phenomena of industrial society, that impact engineer's various realms of life.
CO5	Develop leadership quality, potential to analyze and address social issues and to transform young engineers as a very good human being and successful technocrat.

Text Book (s)

1. Bottomore, T B .,Sociology: A Guide to Problems and Literature, London: George Allen & Unwin1962
2. .Robbins Stephens, Organizational Behaviour. P. Printice Hall International ,Inc. Eaglewood cliffs, 2005,ISBN: 0-13-191435,11th Edition
3. Giddens, A. ., Sociology, Cambridge; Polity ,2000.
4. Horton P B & Hunt C L Sociology, New York: McGraw-Hill Co., 1964.
5. *The Sociology of Social Problems*. Authors, Paul B. Horton, Gerald R. Leslie, Richard F. Larson. Edition, 10, illustrated. Publisher, Prentice Hall, 1991

Reference Book (s)

1. Clifford T. ***Morgan***, Richard A ***King***, John R Weisz and John Schopler; Introduction to Psychology Published: 19/02/2001; Edition: 7; ISBN: 9780074622506
2. Haralambos, M and Holborn., M. Sociology, London: HaperCollins,2000.

Course Content:

Unit-1 Industrial Psychology **8 hours**
Psychology: Meaning, Definition, nature and Scope. Relevance for engineers. **Personality:** Definition and types, theories. **Memory:** Types, and models, strategies to improve memory **Motivation:** Motivational theories and job satisfaction, **Learning**: Types, classical conditioning, operand conditioning & observational learning

Unit-2 Group dynamics and leadership **8 hours**
Group dynamics and leadership: skills and various types, **Stress ,Stress management** Definition, types, causes, strategies to cope with stress **Work Environment**: Fatigue and boredom, , accidents and safety
Unit-3 Introduction To Industrial Sociology **8 hours**
Sociology, Industrial Sociology: Meaning definition, Nature , scope, Importance of Sociology for Engineers, **Basic concepts:** Interaction, Group, community, Society. **Social Processes:** Associative & Dissociative, social process and organizational goals. **Social Institutions:** Family ,Marriage, Religion: Functions and dysfunctions & Impact of Industrialization
Unit-4 Social and Industrial Concerns **8 hours**
Social Inequality, Stratification & Mobility, Impact of Industrialization on Sanskritization Urbanization, Westernization, & Modernization , **Social Change and Social Movements:** Meaning Definition, Genesis, Types, Functions, role in Social transformation. **Industrialization in India and Industrial** policy resolution 1956., **Industrial Disputes:** Strikes and lockouts
Unit-5 Industrial relations machinery **8 hours**
Bi-partite & Tripartite agreement, Labour courts, Industrial tribunals, code of Discipline, Standing orders., **Social Problems:** - Social Disorganization, Unemployment, Deviance, Delinquent behaviour amongst youth, Crime, , Gender injustice, Child Abuse, Terrorism.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Environmental Science			
Course Code	ENVS1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

1. To develop solid foundation for further study of electrical and electronics courses
2. To develop the analytical skills for solving the electrical and electronics circuits
3. To learn the utility of basic electronics devices and circuits
4. To understand the basic principles of electrical machines

Course Outcome

CO1	Identify the scope and importance of studying the environment and analyze the problems associated with various natural resources. **(K4)**
CO2	Determine the harmful effects of toxic chemicals on living beings and environment. **(K2)**
CO3	Identify the harmful effects of environmental pollution and apply suitable control methods. **(K4)**
CO4	Analyze the different social issues affecting the society and environment. **(K4)**
CO5	Interpret and utilize the different tools of Green Chemistry towards generating a zero waste environment **(K3)**

Text Book (s)

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.
2. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5
3. Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005, ISBN: 978 81 7371 540 2
4. Environmental Studies (From Crisis to Cure) Second Edition. , R. Rajagopalan, Oxford University Press, 2012, ISBN 0-19-807208-2.
5. Environmental Studies, Ranu Gadi, Sunitta Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s)

1. Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.
2. Environmental Studies, Anindita Basak, Pearson Education, 2009, ISBN: 978-81-317-2118-6.
3. Principles of Environmental Science (Inquiry and Applications), William P. Cunningham & Mary Ann Cunningham, Tata McGraw Hill Education Private Limited, 2007, ISBN: 987-0-07-064772-0.

Course Content:

Unit I: Environment and Natural Resources **10 Hours**
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources –Use and exploitation, environmental effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.
Unit II: Chemical Toxicology **7 Hours**

Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides
Unit III: Environmental Pollution **10 Hours**
Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.
Unit IV: Social Issues, Human Population and the Environment **10 Hours**
Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.
Unit V: Green Chemistry **4 Hours**
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Linear Algebra and Differential equations			
Course Code	MATH1006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To introduce and apply the concepts of rings, finite fields and polynomials.
- To understand the basic concepts in number theory.
- To examine the key questions in the Theory of Numbers.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

Course Outcome

CO1	Define various terminologies of linear algebra and differential equations
CO2	Summarize various methods and techniques of linear algebra and differential equations
CO3	Solve system of linear equations in finite dimensional vector space
CO4	Apply appropriate methods to solve nth order linear ordinary differential equations
CO5	Apply method of separation of variables to solve some problems of partial differential equations.

Text Books:

1. D. Poole**, Linear Algebra: A Modern Introduction,** 4th Edition, Brooks/Cole, 2015.
2. *Erwin Kreyszig*, **Advanced Engineering Mathematics,** 10th Edition, John Wiley & Sons.
3. *Peter V. O'Neil,* **Advanced Engineering Mathematics,** 7th Edition, Cengage Learning.

Reference Books:

1. *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 5th Edition, Narosa Publishers.
2. *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition, McGraw Hill Education.
3. *David C Lay,* **Linear Algebra and its application,** 3rd Edition,
4. KENNETH HOFFMAN, **Linear Algebra,** 2nd Edition**,** PRENTICE-HALL, INC., Englewood Cliffs, New Jersey

Course Content:

Unit-1: Matrices	**6 hours**
Basic Operations on matrices and vectors, Determinants, Cramer Rule, Inverse of matrix using Gauss Jordan elimination, Rank of a matrix, Solution of system of linear equations: Gauss elimination.	
Unit-2: Vector Spaces-I	**10 Hours**
Vector Space, Linear Independence of vectors, basis, dimension; Lineartransformations (maps), range and kernel of a linear map, rank, nullity, rank-nullity theorem, Inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	
Unit-3: Vector Spaces-II	**10 Hours**
Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices,eigenbases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	
Unit-4: Ordinary Differential Equations	**10 Hours**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters,Cauchy-Euler equation, System of linear differential equations with constant coefficients, applications oflinear differential equations.	
Unit-5: Partial Differential Equation	**9 Hours**

Basic concepts, Classification of second order linear PDE, Method ofseparation of variables and its application in solving Wave equation (one dimension), heat equation (onedimension) and Laplace equation (two dimension steady state only).

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Exploration with CAS-II**			
Course Code	**MATH1008**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objective

Open source software tools like Scilab also demands an open and free learning resource. LearnCAx brings to you a free course which will introduce you to the basics of programming using Scilab along with examples and supporting material. Register now if you are curious about Scilab and want to get started with programming in Scilab.

Course Outcome

CO1	Demonstrate knowledge of SciLabfor solvingsimple problems.
CO2	Apply commands of SciLab for solvingasystem of equations including eigen value problems.
CO3	Write a program in SciLab to solve ainitial value problems.
CO4	Solve domain related problems using SciLab

References

1. Urroz, G E., **Numerical and Statistical Methods with SCILAB for Science and Engineering** ,Vol 1 Book Surge Publishing, 2001, ISBN-13: 978-1588983046
2. **Software site: http://www.scilab.org, official scilab website**
3. Wikipedia article: http://en.wikipedia.org/wiki/Scilab

List of Experiments
1. Review of working with Scilab
2. Using Scilab for basic operations on matrices including inverse, rank, trace and determinant of a matrix.
3. Using Scilab to determine LI of vectors and determining solution of system of linear equations.
4. Use of Scilab to find the Kernel, range and verification of rank and nullity theorem.
5. Matrix representation of any linear transformation, using Scilab to find inverse of a linear transformation.
6. Using Scilab to compute the Eigen Values and Vectors and check whether a given matrix is symmetric, skew-symmetric, orthogonal.
7. Develop a code in Scilab for Gram-Schmidt orthogonalization process.
8. Solving an initial value problem of II order and plotting the solution.
9. Solving an initial value problem of first and second order (domain specific) and plotting the solution of problem
10. Using Scilab to Solve one dimensional wave equation under specified conditions and graphing the solution.
11. Using Scilab to solve one dimensional heat equation under specified conditions and graphing the solution.
12. Using Scilab to Solve a Laplace equation to find the steady state temperature in the square plate satisfying specific boundary conditions and graphing isotherms

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	PHYSICS OF SEMICONDUCTOR DEVICES FOR CSE, ECE, EEE			
Course Code	PHYS1004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

- To inculcate how to expresses ideas of technical nature with a pragmatic intention.
- To explore from the first idea and intuitive concepts to the final development and evaluation of the quality of a product.
- Helping students understand the role of engineering graphics in a product design process.

Course Outcome

CO1	Describe the fundamentals of intrinsic and extrinsic semiconductors.(K2)
CO2	Interpret the Junction theory, and breakdown phenomena of avalanche and Zener processes. (K3)
CO3	Explain the rectifiers, ripple factor , filtering, diode protection and application of diodes. (K2)
CO4	Utilize the fundamental operation of transistors, Field effect transistor, Biasing and applications.(K3)
CO5	Explain the principles of combinational and sequential circuits.(K2)

Text Book (s)

1. Kanaan Kano, Semiconductor Devices, PHI, 2005.
2. S.O. Pillai, Solid State Physics, New Age International Pvt. Ltd,7th Edition 2015.
3. M. Morris Mano, Digital logic and Computer design, Pearson.
4. V.K. Mehta and Rohit Mehta, Principle of Electronics, S. Chand Publication, New Delhi

Reference Book (s)

1. Robert Boylestad, Electronic Devices and Circuit Theory, Pearson (Tenth Edition)2009.
2. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, PHI, 2004.
3. M. S. Tyagi, Introduction to semiconductor materials and devices, John Wiley & Sons, 2004.
4. D. A. Neamen, Semiconductor physics and devices. 3rd Edition, McGraw-Hill, 2003.

Course Content:

UNIT-I: Semiconductor Fundamentals **8 Hours**
intrinsic and extrinsic semiconductors, elemental and compound semiconductor, Carrier concentration and Fermi level of intrinsic and extrinsic semiconductor, Thermal Effect, conductivity and carrier mobility in semiconductors, Hall effect
UNIT-II: Junction Theory **8 Hours**
PN Junction, junction potential, biasing of PN Junctions, I-V relationships, Static & dynamic resistances, Breakdown phenomena- avalanche and Zenner processes, Zenner diode.
UNIT–III: Applications of Diode **8 Hours**
Sinusoidal inputs, Rectifiers (half &full wave), ripple factor, Power supply filtering, Circuit applications of diodes, Clippers, Clampers, Inductive loads and diode protection.
UNIT–IV: Transistors **10 Hours**

Bipolar junction transistors, Fundamentals of operation,(CB, CE, CC configuration),Transistors parameters, Leakage current, Biasing, Amplification, Field Effect Transistors (FET).
UNIT–V: Combinational and Sequential Circuits: 12 Hours
Basic theorems and properties of Boolean algebra, Logic Operation, digital logic gates, Combinational circuits: adder and subtractor, comparator, decoder, encoder, Multiplexer de-multiplexer. Sequential Circuits- Flip flops - SR, D, JK and T

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Advance Physics Lab**			
Course Code	**PHYS1005**			
Prerequisite				
Corequisite				
Antirequisite				
L	**T**	**P**	**C**	
0	**0**	**2**	**1**	

Course Objective

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

Course Outcome

CO1	Understand the physical principle involve in the various instruments and relate them to new applications.
CO2	Operate CRO and various optical instruments such as- spectrometer, travelling microscope and spherometer.
CO3	Calculate the physical constants by various methods such as- Planck's constant, wavelength of monochromatic light, Hall coefficients, band gap etc. and realize the accuracy in measurements.
CO4	Develop the individual and team work for the performance of scientific works.
CO5	Develop the skill for making scientific graphs, error analysis and measurement technology used in engineering.

Reference Book

1. Practical Physics, 1st Edition, C. L. Arora, S Chand Publications.
2. "Engineering Physics: Theory and Practical", A. K. Katiyar and C. K. Pandey, Willey Publications, 2012.
3. "LABORATORY MANUAL IN APPLIED PHYSICS"-Second edition H. Sathyaseelam -New age International.

S. No	List of Experiment
1	To measure the Planck's constant using LED method.
2	To determine the wavelength of monochromatic light using Newton's ring method.
3	To find the wavelength of monochromatic light with the help of a plane transmission diffraction grating and spectrometer.
4	To determine the angle of prism with the help of spectrometer.
5	To draw the characteristics of solar cell and to estimate Fill Factor (FF), and efficiency of solar cell.
6	To determine the specific resistance of given unknown wire using Carey Foster's bridge.
7	To draw the hysteresis curve (B-H curve) of a given sample of Ferromagnetic material and to determine retentivity, coercivity and hysteresis loss.
8	To draw the characteristics of p-n junction diode and to estimate the dynamic and static resistance.
9	To study the Hall Effect and to determine the Hall coefficient, carrier density and hall mobility of a given semiconductor material using Hall set-up.
10	To determine the energy band gap of a given pure semiconductor using four probe method.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	**Product Design using Graphics**				
Course Code	**BTME1002**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**

Course Objective

- To inculcate how to expresses ideas of technical nature with a pragmatic intention.
- To explore from the first idea and intuitive concepts to the final development and evaluation of the quality of a product.
- Helping students understand the role of engineering graphics in a product design process.

Course Outcome

CO1	Understand the concept and principles of engineering graphics in product design.
CO2	Make isometric and orthographic projection of solids along with free hand sketching.
CO3	Develop a solid model using AutoCAD
CO4	Make a solid model for a given assembly using AutoCAD.
CO5	Apply the concepts and techniques learnt in the course to make hands-on project.

TEXT BOOKS

1. Asimow, M. (1962). Introduction to design. Englewood Cliffs: Prentice-Hall.
2. K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
3. P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.

Unit-1: Introduction – Understanding the Concept of Product Design 13 hours
Fundamentals of Design : Design by Evolution and Design by Innovation, Principles that govern any design, Morphology and Process of Design, Application of Graphics in Design, Engineering Graphics: An Overview, Introduction to Computer Aided Drafting, Lettering, Numerals and Dimensioning.
Unit-2: Projection of Solids 12 Hours
Concept of Projection, Object in four quadrant, 2-D description of quadrants, Orthographic Projection of Solids, Isometric Projection of Solids, Free-hand sketching.
Unit-3: Solid Modeling 12 Hours
Division of Engineering Solids- Polyhedra, Regular and Irregular polyhedral, solids of revolution, Geometric Modeling – Wireframe, B-Rep and Solid Modeling, Solid Modelling using AutoCAD
Unit-4: Introduction to Assembly 11 Hours
Types of assembly drawings, Accepted Norms for Assembly Drawings, Sequences of Preparing the Assembly Drawing, Solid Modeling of assembly
Unit-5: Application of Design Concepts for Product Design 10 Hours
Hands-on Project in Groups: Choose a specific objective for Product Design, Design the Product and Model it using AutoCAD, presentation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	UNIVERSAL HUMAN VALUES AND ETHICS			
Course Code	UHVE1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the value of harmonious relationship based on trust and respect in their life and profession
CO4	Understand the role of a human being in ensuring harmony in society and nature.
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Book (s)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Book (s)

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Course Content

Module I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Understanding the need, basic guidelines, content and process for Value Education 2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels
Module II: Understanding Harmony in the Human Being - Harmony in Myself
1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 4. Understanding the characteristics and activities of 'I' and harmony in 'I' 5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail 6. Programs to ensure Sanyam and Swasthya
Module III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship
1. Understanding harmony in the Family- the basic unit of human interaction 2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; 3. Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship 4. Understanding the meaning of *Vishwas*; Difference between intention and competence 5. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship 6. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals 7. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!
Module IV: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence
1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature 3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space 4. Holistic perception of harmony at all levels of existence
Module V: Implications of the above Holistic Understanding of Harmony on Professional Ethics
1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in Professional Ethics: i. Ability to utilize the professional competence for augmenting universal human order ii. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models 5. Case studies of typical holistic technologies, management models and production systems 6. Strategy for transition from the present state to Universal Human Order:

i. At the level of individual: as socially and ecologically responsible engineers, technologists and managers ii. At the level of society: as mutually enriching institutions and organizations

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	English Proficiency and Aptitude Building - 2			
Course Code	SLBT1012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objective

1. To enhance knowledge of English grammar.
2. To help improve English communication skills.
3. To use quantitative methods for problem solving.

Course Outcome

CO1	Develop effective communication (listening and speaking) skills - be able to listen carefully and respectfully other's perspective and to express one's own ideas in a group(K1).
CO2	Construct grammatically correct sentences and practicing correct pronunciation of common words in English language for effective communication (K2).
CO3	Develop real-time problem solving skills in quantitative aptitude (K3).
CO4	Develop basic data analyzing techniques which will help in forecasting and decision making (K3).

Text Book (s)

SLLL's own text book

Reference Books:

1. 1 English Vocabulary in Use (Advanced), Michael McCarthy and Felicity, CUP, 2003
2. Murphy's English Grammar with C.D. Murphy, Cambridge University Press.
3. Quicker Maths , M Tyra
4. Quantitative Aptitude, Abhijeet Guha

Unit-1: Introduction and Greetings	**4 hours**
• Ice Breaking Activity • Speaking Activity • Pronunciation • Listening Skills	
Unit-2: English Grammar	**2 Hours**
• Pronouns • Articles and Prepositions	
Unit-3: Quantitative Aptitude	**6 Hours**
• Number System • Percentage • Profit and Loss	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Semester 3

Name of the Course	**English Proficiency and Aptitude Building -3**			
Course Code	**SLBT2021**			
Prerequisite	Completion of semester 2			
Corequisite				
Antirequisite				
24 sessions of 100 minutes each, 12 hours of online tests	**L**	**T**	**P**	**C**
	0	0	4	2

Course Objectives

- Enhance formal writing skills
- To understand soft-skills pertaining to industry

Course Outcomes

CO1	Improve arithmetic aptitude
CO2	Learn tricks to solve aptitude questions faster, thereby saving time during competitive exams
CO3	Improve arithmetic aptitude

Text Book (s)

SLLL own text book

Reference Book (s):

1. CommunicationSkillsforEngineers, Mishra,Sunita&C.Muralikrishna,,Pearson
2. CorporateSoftskills,SarveshGulati,2006.
3. Effective Communication,JohnAdair,MacmillanLtd.1997.
4. DevelopingCommunication Skills,KrishnaMohanandMeeraBannerji,Macmillan IndiaLtd.1990

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Digital Design and Computer Architecture			
Course Code	BCSE2310			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

Learn how to design digital circuits by simplifying the Boolean functions. Also, gives an idea about designs using PLDs, and writing HDL codes for designing larger digital systems.

Course Outcome

CO1	Understand the basics of logic gates, K-map, various circuit designing models.
CO2	Understand the concepts of combinational circuits and sequential circuits.
CO3	Understand the architecture of digital system by using machine language.
CO4	Understand the fundamentals of microarchitecture using x86 architecture
CO5	Identify core concepts of Memory and I/O systems.

TEXT BOOKS

1. David Harris, Sarah Harris, Digital Design and Computer Architecture,2nd Edition ISBN: 978-0-12-394424-5, ISBN10:0123944244, Elsevier Science & Technology , 2013.

2. M. Morris Mano and Michael D. Ciletti, "Digital Design", IV Edition, Pearson Education, 2008.

REFERENCES:

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition – Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill, 2003.

Course Content:

Unit-1: Introduction **9 hours**
Introduction, Logic Gates, Digital Abstraction. Combinational Logic Design-Boolean Equations, Boolean Algebra, From Logic to Gates, Multilevel Combinational Logic, X's and Z's, Oh My, Karnaugh Maps, Combinational Building Blocks, Timing.
Unit-2: Hardware Description Languages **9 Hours**
Sequential Logic Design-Introduction, Latches and Flip-Flops, Synchronous Logic Design, Finite State Machines, Timing of Sequential Logic, Parallelism, Structural Modeling, More Combinational Logic, Data Types, Parameterized Modules, Testbenches.
Unit-3: Digital Building Blocks & Architecture **9 Hours**
Introduction, Arithmetic Circuits, Number Systems, Sequential Building Blocks, Memory Arrays, Logic Arrays. Architecture: Introduction, Assembly Language, Machine Language, Programming, Addressing Modes, Lights, Camera, Action: Compiling, Assembling, and Loading, Odds and Ends, Real-World Perspective: x86 Architecture.
Unit-4: Microarchitecture **9 Hours**
Introduction, Performance Analysis, Single-Cycle Processor, Multicycle Processor, Pipelined Processor, HDL Representation, Exceptions, Advanced Microarchitecture, Real-World Perspective: x86 Microarchitecture
Unit-5: Memory and I/O Systems **9 Hours**

Introduction, Memory System Performance Analysis, Caches, Virtual Memory. I/O - Introduction, Embedded I/O Systems, PC I/O Systems, Real-World Perspective: x86 Memory and I/O Systems.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Discrete Structures**				
Course Code	**MATH2007**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		4	**0**	**0**	**4**

Course Objective

1. Develop a foundation of set theory concepts and notation
2. Explore a variety of various mathematical structures by focusing on mathematical objects, operations, and resulting properties
3. Develop formal logical reasoning techniques and notation
4. Demonstrate the application of logic to analyzing and writing proofs
5. Develop techniques for counting, permutations and combinations
6. Develop the concept of relation through various representations (digraphs, matrices, lists)

Course Outcome

CO1	Implement algorithms
CO2	Prove computational theorems
CO3	Analyze computational systems
CO4	Communicate technical results

REFERENCES:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

Unit-1: Set Theory **9 hours**
Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.Relations: Definition, Operations on relations, Properties of relations, Composite Relations,Equality of relations, Recursive definition of relation, Order of relations.Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.
Unit-2: Algebraic Structures **9 Hours**
Definition, Groups, Subgroups and order, Cyclic Groups, Cosets,Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.
Unit-3: Partial order sets **9 Hours**
Definition, Partial order sets, Combination of partial order sets, Hasse diagram.Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.
Unit-4: Propositional Logic **9 Hours**
Proposition, well formed formula, Truth tables, Tautology, Satisfiability,Contradiction, Algebra of proposition, Theory of Inference Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.
Unit-5: Trees **9 Hours**
Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs,Planar graphs,Isomorphism and Homeomorphism of

graphs, Euler and Hamiltonian paths, Graph coloringRecurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Engineering Thermodynamics**				
Course Code	**BTME2002**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objective

1. To learn the basic principles of classical thermodynamics.
2. To apply the laws of thermodynamics to various systems and analyze the significance of the results.
3. To analyze the performance of thermodynamic gas and vapour power cycles

Course Outcome

CO1	Demonstrate basic understanding and knowledge of thermodynamic properties.
CO2	Demonstrate basic understanding and knowledge of first law of thermodynamics and its application to open and closed systems
CO3	Demonstrate basic understanding and knowledge of the second law of thermodynamics and its application to open and closed systems.
CO4	Demonstrate basic understanding and knowledge of entropy and its application to engineering systems.
CO5	Perform the basic thermal analysis of thermodynamic cycles.

TEXT BOOK:

1. P. K. Nag (2010), Basic and Applied Thermodynamics, Tata McGraw-Hill Publishing Company Ltd., ISBN 978-0-070-15131-4

REFERENCES:

1. Yunus A. Cengel and Michael A. Boles, Thermodynamics, An Engineering Approach, 8th Ed., McGraw Hill, 20015, ISBN: 978-9-339-22165-2.

Unit-1: Basic Concepts of Thermodynamics **6 hours**
Thermodynamics and Energy, Macroscopic and microscopic viewpoint, Closed and open systems, Thermodynamic properties of a system, State and equilibrium, Processes and cycles, Forms of energy , Temperature and its measurement, Zeroth law of thermodynamics.
Unit-2: First Law of Thermodynamics **9 Hours**
Work transfer, pdV work, Types of work transfer, Net work done by a system, heat transfer, path function, Specific heat and latent heat, First law of thermodynamics for a closed system undergoing a cycle and change of state, Energy – a property of the system, enthalpy, specific heat at constant pressure and volume, PMM-I, Control volume, First law applied to steady flow process, Mass and energy balance
Unit-3: Second Law of Thermodynamics **9 Hours**
Limitations of the first law of Thermodynamics, Kelvin-Planck statement of the second law of thermodynamics, Clausius statement, Equivalence of Kelvin- Planck and Clausius statements, Heat engine, Refrigerators, Heat Pump, COP, Carnot's theorem, Corollary of Carnot's theorem, Reversible and Irreversible process, Efficiency of Reversible Heat engine, PMM-II, Carnot cycle.
Unit-4: Entropy and properties of pure substances **8 Hours**
Introduction, Clausius theorem, Entropy – property of the system, Clausius inequality, Entropy change in irreversible process, Entropy principle, Reversible adiabatic work in steady flow system, Availability and irreversibility, Second law efficiency, p-v, p-T and T-s diagrams for a pure substance, Quality, Introduction to steam tables.
Unit-5: Thermodynamic Cycles **8 Hours**
Carnot cycle, Otto cycle, Diesel and Dual cycles, Brayton and reversed Brayton Cycle, Rankine cycle

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Data Structures using C++			
Course Code	BCSE2320			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objective

1. To understand the concepts of ADTs.
2. To Learn linear data structures – lists, stacks, and queues.
3. To understand sorting, searching and hashing algorithms.
4. To apply Tree and Graph structures

Course Outcome

CO1	Understand the comparison and use of Recursion and Loops.
CO2	Understand the application of linear data structure(s) to solve various problems.
CO3	Understand the application of non-linear data structure(s) to solve various problems.
CO4	Understand the shortest path algorithms involving complicated data structures like Graphs.
	Become expert in calculating and comparing complexities of various searching and sorting algorithms.

TEXT BOOK:

1. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. Introduction to Algorithms, MIT Press, Second Edition (Indian reprint: Prentice-Hall), 2013.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson, 4th Edition, 2014.

REFERENCES:

1. "Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI, 1996.
2. "Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill, 2007.
3. R. Kruse, "Data Structures and Program Design in C++", Pearson Education, 2000.

Unit-1: Introduction: Basic Terminology **9 hours**
Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked
Unit-2: Stacks and Queues: Abstract Data Type **8 Hours**
"Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion. Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue"
Unit-3: Trees: Basic terminology **8 Hours**
Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit-4: Graphs **7 Hours**
Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Dijikstra Algorithm.

Unit-5: Sorting and Searching	**9 Hours**
Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Shell sort Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees. Hashing: Hash Function, Collision Resolution Strategies. Storage Management: Garbage Collection and Compaction.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Introduction to Cryptographic Fundamentals			
Course Code	BCSE2330			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

1. To understand Cryptography Theories, Algorithms and Systems.
2. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

Course Outcome

CO1	Learn to analyse the security of the in-built cryptosystems.
CO2	Develop authentication schemes for identity and membership authorization.
CO3	Develop cryptographic algorithms for information security.

TEXT BOOK:

1. D. R. Stinson, Cryptography: Theory and Practice, 3rd ed. Boca Raton, FL: Chapman & Hall/CRC, 2005. (ISBN No.: 978-1-58-488508-5)
2. W. Stallings, Cryptography and Network Security: Principles and Practice, 5th Ed. Boston: Prentice Hall, 2010. (ISBN No.: 978-0-13-609704-4)
3. J. H. Silverman, A Friendly Introduction to Number Theory, 4th Ed. Boston: Pearson, 2012.
4. C. Kaufman, R. Perlman, and M. Speciner, Network Security: Private Communication in a Publ

REFERENCES:

1. "Atul Kahate, Cryptography and Network Security, 2nd ed., Tata Mcgraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rd ed, Wiley Publications,2011.
3. Introduction to Computer Security, Matt Bishop,1st ed,Addison-Wesley Proffesional,2004.
4. Hand Book of Applied Cryptography, by Alfred Menezes, Paul van Oorschot, Scott Vanstone , CRC.

Course Content:

Unit-1: Introduction to Security **9 hours**
Information Security - Confidentiality, Integrity & Availability – Authentication, Authorization & Non-Repudiation – Introduction to Plain Text, Cipher Text, Encryption and Decryption Techniques, Secure Key, Hashing, Digital signature.
Unit-2: Symmetric and Asymmetric Encryption **9 Hours**
"Block cipher, Stream Cipher - Data Encryption Standard (DES) - Cipher Block Chaining (CBC) - Multiple Encryption DES - International Data Encryption Algorithm (IDEA) - Advanced Encryption Standard (AES). Asymmetric key generation techniques – Applications of Asymmetric encryption methods – RSA- Elliptic Curve Cryptography"
Unit-3: Digital Signatures **9 Hours**
Digital signature standards - Secure One-time Signatures - Application of Digital Signatures - Diffie-Hellman Key Exchange - Elliptic Curve Digital Signature algorithm.
Unit-4: Hashing and Message Digests **9 Hours**
Cryptographic Hash Functions- Applications- Simple hash functions and features for ensuring security - Hash functions based on Cipher Block Chaining- Secure Hash Algorithm (SHA) - Message Digest - MD5.
Unit-5: Applications of Cryptographic Algorithms **9 Hours**

Applying cryptography algorithms - Smart cards-Mobile phone security - Electronic passports and ID cards - SDA/DDA/CDA Bank Cards - Financial Cryptography – Secure Payment Systems - Crypto currencies – Bitcoin.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Theory Of Automata And Formal Languages			
Course Code	BCSE2340			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

1. To understand the language hierarchy.
2. To construct automata for any given pattern and find its equivalent regular expressions.
3. To design a context free grammar for any given language.
4. To understand Turing machines and their capability.
5. To understand undecidable problems and NP class problems.

Course Outcome

CO1	Understand basic principles of compiler.
CO2	Develop Deterministic Finite Automata and Non-Deterministic Finite Automata.
CO3	Develop Regular Expression for regular languages. Analyses difference between regular and non regular languages
CO4	Understand Context Free Grammar and its normalization
CO5	Able to draw and develop working model of Push Down Automata.

TEXT BOOK:

1. Introduction to Automata Theory, Languages, and Computation, Third Edition, John E.Hopcroft, Rajeev Motwani, Jeffery D. Ullman, Pearson Education, 2001.

REFERENCES:

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH, Third Edition, 2003.
2. Theory of computer Science Automata, Languages and Computation, K.L.P. Mishra, N. Chandrasekaran, PHI, Third Edition, 2003.

Course Content:

Unit-1: Introduction **9 hours**
Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem
Unit-2: Regular expression (RE) 9 Hours
Regular expression (RE) Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.
Unit-3: Context free grammar (CFG) and Context Free Languages CFL) 10 Hours
Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs
Unit-4: Push Down Automata (PDA) 9 Hours

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA
Unit-5: Turing machines **8 Hours**
Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Digital Design and Computer Architecture Lab			
Course Code	BCSE2311			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

1. To introduce the basic concepts of digital system and the use of Boolean algebra in logic analysis and design.
2. Understand the principles and methodology of digital logic design at the gate and switch level, including both combinational and sequential logic elements.
3. To introduce basic tools of logic design and provide hands-on experience designing digital circuits and components through simple logic circuits to hardware description language and interface programming in C

Course Outcome

CO1	Understand the basics of logic gates, K-map, various circuit designing models.
CO2	Understand the concepts of combinational circuits and sequential circuits.
CO3	Understand the architecture of digital system by using machine language.
CO4	Understand the fundamentals of microarchitecture using x86 architecture
CO5	Identify core concepts of Memory and I/O systems.

Text Book

1. David Harris, Sarah Harris, Digital Design and Computer Architecture,2nd Edition ISBN: 978-0-12-394424-5, ISBN10:0123944244, Elsevier Science & Technology , 2013.
2. M. Morris Mano and Michael D. Ciletti, "Digital Design", IV Edition, Pearson Education, 2008.

References

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition – Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill, 2003.

List of Experiments
1. Introduction to Digital Electronics lab- nomenclature of digital ICS, specifications, study of the data sheet, concept of vcc and ground, verification of the truth tables of logic gates using TTL ICS.
2. Implementation of the given Boolean function using logic gates in both sop and pos forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & nor gates.
4. Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
5. To design and verify operation of half adder and full adder.
6. To study and verify NAND as a universal gate.
7. Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction.
8. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along with examples.
9. Write an assembly language code in GNUsim8085 to implement data transfer instruction

10. Write an assembly language code in GNUsim8085 to implement arithmetic instruction.
11. Write an assembly language code in GNUsim8085 to implement logical instructions.
12. Write an assembly language code in GNUsim8085 to implement stack and branch instructions.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	Data Structures Using C++ Lab				
Course Code	BCSE2321				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objective

1. Be familiarized with good programming design methods, particularly Top- Down design.
2. Getting exposure in implementing the different data structures using C++
3. Appreciate recursive algorithms.

Course Outcome

CO1	Understand the comparison and use of Recursion and Loops.
CO2	Understand the application of linear data structure(s) to solve various problems.
CO3	Understand the application of non-linear data structure(s) to solve various problems.
CO4	Understand the shortest path algorithms involving complicated data structures like Graphs.
CO5	Become expert in calculating and comparing complexities of various searching and sorting algorithms.

Text Book

1. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. Introduction to Algorithms, MIT Press, Second Edition (Indian reprint: Prentice-Hall), 2013.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson, 4th Edition, 2014.

References

1. "Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI, 1996."
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill, 2007.
3. R. Kruse, “Data Structures and Program Design in C++”, Pearson Education, 2000.

List of Experiments
1. a) Write a Program to implement linear search algorithm. b) Write a Program to implement binary search algorithm.
2. Write a Program to Implement Singly Linked List and its operations.
3. a) Write a Program to Implement Stack Operations by using Array. b) Write a Program to Implement Stack Operations by using Linked List.
4. a) Write a program that uses stack operations to convert a given infix expression into its postfix. b) Write a program that uses stack operations to evaluate given postfix expression.
5. a) Write a Program to implement the operations of Queue using array. b) Write a Program to implement the operations of Queue using linked list.
6. Write a Program to Implement Circular Queue Operations by using Array.
7. Write a Program to Sort the set of elements by using Quick Sort. iii) Merge Sort.
8. Write a Program to Implement All functions of a Dictionary by using Hashing.

9. Write a Program to Implement the Binary Search Tree Operations.
10. Write a Program to Perform the Tree Traversal Techniques by using Iterative Method
11. Write a Program to Perform the Tree Traversal Techniques by using recursion.
12. Write a program to Implement Insertion and Deletion Operations on AVL Trees
13. Write a program for implementing the following graph traversal algorithms: Depth First Search b) Breadth First Search.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Semester 4

Name of the Course	**Probability and Statistics**			
Course Code	**MATH2003**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	2	**0**	**2**	**3**

Course Objective

This course contains one Unit on Random Variable and Probability Distributions which deals with basic and theoretical concepts of Probability, random variables, Distribution functions, expectation, Variances as well as special type of distributions (discrete and continuous). The course includes next two units on Correlation and Regression Analysis as well as Sampling and Estimation Theory. In last Unit students will study testing of Hypothesis and Its Significance.

Course Outcome

CO1	Define the basic concepts of Probability theory and Random variables.
CO2	Identify the type of distribution and Apply it in problem solving.
CO3	Apply the concept of correlation and Regression.
CO4	Explain the concepts of sampling distributions and estimation theory and apply it to estimate the confidence intervals.
CO5	Apply statistical tests to solve the hypothesis testing problems.

Text Book (s)

1. R. E. Walpole, R. H. Mayers, S. L. Mayers and K. Ye (2007), Probability and Statistics for Engineers and Scientists, 9th Edition, Pearson Education, ISBN:978-0-321-62911-1.
2. Sheldon M. Ross (2011), Introduction to Probability and Statistics for Engineers and Scientists, 4th Edition, Academic Foundation, ISBN:978-8-190-93568-5.

Reference Book (s)

1. Douglas C. Montgomery (2012), Applied Statistics and Probability for Engineers, 5th Edition, Wiley India, ISBN: 978-8-126-53719-8.
2. M. R. Spiegel, J. Schiller and R. A. Srinivasan(2010), Probability & Statistics, 3rd Edition, Tata-McGraw Hill, ISBN:978-0-070-15154-3. https://nptel.ac.in/courses/111105041/

Course Content:

Unit-1	**9 hours**
Random Variables and probability Distributions: Review of Probability, Probability density function, Cumulative distribution function, Expectation and Variance. Binomial, Poisson and Geometric distributions, Probability density function, Cumulative distribution function, Expectation and Variance, Uniform, Normal, Exponential distributions, Joint distribution and joint density functions, Conditional distribution.	
Unit-2	**9 hours**
Correlation and Regression: Curve fitting by method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Rank correlation, Regression analysis, Linear and non-linear regression, Multiple regression.	
Unit-3	**9 hours**
Sampling and Estimation Theory: Population and sample, Statistical inference, Sampling with and without replacement, Random samples, Population parameters, Sample statistics, Sampling distributions, Sample mean, Sampling distribution of means, Sample variances, Sampling distribution of variances, Case where population variances is unknown, Estimators, Point and Interval Estimation, Confidence Interval estimates of population parameters, Confidence intervals for variance of a Normal distribution, Maximum likelihood estimates.	
Unit-4	**9 hours**

Tests of Hypothesis and Significance: Statistical hypothesis, Null and Alternate hypothesis, test of hypothesis and significance, Type I and Type II errors, Level of Significance, Tests involving the Normal distribution, One-Tailed and Two-Tailed tests, P value, Special tests of significance for Large and Small samples (F, chi-square, z, t- test), one way ANOVA.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Operating System			
Course Code	BCSE2010			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	2	3

Course Objective

Gives an idea about process synchronization, inter-process communication, scheduling, deadlock handling, and memory management.

Course Outcome

CO1	Remember the classification and diversification of Operating system.
CO2	Understand the classical problems in Concurrent Processes and their solutions.
CO3	Implement different types of CPU Scheduling Algorithm along with the understanding of the concept of Deadlock in system and its methods of handling deadlocks.
CO4	Analyse the concept of memory management and paging concept in operating system.
CO5	Demonstrate the learnt knowledge with a optimized solution in the functions like memory management, I/O management and various scheduling algorithms and take care of deadlocks.

Text Book (s)

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley, Ninth Edition, 2013.
2. D M Dhamdhere, "Operating Systems: A Concept based Approach", McGraw Hill Education, 3 edition, 2012.

Reference Book (s)

1. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education India, 2014.
2. Harvey M Dietel, " An Introduction to Operating System", Pearson Education, 1990.

Course Content:

Unit-1 Introduction	**9 hours**
Operating system and functions, Classification of Operating systems-Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems, Operating System Structure-Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	
Unit-2 CPU Scheduling	**9 hours**
Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	
Unit-3 Concurrent Processes	**9 hours**
Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency-Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	
Unit-4 Memory Management	**9 hours**
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	
Unit-5 Input/ Output	**9 hours**
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Database Management Systems				
Course Code	BCSE2011				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		2	0	2	3

Course Objective

The scope of the course is Database System concepts and major application areas. The objective is to understand various data models and to develop the relational model of database including the rigorous practice of query language, SQL. The emphasis is to apply the concepts to wide range of applications. The course will start with the manipulative aspects of databases, proceed to the design of data bases and culminate in techniques needed for supporting the design and manipulative aspects. The course will by and large be structured but will introduce open-ended data base problems.

Course Outcome

CO1	Learn knowledge of Entity Relationship (ER) Modeling.
CO2	Apply programming concepts using DDL and DML commands in SQL.
CO3	Understand the storage system in Relational Database and imposing security.
CO4	Able to remove various anamolies from databases.
CO5	Understanding of transaction process.

Text Book (s)

1."Data base System Concepts", Silberschatz, Korth, McGraw Hill, V editionThe UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India, Sixth Edition, 2013.

Reference Book (s)

1	C.J. Date, " An Introduction to Database Systems", Addision Wesley, Eigth Edition, 2003.
2	Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley, Sixth Edition, 2011.

Course Content:

Unit-1 Introduction	**9 hours**
Introduction: An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	
Unit-2 Relational data Model and Language	**9 hours**
Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. Introduction on SQL: Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	
Unit-3 Data Base Design & Normalization	**9 hours**
Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	
Unit-4 Transaction Processing Concept	**9 hours**

Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. Distributed Database: distributed data storage, concurrency control, directory system.
Unit-5 Concurrency Control Techniques **9 hours**
Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**AI ML using Python**				
Course Code	**BCSE3029**				
Prerequisite	Artificial intelligence keeps changing in its definition as does its scope and capabilities. A few decades ago, simple calculators were considered artificial intelligence since math problems were previously only solved by the human brain.				
Corequisite	Artificial Intelligence and Machine Learning are the terms of Computer Science and Engineering .Machine Learning : Machine Learning is the learning in which machine can learn by its own without being explicitly programmed. It is an application of Artificial Intelligence that provide system the ability to automatically learn and improve from experience.				
Antirequisite	You will have to have a good foundation in calculus, linear algebra,algorithm and statistics in order to help you to develop algorithms. You will also need a good knowledge of Python and Python for data science track as it is the predominant language used in machine learning.				
TOTAL:		**L**	**T**	**P**	**C**
45 PERIODS		**2**	**0**	**2**	**3**

Course Objective

To search and discover intelligent characteristics of existing AI projects, map a new problem – as search and create an animation – showing different search strategies for a problem, program a new game/ problem in Prolog, evaluate different Knowledge Representation schemes for typical AI problems, design and implement a typical AI problem to be solved Using Machine Learning Techniques, design and implement a futuristic AI application.

Course Outcome

CO1	To Describe the modern view of AI as the study of agents that receive percepts from the environment and perform actions.
CO2	To Demonstrate awareness of informed search and exploration methods.
CO3	To Develop knowledge of decision making and learning methods.
CO4	To Outline the needs and application of various types of learning.
CO5	To Identify applications suitable for different types of machine learning models.

Text Book (s)

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill- 2008.
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007
3. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Reference Book (s)

1. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
2. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.
3. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

Course Content:

Unit-1 Introduction	**9 hours**

Introduction to AI - Applications of Artificial Intelligence, Heuristic Searching Techniques- Hill Climbing- Depth first - Breath first- Greedy Method- A* Algorithm- AO* Algorithm, Game Playing.
Unit-2 KNOWLEDGE REPRESENTATION 9 hours Knowledge representation: Knowledge management- Types of Knowledge- Knowledge Representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution examples.
Unit-3 REASONING AND LEARNING 9 hours Types of Reasoning: Reasoning with fuzzy logic- Rule based reasoning. Types of learning, Machine Learning: Applications, Algorithms: Apriori algorithm, Eclat algorithm, Clustering: K-means, fuzzy, hierarchical clustering.
Unit-4 MACHINE LEARNING 9 hours Foundations of ML, Classification: Naïve Bayes classifier, K-nearest neighbors , Support vector Machines , Decision tress- ID4,Association rule mining.
Unit-5 APPLICATIONS 9 hours Expert systems – Architecture of expert systems, Roles of expert systems. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Data Communication and Networking			
Course Code	BCSE2012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	2	3

Course Objective

- Learn how computer network hardware and software operate
- Investigate the fundamental issues driving network design
- Learn about dominant network technologies

Course Outcome

CO1	Understanding the basic services and concepts of all layer of OSI Model and various practical approach related to topology
CO2	Understanding the services and techniques in physical layer
CO3	Understanding and implementing various error and flow control Mechanism
CO4	Acquiring knowledge of IP addressing and Understand the layered network architecture
CO5	Understanding and implementing the functionality of transport layer ,presentation layer and application layer

Text Book (s)

1. Behrouz A. Forouzan, "Data Communications and Networking" 5th ed., 2010
2. William Stallings, Data and Computer Communications,9th ed., 2010

Reference Book (s)

1. Andrew S Tanenbaum "Computer Networks"
2. Todd Lammle, CCNA Study Guide, 7th ed. 2011

Course Content:

Unit-1 Introduction	**9 hours**
Computer Networks Definition, LAN,MAN,WAN, Modes, Network topologies, Circuit Switching and Packet Switching, Layers in the OSI model and Functionality of each layer , Introduction to TCP/IP protocol suite, Link layer protocols, IEEE Standards ,Serial and Parallel Transmissions, Physical and port Addressing	
Unit-2 Physical Layer	**9 hours**
Line coding: Unipolar scheme, Polar schemes, bipolar schemes, ASK, FSK, PSK, Pulse code Modulation, Multiplexing: FDM, TDM, WDM, Guided Media: Twisted Pair, Coaxial Cable Fiber optical cable, unguided media: Radio waves, Microwaves, Infrared	
Unit-3 Data Link Layer	**9 hours**
Framing, Errors Detection methods, Error correction Method, Hamming Distance, Correction Vs Detection Flow Control Mechanisms, Sender side Stop and Wait Protocol, Receiver side Stop and Wait Protocol, Go back N ARQ, Selective Reject ARQ, Sliding Window protocol , CSMA, CSMA/CD, HDLC, PPP,ALOHA Protocol.	
Unit-4 Network Layer	**9 hours**
Categories IPv4 Addressing, Address space, Dotted Decimal Notation. Classful Addressing, Subnet Mask, Sub netting, Classless Addressing, Private Address, IPV6 addressing, NAT, Super netting, Hub, Repeaters, Switch, Bridge, Router, Gateways, Routing Table, Intra domain Routing and Inter domain Routing, Static Routing and Dynamic Routing, Distance Vector Routing, Link state Routing, Path vector Routing	
Unit-5 Transport Layer	**9 hours**

connection management, Presentation Layer: Data compression techniques, cryptography, Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other Protocols: OSPF, EIGRP, BGP

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Soft Skill - 4 (English Proficiency and Aptitude Building - 4)**			
Course Code	**SLBT2022**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

Course Objective

1. Skill development related to classification of numbers
2. Implementing logical approach in decision making

Course Outcome

CO1	Able to develop a logical thought process related to every aspect of life
CO2	Able to widen the horizon of one's thought process and data analysis skill
CO3	Able to interpret data and convert it into information

Text Book (s)

1. SLLL own text book

Reference Book (s)

1. Quicker Maths , M Tyra
2. Quantitative Aptitude, Abhijeet Guha

Course Catalogue

It is imperative for a student to develop interpretation and analysis skills to be able to hold onto his own in this competitive world. The course thus, focuses on aptitude at the next level of reasoning and data interpretation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Transducer, Sensors and Embedded Systems**				
Course Code	**BECE9009**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	**0**	**0**	**3**	

Course Objective

- To make students familiar with the constructions and working principle of different types of sensors and transducers.
- To gain an in-depth understanding of the operation of microcontrollers, machine language programming & interfacing techniques with peripheral devices
- To gain an understanding of applications of microcontroller in designing processor-based automated electronics system.

Course Outcome

CO1	Choose Suitable sensor/transducer for a given physical variable and understand its principle, characteristics and determine order of the senor.
CO2	Measure displacement, pressure, flow, temperature variables.
CO3	Design suitable signal conditioning circuit for sensor/transducers.
CO4	Analyze the bridge circuits for calculating L, C, R.
CO5	Understand noise reduction using grounding and shielding techniques.

Text Book (s)

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation' Dhanpat Rai and Co 2004.
2. D.V.S.Murty, Transducers and instrumentations, 2nd edition, Prentice Hall of India, 2012.
3. Mohammad Ali Mazidi and Janice Gillispie Maszidi "The 8051 Microcontroller and Embedded Systems" Pearson education, 2003, ISBN- 9788131710265, 2ndEdition

Reference Book (s)

1. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
2. Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, "Pearson Education, 2005.
3. "The 8051 Microcontroller Architecture, Programming & Applications", 2e Kenneth J. Ayala;, Penram International, 1996 / Thomson Learning 2005.

Course Content:

Unit-1 TRANSDUCERS **9 hours**
Introduction to transducer, classification and characteristics of transducers, Resistive Transducers: principle of resistive strain gauge, signal conditioning circuit, Displacement Transducers: L.V.D.T, applications. Temperature Transducers: resistance temperature detectors (RTD), thermocouple. Pressure transducers: diaphragm pressure transducer.
Unit-2 SENSORS **9 hours**
Introduction to sensors, classification, difference between transducer and sensors, Radiation Sensors: LDR, photodiodes - construction and response. Capacitive Sensor: stretched diaphragm type – microphone -

construction and characteristics, ultrasonic sensor, optical sensor, magnetic sensor, sensor interface: signal processing, introduction to smart sensor.
Unit-3 MICROCONTROLLER **9 hours**
Introduction to single chip microcontrollers, 8051-architecture –instruction sets, addressing modes, memory organizations, assembly language programming, programming interrupts, timers and serial communication.
Unit-4 IOT & EMBEDDED SYSTEM **9 hours**
Introduction to IoT, physical design of IoT, logical design of IoT- functional blocks of IoT, challenges in IoT. Introduction to embedded system, difference between CISC and RISC Architecture, embedded system design methodologies, embedded controller design for communication, digital control.
Unit-5 INTERFACING **9 hours**
Sensors interfacing with embedded controller, ADC, DAC, LCD, weather monitoring system, water monitoring system, line follower robot, distance sensor interface.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Industry Oriented Java-II**				
Course Code	**BCSE3071**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	4	2

Course Objective

This course comprehends the concepts of core java and working principles of Internet, and the knowledge will be enhanced to the client and server side programming and web development.

Course Outcome

CO1	Implement file handling and serialization to store data in to a file
CO2	Apply multithreading in solving Problems.
CO3	Apply collections to solve problems efficiently.
CO4	Implement the Database connectivity using JDBC
CO5	

TEXT BOOKS:

1. Java Black Book, Author: Steven Holzner, Publisher-Coriolis Group Books, 2000

2. Kathy Sierra & Bert Bates, "Head First Java", O'Reilly, 2nd Edition.

3. R. Naughton and H. Schildt –Java2 (The Complete Reference) –Fifth Edition –TMH –2004.

REFERENCE BOOKS:

1. Kathy Sierra and Bert Bates- Head First Java-O'Really Publication

2. K. Arnold and J.Gosling –The Java Programming Language –3rd Edition., Pearson Edu,2005.

3. E Balagurusamy, "Programming with Java A Primer", TMH, 4th edition.

4. David Flanagan –Java in a Nutshell: A Desktop Quick Reference for Java Programmers– O'Reilly & Associates, Inc. 1999.

Days	Topics	Description	Weeks
1	Java-1	Basic Programming Concepts Control Statements OOPs String Arrays Exception Handling Assessment	3
2	Java-2	IO Serialization Multithreading Collection SQL JDBC	

		Assessment	
5	UI	Introduction to web development. What is JEE, Key technologies in JEE, JEE application architecture	2
		Basic code of HTML,CSS Validations with Javascripts	
		Assessment	
6	Servlet Basics	What is a servlet Servlet Lifecycle classes for handling request and response Simple servlet example Working with form data	3
7	Servlet Initialization	Initialization in init Initialization through ServletConfig Initialization through ServletContext	
8	Servlet Communication	sendRedirect()Servlet communication forward() and include() Request Attributes	
		Assessment	
9	Session handling	Session Introduction Ways to maintain state HttpSession, Session Destruction Internal working Session tracking API	
		Assessment	
10	JSP Basics	JSP introduction MVC JSP lifecycle Syntactic Elements of a JSP Page JSP scripting elements Implicit objects JSP directives	2
		Assessment	
11	JSP Standard Action tags	Scriptlets JSP JSP Standard Action tags Java Bean <jsp:useBean> <jsp:forward>, <jsp:include>,<jsp:param>	
		Assessment	

12	Database Connectivity using JSP and Servlet	JSP,Servlet, JDBC	4
		Total Weeks	14

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Name of the Course	**Industry Oriented Python-II**				
Course Code	**BCSE3072**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	4	2	

Course Objective

The objective is to introduce to the learner core programming concepts and equip them to write robust codes and solve complex problems by using procedural, object oriented, data structures and database connectivity concepts in Python.

Course Outcome

CO1	Select decision-making and looping structures in programming, and apply Modular programming approach using methods and functions.
CO2	Incorporate object-oriented programming concept in programming.
CO3	Use of python packages in different data structures.
CO4	Design Python application with database connectivity

List of Exercise (Industrial oriented Python-3)-BCSE2340

1. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
2. Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user. *Hint: how does an even / odd number react differently when divided by 2?*
3. Take a list, and write a program that prints out all the elements of the list that are less than 5.
4. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a *divisor* is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because 26 / 13 has no remainder.)
5. Take two lists, and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.
6. Ask the user for a string and print out whether this string is a palindrome or not. (A **palindrome** is a string that reads the same forwards and backwards.)
7. Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list a and makes a new list that has only the even elements of this list in it.
8. Make a two-player Rock-Paper-Scissors game. (*Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game*)

   Remember the rules:

- Rock beats scissors
- Scissors beats paper
- Paper beats rock

9. Generate a random number between 1 and 9 (including 1 and 9). Ask the user to guess the number, then tell them whether they guessed too low, too high, or exactly right.
10. Take two lists, and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.
11. Ask the user for a number and determine whether the number is prime or not. (For those who have forgotten, a prime number is a number that has no divisors.).
12. Write a program that takes a list of numbers (for example, a = [5, 10, 15, 20, 25]) and makes a new list of only the first and last elements of the given list. For practice, write this code inside a function.
13. Write a program that asks the user how many Fibonnaci numbers to generate and then generates them. Take this opportunity to think about how you can use functions. Make sure to ask the user to enter the number of numbers in the sequence to generate.(*Hint: The Fibonnaciseqence is a sequence of numbers where the next number in the sequence is the sum of the previous two numbers in the sequence. The sequence looks like this: 1, 1, 2, 3, 5, 8, 13, …*)
14. Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates.
15. Write a program (using functions!) that asks the user for a long string containing multiple words. Print back to the user the same string, except with the words in backwards order. For example, say I type the string:
    My name **is** Michele

    Then I would see the string:
    Michele **is** name My

    shown back to me.
16. Write a password generator in Python. Be creative with how you generate passwords - strong passwords have a mix of lowercase letters, uppercase letters, numbers, and symbols. The passwords should be random, generating a new password every time the user asks for a new password. Include your run-time code in a main method.
17. Create a program that will play the "cows and bulls" game with the user. The game works like this:

    Randomly generate a 4-digit number. Ask the user to guess a 4-digit number. For every digit that the user guessed correctly *in the correct place*, they have a "cow". For every digit the user guessed correctly *in the wrong place* is a "bull." Every time the user makes a guess, tell them how many "cows" and "bulls" they have. Once the user guesses the correct number, the game is over. Keep track of the number of guesses the user makes throughout teh game and tell the user at the end.
18. Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.
19. Given a .txt file that has a list of a bunch of names, count how many of each name there are in the file, and print out the results to the screen.
20. Given two .txt files that have lists of numbers in them, find the numbers that are overlapping.
21. Let's say we want to draw game boards that look like this:

    ```
    ---------
    |||
    ---------
    |||
    ---------
    |||
    ---------
    ```

This one is 3x3 (like in tic tac toe). Obviously, they come in many other sizes (8x8 for chess, 19x19 for Go, and many more).

Ask the user what size game board they want to draw, and draw it for them to the screen using Python's print statement.

22. You, the user, will have in your head a number between 0 and 100. The program will guess a number, and you, the user, will say whether it is too high, too low, or your number.At the end of this exchange, your program should print out how many guesses it took to get your number.
23. Given a 3 by 3 list of lists that represents a Tic Tac Toe game board, tell me whether anyone has won, and tell me which player won, if any. A Tic Tac Toe win is 3 in a row - either in a row, a column, or a diagonal. Don't worry about the case where TWO people have won - assume that in every board there will only be one winner.
24. Implement a function that takes as input three variables, and returns the largest of the three. Do this without using the Python max() function!.
25. Let's continue building Hangman. In the game of Hangman, a clue word is given by the program that the player has to guess, letter by letter. The player guesses one letter at a time until the entire word has been guessed. (In the actual game, the player can only guess 6 letters incorrectly before losing).
26. For this exercise, we will keep track of when our friend's birthdays are, and be able to find that information based on their name. Create a dictionary (in your file) of names and birthdays. When you run your program it should ask the user to enter a name, and return the birthday of that person back to them.
27. Write a Program to print an appropriate message if the number is positive.
28. Program to find the sum of all numbers stored in a list.
29. Program to iterate through a list using indexing.
30. Take values of length and breadth of a rectangle from user and check if it is square or not.
31. Take two int values from user and print greatest among them.
32. A school has following rules for grading system:
    a. Below 25 - F
    b. 25 to 45 - E
    c. 45 to 50 - D
    d. 50 to 60 - C
    e. 60 to 80 - B
    f. Above 80 - A
    Ask user to enter marks and print the corresponding grade.
33. A student will not be allowed to sit in exam if his/her attendence is less than 75%.
    Take following input from user
    Number of classes held
    Number of classes attended.
    And print
    percentage of class attended
    Is student is allowed to sit in exam or not.
34. Create a simple calculator which can perform basic arithmetic operations like addition, subtraction, multiplication or division depending upon the user input.
    Approach :
    - User choose the desired operation. Options 1, 2, 3 and 4 are valid.
    - Two numbers are taken and an if…elif…else branching is used to execute a particular section.

- Using functions add(), subtract(), multiply() and divide() evaluate respective operations.

35. WAP to construct list of countries and using list comprehension write the initial letter of the countries.
36. Create a list with multiple programming language and display I
37. Love “Programming Language” for each entry.
38. Write a program to check if a year is leap year or not.
    If a year is divisible by 4 then it is leap year but if the year is century year like 2000, 1900, 2100 then it must be divisible by 400.
39. A 4 digit number is entered through keyboard. Write a program to print a new number with digits reversed as of orignal one. E.g.-
    INPUT : 1234 OUTPUT : 4321
    INPUT : 5982 OUTPUT : 2895
40. Consider a list (list = []). You can perform the following commands:
    - insert i e: Insert integer at position .
    - print: Print the list.
    - remove e: Delete the first occurrence of integer .
    - append e: Insert integer at the end of the list.
    - sort: Sort the list.
    - pop: Pop the last element from the list.
    - reverse: Reverse the list.

    Initialize your list and read in the value of followed by lines of commands where each command will be of the types listed above. Iterate through each command in order and perform the corresponding operation on your list.
41. Given an integer, , and space-separated integers as input, create a tuple, , of those integers. Then compute and print the result of .
    Note: hash() is one of the functions in the __builtins__ module, so it need not be imported.
42. . Write a Python program to replace last value of tuples in a list.
    Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]
    Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]
43. Write a Python script to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
    Sample Dictionary (n = 5) :
    Expected Output : {1: 1, 2: 4, 3: 9, 4: 16, 5: 25}
44. In ATM, there are notes of 100, 500 and 1000. User specifies how many notes of each currency, that are to be withdrawn. Calculate the total amount withdrawn.
45. To calculate electricity bill based on following information:

Consumption unit	**Rate of charge**
0-150	Rs. 3 per nit
151-350	Rs. 100 plus Rs. 3.75 per unit exceeding 150 units
301-450	Rs. 250 plus Rs. 4 per unit exceeding 350 units
451-600	Rs. 300 plus Rs. 4.25 per unit exceeding 450 units
Above 600	Rs. 400 plus Rs. 5 per unit exceeding 600 unit

46. ARS Gems Store sells different varieties of gems to its customers. Write a Python program to calculate the bill amount to be paid by a customer based on the list of gems and quantity purchased. Any purchase with a total bill amount above Rs.30000 is entitled for 5% discount. If any gem required by the customer is not available in the store, then consider total bill amount to be -1. Assume that quantity required by the customer for any gem will always be greater than 0. Perform case-sensitive comparison wherever applicable.

47. Write a python program to generate the ticket numbers for specified number of passengers traveling in a flight as per the details mentioned below:
The ticket number should be generated as **AI : src : dest : number** where AI is the value for airline, src and dest should be the first three characters of the source and destination cities, number should be auto-generated starting from 101. Write a program to return the list of ticket numbers of last five passengers.
Note: If passenger count is less than 5, return the list of all generated ticket numbers.

Sample Input	**Expected Output**
airline = AI source = Bangalore destination = London no_of_passengers = 10	['AI:Ban:Lon:106', 'AI:Ban:Lon:107', 'AI:Ban:Lon:108', 'AI:Ban:Lon:109', 'AI:Ban:Lon:110']
airline = BA source = Australia destination = France no_of_passengers = 2	['BA:Aus:Fra:101', 'BA:Aus:Fra:102']

48. The road transport corporation (RTC) of a city wants to know whether a particular bus-route is running on profit or loss.

Assume that the following information are given:
Price per litre of fuel = 70
Mileage of the bus in km/litre of fuel = 10
Price(Rs) per ticket = 80

The bus runs on multiple routes having different distance in kms and number of passengers. Write a function to calculate and return the profit earned (Rs) in each route. Return -1 in case of loss.

49. A teacher is in the process of generating few reports based on the marks scored by the students of her class in a project based assessment.

Assume that the marks of her 10 students are available in a tuple. The marks are out of 25.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	0	50	100

Semester 5

Name of the Course	**Design & Analysis of Algorithms**			
Course Code	**BCSE3510**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective

The primary objective of this course is to introduce the topic of algorithms as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs. The course consists of a strong mathematical component in addition to the design of various algorithms.

Course Outcome

CO1	Analyze the complexity of the algorithms and use technique divide and conquer to solve the problems
CO2	Identify feasible solutions for different problems through greedy method and minimize the solutions space and to solve the problems through dynamic programming.
CO3	Solve the problems through graph algorithms.
CO4	Justify that a certain problem is NP-Complete
CO5	Understand and apply linear programming concepts to real time applications.

Text Book (s)

1	Micheal T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples (John Wiley &Sons, Inc., 2002).
2	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran. Fundamentalas of Computer
3	Algorithms Algorithms, MIT Press, Second Edition (Indian reprint: Prentice-Hall), 2008.

Reference Book (s)

1	Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, The MIT Press, 3rd edition, 2009.
2	RCT Lee, SS Tseng, RC Chang and YT Tsai, “Introduction to the Design and Analysis of Algorithms”, Mc Graw Hill, 2005.
3	Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education.

Course Content:

Unit-1 Introduction	**9 hours**

Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.
Unit-2 Tree **9 hours**
Advanced Data Structures: Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.
Unit-3 Algorithm **9 hours**
Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples Huffman Coding, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.
Unit-4 Dynamic Programming **9 hours**
Dynamic programming with examples such as Knapsack, All pair shortest paths – Warshal's andFloyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.
Unit-5 Computations **9 hours**
Selected Topics: Algebraic Computation, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Compiler Design**			
Course Code	**BCSE3520**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective

The goal of the course is to provide an introduction to the system software like assemblers, compilers, and macros. It provides the complete description about inner working of a compiler. This course focuses mainly on the design of compilers and optimization techniques. It also includes the design of Compiler writing tools. This course also aims to convey the language specifications, use of regular expressions and context free grammars behind the design of compiler.

Course Outcome

CO1	Use language specifications behind the design of compiler.
CO2	Construct LL, SLR, CLR and LALR parsing table.
CO3	Evaluate different intermediate codes.
CO4	Implement different data structure and allocation schemes for symbol table.
CO5	Apply modern tools and technologies for designing new compiler.

Text Book (s)

1	Alfred V Aho, Jeffrey D. Ullman, “Principles of Compiler Design”, Narosa Publishing House, 2002.
2	Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Addison Wesley; 2nd edition, 2006.

Reference Book (s)

1	V Raghvan, “Principles of Compiler Design”, TMH, 2011.
2	Kenneth Louden,” Compiler Construction”, Cengage Learning, 2002.
3	Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education,1991.

Course Content:

Unit-1 Introduction	**9 hours**
Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers, implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	
Unit-2 Basic Parsing Techniques	**9 hours**
Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, prdictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR (0) items, constructing SLR	

parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, and implementation of LR parsing tables.
Unit-3 Syntax Directed Translation **9 hours**
Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declaration sand case statements.
Unit-4 Symbol Table **9 hours**
Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.
Unit-5 Code Generation **9 hours**
Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Software Engineering			
Course Code	BCSE3530			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

The scope of the course is concerns with the stages of the software engineering process, including requirements gathering, specification, design, implementation, and testing. Students will learn the various the testing techniques.

Course Outcome

CO1	Understand the key concerns that are common to all software development processes.
CO2	Able to select appropriate process models, approaches and techniques to manage a given software development process.
CO3	Able to elicit requirements for a software product and translate these into a documented design.
CO4	Recognize the importance of software reliability and how we can design dependable software, and what measures are used.
CO5	Understand the principles and techniques underlying the process of inspecting and testing software and making it free of errors and tolerable.

Text Book (s)

1	Software Engineering: A practitioner's Approach, Roger S Pressman, Sixth Edition. McGrawHill International Edition, 2005.
2	Software Engineering: Ian Sommerville, Seventh Edition, Pearson Education, 2004.

Reference Book (s)

1	Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.
2	Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
3	Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
4	Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

Unit-1 Introduction to Software Engineering **9 hours**
Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.
Unit-2 Software Requirement Specifications (SRS) and Design **9 hours**

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review andManagement of User Needs, Feasibility Study, Information Modeling, Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization,Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, DesignStrategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-UpDesign Data Flow Diagrams,Entity Relationship Diagrams.
Unit-3 Software Testing 9 hours
Testing Objectives ,Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.
Unit-4 Software Testing Methods and Selection 9 hours
Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Integration Testing, , Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up, Acceptance Testing ,Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Regression testing, Regression test process, Initial Smoke or Sanity test, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.
Unit-5 Software Project and Test Management 9 hours
Software as an Evolutionary Entity, Need for Maintenance, Categories of maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Constructive Cost Models (COCOMO). Test Planning, Management, Execution and Reporting, Software Test Automation: Testing in Object Oriented Systems.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Introduction to Cyber Security**				
Course Code	**BCSE3540**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objective

This course provides knowledge on the various cyber threats and attacks. To learn the cyber security policies and crime laws.

Course Outcome

CO1	Know the fundamental mathematical concepts related to security.
CO2	Understand and implement the cryptographic techniques and know the real time applications of various cryptographic techniques.
CO3	Comprehend the authenticated process and integrity, and its implementation.
CO4	Know fundamentals of cybercrimes and the cyber offenses.
CO5	Understand the cyber threats, attacks and vulnerabilities and its defensive mechanism.

Text Book (s)

1	Cryptography and Network security, William Stallings, Pearson Education, 7th Edition, 2016.
2	Cyber Security, Understanding cyber crimes, computer forensics and legal perspectives, Nina Godbole, Sunit Belapure, Wiley Publications, Reprint 2016.
3	Writing Information Security Policies, Scott Barman, New Riders Publications, 2002.

Reference Book (s)

1	Cybersecurity for Dummies, Brian Underdahl, Wiley, 2011
2	Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, Mcgraw Hill Education, 2 nd Edition, 2011.

Course Content:

Unit-1 Introduction **9 hours**
Finite Fields and Number Theory: Modular arithmetic – Euclidian Algorithm – Primality Testing – Fermat's and Euler's theorem –Chinese Reminder theorem – Discrete Logarithms
Unit-2Cryptographic Techniques **9 hours**
Symmetric key cryptographic techniques: Introduction to Stream cipher – Block cipher: DES – AES- IDEA. Asymmetric key cryptographic techniques: principles – RSA – ElGamal - Elliptic Curve cryptography – Key distribution and Key exchange protocols.
Unit-3 Authentication and Cybercrimes **9 hours**
Hash functions – Secure Hash Algorithm (SHA) Message Authentication – Message Authentication Code (MAC) – Digital Signature Algorithm: RSA & ElGamal based Classification of cybercrimes – planning of attacks – social engineering: Human based – Computer based – Cyberstalking – Cybercafe and Cybercrimes
Unit-4 Cyber Threats, Attacks and Prevention **9 hours**
Phishing – Password cracking – Keyloggers and Spywares – DoS and DDoS attacks – SQL Injection. Identity Theft (ID) : Types of identity theft – Techniques of ID theft.

Unit-5 Cybersecurity Policies and Practices	**9 hours**
What security policies are – determining the policy needs – writing security policies – Internet and email security policies – Compliance and Enforcement of policies- Review	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Advanced Java Programming**			
Course Code	**BCSE3550**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	1	0	6	4

Course Objective

Basics of Object Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Outcome

CO1	Demonstrate best practices in designing classes and class hierarchies from problem statements using sub-classing, abstract classes, and interfaces to achieve polymorphism in Java.
CO2	Demonstrate the use of encapsulation along with inner, anonymous class and packages.
CO3	Apply exception handling, generation and escalation mechanisms and practices in writing Java programs.
CO4	Describe and implement the Database Handling using Java.
CO5	Practice self documentation and consistent coding style in writing programs.

Text Book (s)

1	Kathy Sierra, and Bates Bert. Head First Java: A Brain-Friendly Guide. " O'Reilly Media, Inc.", Second Edition, 2009.
2	James Rumbaugh et. al, “Object Oriented Modeling and Design”, Prentice-Hall; 1st edition, 1990.

Reference Book (s)

1	Naughton, Schildt, “The Complete Reference JAVA2”, TMH, 3rd Edition, 1999.
2	Kathy Sierra, and Bates Bert. Sun Certified Programmer for Java. McGraw Hill Publications, 2008.
3	Pandey, Tiwari, “ Object Oriented Programming with JAVA” , Acme Learning Private Limited;
4	Horstmann, Cay S., and Gary Cornell. Core Java 2: Volume I, Fundamentals. Pearson Education

Course Content:

Unit-1 Introduction	**9 hours**
Declare and initialize variables (including casting of primitive data types),Define the scope of variables, Define the structure of a Java class, Create executable Java applications with a main method; run a Java program from the command line; including console output. Import other Java packages to make them accessible in your code. Compare and contrast the features and components of Java such as: platform independence, object orientation, encapsulation, etc. Differentiate between object reference variables and primitive variables. Read or write to object fields, Object’s Lifecycle (creation, “dereference by reassignment” and garbage collection), JAR files.	

Unit-2 Operators and Object oriented Concepts	**9 hours**
Java operators; including parentheses to override operator precedence, Test equality between Strings and other objects using == and equals (),Create if and if/else and ternary constructs, Use a switch statement, Declare, instantiate, initialize and use a one-dimensional array, Declare, instantiate, initialize and use multi-dimensional array, Create and use while loops, Create and use for loops including the enhanced for loop, Create and use do/while loops, Compare loop constructs, Use break and continue. Create methods with arguments and return values; including overloaded methods, Apply the static keyword to methods and fields, Create and overload constructors; including impact on default constructors, Apply access modifiers, Apply encapsulation principles to a class, Determine the effect upon object references and primitive values when they are passed into methods that change the values, Wrapper class, Develop code that uses wrapper classes such as Boolean, Double, and Integer.	
Unit-3 Inheritance and Exception Handling	**9 hours**
Inheritance and its benefits, Develop code that demonstrates the use of polymorphism; including overriding and object type versus reference type. Determine when casting is necessary. Use super and this to access objects and constructors, Use abstract classes and interfaces. Differentiate among checked exceptions, unchecked exceptions, and Errors. Create a try-catch block and determine how exceptions alter normal program flow, Describe the advantages of Exception handling, Create and invoke a method that throws an exception, Recognize common exception classes (like NullPointerException, ArithmeticExcpetion, ArrayIndexOutOfBoundsException, ClassCastException). Manipulate data using the StringBuilder class and its methods, Creating and manipulating Strings, Create and manipulate calendar data using classes from java.time package.	
Unit-4 Threads and Collections	**9 hours**
Inner classes, Anonymous class, Multi threading, Collection, Applets, Java APIs, Java Beans: Application Builder tools, The bean developer kit(BDK), Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).	
Unit-5 Advanced Java	**9 hours**
Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application. Event Handling. Develop a game using event handling and AWT/swing. JDBC, The connectivity model, JDBC/ODBC Bridge. Develop application using AWT/Swing and JDBC.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Compiler Design Lab**			
Course Code	**BCSE3521**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objective

The goal of the course is to provide an introduction to the system software like assemblers, compilers, and macros. It provides the complete description about inner working of a compiler. This course focuses mainly on the design of compilers and optimization techniques. It also includes the design of Compiler writing tools. This course also aims to convey the language specifications, use of regular expressions and context free grammars behind the design of compiler.

Course Outcome

CO1	Understand how to design a compiler.
CO2	Construct LL, SLR, CLR and LALR parsing table.
CO3	Evaluate different intermediate codes.
CO4	Implement different data structure and allocation schemes for symbol table.
CO5	Apply modern tools and technologies for designing new compiler.

Reference Book (s)

1	V Raghvan, “Principles of Compiler Design”, TMH, 2011.
2	Kenneth Louden,” Compiler Construction”, Cengage Learning, 2002.
3	Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education,1991.

List of Experiments	
1	Design a Lexical analyzer for identifying different types of token used in C language.
2	Write a program to find first and follow of a given string.
3	Write a program to implement left recursion of a given grammar.
4	Write a program to implement left factoring.
5	Write a program to implement 3 address code.
6	Write a program to implement Predictive Parser. Write a C program
7	Write a Program to Design Lexical Analyzer.
8	Write a program to Design LALR Bottom up Parser.
9	Convert The BNF rules into Yacc form and write code to generate abstract syntax tree.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	0	50	100

Name of the Course	Software Engineering Lab				
Course Code	BCSE3531				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objective

This course presents software engineering techniques and explains the software development life-cycle, including software specification, Requirement analysis, design implementation, testing and maintenance. This course covers on past and current trends in software development practices.

Course Outcome

CO1	Describe principles, concepts and practice of software engineering.
CO2	Explain the methods and processes of constructing the different types of software systems.
CO3	Describe Software design and Engineering process
CO4	Explain testing strategies of software projects and quality of software systems

Reference Book (s)

1	Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.
2	Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
3	Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
4	Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

List of Experiments	
1	Phases in software development project, overview, need, coverage of topics
2	To assign the requirement engineering tasks
3	To perform the system analysis : Requirement analysis, SRS
4	To perform the function oriented diagram : DFD and Structured chart
5	To perform the user's view analysis : Use case diagram
6	To draw the structural view diagram : Class diagram, object diagram
7	To draw the behavioral view diagram : Sequence diagram, Collaboration diagram
8	To draw the behavioral view diagram : State-chart diagram, Activity diagram
9	To draw the implementation view diagram: Component diagram
10	To draw the environmental view diagram : Deployment diagram
11	To perform various testing using the testing tool unit testing, integration testing

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	0	50	100

Semester 6

Name of the Course	**Campus to Corporate**			
Course Code	**SLBT3032**			
Prerequisite	**Completion of Semester 5**			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objective

1. To assess the current level of students.
2. To give a real time GD, Interview practice to the students.
3. To prepare students for technical interviews
4. To prepare the students for the placement process and future career prospects

Course Outcome

CO1	Able to analyse self and make necessary corrections
CO2	Able to recognize and make use of the strengths
CO3	Able to structure and express their thoughts during interviews , GD and presentations
CO4	Able to develop skills for career enhancement

Text Book

SLLL own text book

Reference Books

1. Delivering Employability Skills in the Lifelong Learning Sector by Ann Gravells, ISBN-10: 1844452956
2. Sample Papers of Various companies
3. Real world HR interviews from companies across various sectors like IT, ITES, Manufacturing, etc. in and around NCR region.

Course Catalogue

Practice makes a man perfect – so says the wise man. The course in this semester hence, focuses on the practice of company sample papers along with mock interviews – general, technical and HR. It aims to give a holistic approach to a student's final preparation.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Computer Graphics			
Course Code	BCSE3610			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

This course focuses on 2D and 3D interactive and non-interactive graphics. This course studies the principles underlying the generation and display of 2D and 3D computer graphics. In this course topics include geometric modeling, 3D viewing and projection, lighting and shading, color, and the use of one or more technologies and packages such as OpenGL, and Blender. Course requirements usually include exam and several programming or written homework assignments.

Course Outcome

CO1	To understand the principles, commonly used paradigms and techniques of computer graphics. e.g. the graphics pipeline, and Bresenham's algorithm for speedy line and circle generation.
CO2	Be able to understand 2D graphics concepts in the development of computer games, information visualization, and business applications.
CO3	To develop a facility with the relevant mathematics of 3D graphics like projection, clipping and transformation
CO4	Be able to understand the representation of non linear shapes. E. g. Curves, hidden surfaces.
CO5	Be able to develop animations like motion sequence, morphing and illustrating models for lighting/shading.

Text Book (s)

1	Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education, India; 2 edition 2002.
2	Computer Graphics Principles and Practice, Second Edition in C, James D.Foley, Andries Van Dam, Steven K.Feiner, Jhon F.Hughes, Addison Wesley, Third Edition, 2014.

Reference Book (s)

1	Steven Harrington, "Computer Graphics: A Programming Approach" , McGraw-Hill Inc.,US; 2nd Revised edition edition, 1983.
2	David Rogers, " Procedural Elements of Computer Graphics", McGraw Hill Education; 2 edition, 2017.

Course Content:

Unit-1 Introduction	**9 hours**
Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Midpoint circle generating algorithm, and parallel version of these algorithms.	
Unit-2 Transformations	**9 hours**
Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.	

Unit-3 Three Dimensional	**9 hours**
3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.	
Unit-4 Curves and Surfaces	**9 hours**
Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	
Unit-5 Hidden Lines and Illumination models	**9 hours**
Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Web Technologies**			
Course Code	**BCSE3620**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective

Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's. Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services.

Course Outcome

CO1	Understand basic web concepts and Internet protocols.
CO2	Understand CGI Concepts & CGI Programming.
CO3	Analyze Scripting Languages.
CO4	Analyze Scripting Languages.
CO5	Design SERVELETS AND JSP.

Text Book (s)

1	Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2	Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
3	Paul Dietel and Harvey Deitel,"Java How to Program", Prentice Hall India Learning Private Limited

Reference Book (s)

1	Mahesh P. Matha, "Core Java A Comprehensive study", Prentice Hall of India, 2011.
2	Uttam K.Roy, "Web Technologies", Oxford University Press, 2011.

Course Content:

Unit-1 Introduction **9 hours**
Internet Principles – Basic Web Concepts – Client/Server model – retrieving data from Internet – HTML and Scripting Languages – Standard Generalized Mark –up languages – Next Generation – Internet –Protocols and Applications.
Unit-2 Common Gateway Interface Programming **9 hours**
HTML forms – CGI Concepts – HTML tags Emulation – Server – Browser Communication – E-mail generation – CGI client Side applets – CGI server applets – authorization and security.
Unit-3 Scripting Languages **9 hours**
Dynamic HTML-Cascading style sheets-Object model and Event model- Filters and Transitions-Active X Controls-Multimedia-Client side script - VB Script programming – Forms – Scripting Object.
Unit-4 Server side Programming **9 hours**
XML – Server side includes – communication – DTD – Vocabularies – DOM methods – Firewalls– Proxy Servers.
Unit-5 SERVELETS AND JSP **9 hours**
JSP Technology Introduction-JSP and Servelets- Running JSP Applications Basic JSP- JavaBeans Classes and JSP-Tag Libraries and Files- Support for the Model- View- Controller Paradigm- Case Study- Related Technologies.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Computer Graphics Lab**				
Course Code	**BCSE3611**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objective:

This Course is a study of the hardware and software principles of interactive raster graphics. Topics includes an introduction to the basic concepts, 2-D and 3-D modelling and transformations, viewing transformations, projections, rendering techniques, solid modelling, graphical software packages achromatic light and colored light and Graphics System. Students will use a standard computer API to reinforce concepts and study fundamental computer graphics algorithms

Course Outcome

CO1	Create interactive graphics applications using one or more graphics application programming interfaces.
CO2	Learn about graphics packages and displaying techniques.
CO3	Learn about geometrical transformations.

Text Book (s)

Reference Book (s)

1	Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education, India; 2 edition 2002.
2	Computer Graphics Principles and Practice, Second Edition in C, James D.Foley, Andries Van Dam, Steven K.Feiner, Jhon F.Hughes, Addison Wesley, Third Edition, 2014.

List of Experiments	
1	Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)
2	2D Geometric transformations – Translation Rotation Scaling Reflection Shear Window-Viewport
3	Composite 2D Transformations
4	3D Transformations - Translation, Rotation, Scaling.
5	3D Projections – Parallel, Perspective.
6	Creating 3D Scenes.
7	Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
8	2D Animation – To create Interactive animation using any authoring tool

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	0	50	100

Name of the Course	**Web Technologies Lab**			
Course Code	**BCSE3621**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objective

This course is to apply the concepts of web programming in a practical approach; the emphasis of this course is on techniques of web programs development within the structure and object-oriented paradigm. Implementation of programs includes HTML static pages, CSS, JavaScript, XML, and PHP with database interactions.

Course Outcome

CO1	Create a fully functional website with database interactions
CO2	Use PHP languages features effectively and implement solutions using PHP languages.
CO3	Analyze Scripting Languages.

Reference Book (s)

1	Deitel H.M. and Deitel P.J., “Internet and World Wide Web How to program”, Pearson International, 2012, 4th Edition.
2	Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
3	Paul Dietel and Harvey Deitel,”Java How to Program”, Prentice Hall India Learning Private Limited

List of Experiments	
1	Creation college website
2	Working on CSS
3	Client side validations using javascript
4	Working on jQuery effects
5	Display Library information using XML
6	User Authentication User authentication through cookies User authentication through sessions
7	Working with MySQL database
8	Create a table which should contain at least the following fields: name, password, email-id, phone number.
9	Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

10	Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page
11	Insert the details of the 3 or 4 users who register with the web site (week8) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.
12	Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Create catalogue page in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP
13	Implementation of stateful HTTP (HTTP is a stateless protocol). Session is required to maintain the state.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	0	50	100

Basket-1

Name of the Course	**Introduction to Cloud Computing**				
Course Code	**BCSE9010**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objective

1. Understand the Importance of Virtualization in Cloud.
2. Gain knowledge on Cloud Computing
3. Understands Cloud Delivery and Cloud Deployment models

Course Outcome

CO1	To Understand the Importance of Virtualization in Cloud.
CO2	To Introduce the Cloud deployment models and Cloud delivery models
CO3	To Learn the stepping stones for the development of cloud
CO4	To Learn the Decision Factors for Cloud Implementations
CO5	To Understands the Public, Private and Hybrid Cloud

Text Book (s)

1. Introduction to Virtualization and Cloud Computing by IBM ICE Publication
2. IBM Redbooks | System x Virtualization Strategies
3. PowerVM Virtualization on IBM System p: Introduction and Configuration Fourth Ed.

Reference Book (s)

1. Gruman, Galen (2008-04-07). "What cloud computing really means". InfoWorld.
2. "What is Cloud Computing?". Amazon Web Services. 2013-03-19.
3. "Baburajan, Rajani, "The Rising Cloud Storage Market Opportunity Strengthens Vendors," infoTECH, August 24, 2011". It.tmcnet.com. 2011-08-24. Retrieved 2011-12-02.

Course Content:

Unit-1: Introduction to Virtualization	**8 hours**
Traditional IT Infrastructure, Benefits of Virtualization, Types of Virtualization, History of Virtualization.	
Unit II: Server, Storage, Network and Application Virtualization	**8 hours**
Types of Server Virtualization, Hypervisors, Anatomy of Server Virtualization, Benefits of Storage Virtualization, Types of Storage Virtualization, VPN, VLAN, Benefits of Application Virtualization	
Unit III : Information System	**8 Hours**
Cloud Delivery Models Decision Factors for Cloud Implementations, Public, Private and Hybrid Cloud, Overview,Infrastructure as a Service (IaaS) Cloud Delivery Model, Platform as a Service (PaaS) Cloud Delivery Model, Software as a Service (SaaS) Cloud Delivery Model	
Unit IV : Cloud Implementations / Cloud Deployment Models	**9 Hours**
Cloud Delivery Models Decision Factors for Cloud Implementations, Public, Private and Hybrid Cloud, Overview,Infrastructure as a Service (IaaS) Cloud Delivery Model, Platform as a Service (PaaS) Cloud Delivery Model, Software as a Service (SaaS) Cloud Delivery Model	
Unit V : Case Study On Virtualization, Cloud Workloads	**8 Hours**
Customer IT Landscape, Triggers of Virtualization, Preparation for Virtualization, Transition Tools for Virtualization, Cost savings , Cloud workload Overview, Workloads most suitable for Cloud, Workloads not suitable for Cloud.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Cloud Architecture and Computing				
Course Code	BCSE9001				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	6	3

Course Objective

1. To understand the differences between traditional deployment and cloud computing
2. To determine whether existing applications to the cloud makes technical and business sense
3. To analyze and compare the long-term costs of cloud services
4. To learn how to build a transactional web application for the cloud or migrate one to it

Course Outcome

CO1	Understand the basics of cloud architecture.
CO2	Analyze the requirement analysis and end to end design.
CO3	Design and develop industry related applications.
CO4	Investigate the privacy design issues in cloud applications.
CO5	Design scalable architecture.

Text Book (s)

1. Michael J. Kavis, "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", Wiley; 1 edition, January- 2014.
2. John Rhoton ,Cloud Computing Explained: Handbook for Enterprise Implementation 2013 edition, 2013, recursive press

Reference Book (s)

1. Reese, G. (2009). Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. Sebastopol, CA: O'Reilly Media, Inc. (2009).
2. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi,Mastering Cloud Computing: Foundations and Applications Programming,MorganKaufmann,,Elsevier publication, 2013
3. Thomas Erl, ZaighamMahmood, and Ricardo Puttini,Cloud Computing Concepts, Technology

Course Content:

Unit-1: Introduction	**8 hours**
Requirement analysis: strategic alignment and architecture development cycle-strategic impact-Risk impact-financial impact-Business criteria-technical criteria-cloud opportunities –evaluation criteria and weight-End to end design-content delivery networks-capacity planning-security architecture and design	
Unit II: End-to-End Design	**8 hours**
Requirement analysis: strategic alignment and architecture development cycle-strategic impact-Risk impact-financial impact-Business criteria-technical criteria-cloud opportunities –evaluation criteria and weight-End to end design-content delivery networks-capacity planning-security architecture and design	
Unit III : Cloud Application and Architecture	**8 Hours**
Development environments for service development; Amazon, Azure, Google App-cloud platform in industry	
Unit IV : How to Move Towards the Cloud Application	**8 Hours**
Web Application Design- Machine Image Design-privacy design –Database management	
Unit V : Specialized Cloud Architecture	**8 Hours**

Workload distribution architecture-Dynamic scalability-Cloud bursting-hypervisor clustering-service quality metrics & SLA.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Cloud Storage and Computing			
Course Code	BCSE9020			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

1. To learn cloud computing basic.
2. To learn about cloud storage and security.
3. To learn about optimization of cloud storage.
4. To know about various cloud service provider.

Course Outcome

CO1	Understand the models and evolution of cloud.
CO2	Design secure solutions in virtualized and cloud environments.
CO3	Solve the issues in network design.
CO4	Analyze the various cloud storage mechanisms.
CO5	Investigate different cloud service providers.

Text Book (s)

1. Justin Garrison, Kris Nova, "Cloud Native Infrastructure", O'Reilly Media; 1 edition, November, 2017.

2. Distributed and Cloud Computing, Kai Hwang, GeofferyC.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Brobergand Andrzej M. Goscinski, Wiley, 2011.

Reference Book (s)

1. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly, SPD, 2011.
2. Cloud Computing Bible. Barrie Sosinsky. John Wiley & Sons. ISBN-13: 978-0470903568.
3. Amazon Web Services For Dummies. Bernard Golden. For Dummies. ISBN-13: 978-18571835.
4. RajkumarBuyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition.

Course Content:

Unit-1: Cloud Computing	**8 hours**
Introduction to the Cloud Computing, History of cloud computing, Cloud service options, Cloud Deployment models, Business concerns in the cloud, Exploring virtualization, Load balancing, Hypervisors, Machine imaging, Cloud marketplace overview, Comparison of Cloud providers.	
Unit II: Information Storage Security & Design	**8 hours**
Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments.Monitoring and management; security auditing and SIEM.	
Unit III : Storage Network Design	**8 Hours**
Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.	
Unit IV : Optimization of Cloud Storage	**8 Hours**

Global storage management locations, scalability, operational efficiency.Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attitudes; file systems or object storage.
Unit V : Cloud Service Provider **8 Hours**
Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,Service, Microsoft Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, ServiceCloud: Knowledge as a Service, Rack space, VMware, Manjra soft Aneka Platform.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Cloud Application Development				
Course Code	BCSE9002				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	6	3

Course Objective

1. Use best practices in the design and development of elegant and flexible cloud software solutions.
2. Create, implement and deploy a cloud/LAMP based application.
3. Analyze a real world problem and develop a cloud/LAMP based software solution.
4. Contrast software development in the web, cloud and others.

Course Outcome

CO1	Understand the cloud ecosystem.
CO2	Design code for the cloud.
CO3	Use web development techniques and frameworks.
CO4	Provide cloud services.
CO5	Discuss the case studies.

Text Book (s)

1. Ray J. Rafaels, "Cloud Computing: From Beginning to End", CreateSpace Independent Publishing Platform, April, 2015.
2. Chris Hay, Brian Prince, "Azure in Action" Manning Publications [ISBN: 978-1935182481], 2010.
3. Henry Li, "Introducing Windows Azure" Apress; 1 edition [ISBN: 978-1-4302-2469-3], 2009.

Reference Book (s)

1. Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform" Microsoft Press; 1edition [ISBN: 9780735656062],2010.
2. Eugene Ciurana, "Developing with Google App Engine" Apress; 1 edition [ISBN: 978-1430218319],2009.
3. Charles Severance, "Using Google App Engine" O'Reilly Media; 1 edition, [ISBN: 978-059680069]
4. Dan Sanderson, "Programming Google App Engine" O'Reilly Media; 1 edition [ISBN: 978-059642]

Course Content:

Unit-1: Cloud Based Applications	**8 hours**
Introduction, Contrast traditional software development and development for the cloud. Public vs private cloud apps. Understanding Cloud ecosystems – what is SaaS/PaaS, popular APIs, mobile.	
Unit II: Designing Code for the Cloud Environment	**8 hours**
Class and Method design to make best use of the Cloud infrastructure; Web Browsers and the Presentation Layer: Understanding Web browsers attributes and differences. Building blocks of the presentation layer: HTML, HTML5, CSS, Silverlight, and Flash.	
Unit III : Web Development Techniques and Frameworks	**8 Hours**
Building Ajax controls, introduction to Javascript using JQuery, working with JSON, XML, REST. Application development Frameworks e.g. Ruby on Rails , .Net, Java API's or JSF; Deployment Environments – Platform As A Service (PAAS) ,Amazon, vmForce, Google App Engine, Azure, Heroku, AppForce.	
Unit IV : Case 1: Building an Application Using the Lamp Stack	**8 Hours**

Setting up a LAMP development environment. Building a simple Web app demonstrating an understanding of the presentation layer and connectivity with persistence.
Unit V : Case 2: Developing and Deploying an Application in the Cloud 8 Hours
Building on the experience of the first project students will study the design, development, testing and deployment of an application in the cloud using a development framework and deployment platform.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Cloud Security				
Course Code	BCSE9030				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objective

1. Compare modern security concepts as they are applied to cloud computing
2. Assess the security of virtual systems
3. Evaluate the security issues related to multi-tenancy
4. Appraise compliance issues that arise from cloud computing.

Course Outcome

CO1	Understand the security concepts in cloud.
CO2	Describe the Multi-Tenancy issues.
CO3	Differentiate various attacks.
CO4	Use enhanced security techniques.
CO5	Solve compliance issues in cloud security.

Text Book (s)

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing 1st Edition, Kindle Edition", Wiley, 2010.
2. Tim Mather, SubraKumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.

Reference Book (s)

1. John Rittinghouse, James Ransome, "Cloud Computing" CRC Press; 1 edition [ISBN: 1439806802], 2009.
2. J.R. ("Vic") Winkler, "Securing the Cloud" Syngress [ISBN: 1597495921] 2011.
3. Cloud Security Alliance, "Security Guidance for Critical Areas of Focus in Cloud Computing" 2009
4. Vmware "VMware Security Hardening Guide" White Paper, June 2011.

Course Content:

Unit-1: Introduction	**8 hours**
Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.	
Unit II: Multi-Tenancy Issues	**8 hours**
Isolation of users/VMs from each other. How the cloud provider can provide this; Virtualization System Security Issues- e.g. ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; Virtualization System Vulnerabilities- Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware (botnets etc).	
Unit III : Virtualization System-Specific Attacks	**8 Hours**

Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyperjacking.
Unit IV : Technologies for Virtualization-Based Security 8 Hours
IBM security virtual server protection, virtualization-based sandboxing; Storage Securitys- HIDPS, log management, Data Loss Prevention. Location of the Perimeter.
Unit V : Legal and Compliance Issues 8 Hours
Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Basket-2

Name of the Course	**Foundations of Data Science**				
Course Code	**BCSE9040**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objective

1. Able to apply fundamental algorithmic ideas to process data.
2. Learn to apply hypotheses and data into actionable predictions.
3. Document and transfer the results and effectively communicate the findings using visualization techniques.

Course Outcome

CO1	To understand the basic concept of cloud computing.
CO2	To describe the virtualization fundamentals in cloud.
CO3	To use SAAS and PAAS in cloud environment.
CO4	To compare various cloud storage mechanisms.
CO5	To develop applications in cloud.

Text Book (s)

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.

Reference Book (s)

1. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
2. Mark Gardener, "Beginning R - The Statistical Pr ogramming Language", John Wiley & Sons, Inc., 2012.
3. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
4. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science "

Course Content:

Unit-1: Introduction	**8 hours**
Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.	
Unit II: Modeling Methods	**8 hours**
Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.	
Unit III : Introduction to R	**8 Hours**
Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution.	
Unit IV : MAP Reduce	**8 Hours**

Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop MapReduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution.
Unit V : Delivering Results **8 Hours**
Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. Case studies.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Big Data Technology				
Course Code	BCSE9003				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	6	3

Course Objective:

Course Outcome

CO1	Understand the file system and big data applications.
CO2	Use Hadoop Ecosystem.
CO3	Analyze the Hadoop architecture.
CO4	Describe Hadoop Ecosystem and YARN.
CO5	Design applications with Big Data Tools.

Text Book (s)

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

Reference Book (s)

1. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
2. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
3. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
4. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013

Course Content:

Unit-1: Introduction to Big Data 8 hours
Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.
Unit II: Introduction to Hadoop 8 hours
Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.
Unit III : Hadoop Architecture 8 Hours
Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.
Unit IV : Hadoop Ecosystem and YARN 8 Hours
Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New FeaturesNameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.
Unit V : HIVE and HIVEQL, HBASE 8 Hours
Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Programming for Data Analytics			
Course Code	BCSE9004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	6	3

Course Objective

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

Course Outcome

CO1	Understand network programming.
CO2	Design and execute queries in database.
CO3	Use Javabeans in creating applications.
CO4	Implement streams and memory mapped files.
CO5	Write mapreduce program in Java.

Text Book (s)

1. Y. Daniel Liang, Introduction to Java Programming, Tenth Edition, Pearson, 2015.
2. White, "Hadoop: The Definitive Guide", Third Edition - 2012 – O'Reilly – ISBN: 9789350237564.

Reference Book (s)

1. Cay S. Horstmann, Gary Cornell, "Core Java™ 2: Volume II–Advanced Features", Prentice Hall, 9th edition, ISBN: 978-0137081608.
2. Jean Dollimore, Tim Kindberg, George Coulouris, "Distributed Systems Concepts and Design", 4th Edition, Jun 2005, Hardback, 944 pages, ISBN: 9780321263544.

Course Content:

Unit-1: Network Programming & Distributed Objects	**8 hours**
Connecting to a Server-Implementing Servers and Clients-Advanced Socket Programming- InetAddress-URL Connections-RMI Programming.	
Unit II: Connecting to Database	**8 hours**
The Design of JDBC-Basic Concepts-Executing Queries–Prepared Statemets-Result Sets– Metadata-Transactions.	
Unit III : Javabeans	**8 Hours**
The Bean-Writing Process-Using Beans to Build an Application-Bean Property Types-Property Editors-Customizers.	
Unit IV : Streams and Files	**8 Hours**
Streams-Text Input and Output-Reading and Writing Binary Data-Zip Archives-Object Streams and Serialization-Memory Mapped Files.	
Unit V : Programming Map Reduce	**8 Hours**
MapReduce program in Java-Map Reduce API-Progamming Examples- Combiner Functions - Distributed MapReduce Job.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Big Data Analytics for IoT**				
Course Code	**BCSE9005**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	**0**	**6**	**3**	

Course Outcome

CO1	Define big data platforms for IoT.
CO2	Discuss the authentication issues.
CO3	Understand the importance of Fog Computing.
CO4	Investigate web enhanced building automation systems.
CO5	Apply data analytics techniques in applications.

Text Book (s)

1. Stackowiak, R., Licht, A., Mantha, V., Nagode, L.," Big Data and The Internet of Things Enterprise Information Architecture for A New Age", Apress, 2015.

Reference Book (s)

1. Dr. John Bates , "Thingalytics - Smart Big Data Analytics for the Internet of Things", john Bates, 2015.

Course Content:

Unit-1: Big Data Platforms for the Internet of Things 8 hours
Big Data Platforms for the Internet of Things: network protocol- data dissemination –current state of art- Improving Data and Service Interoperability with Structure, Compliance, Conformance and Context Awareness: interoperability problem in the IoT context- Big Data Management Systems for the Exploitation of Pervasive Environments - Big Data challenges and requirements coming from different Smart City applications
Unit II: RFID False Authentications 8 hours
On RFID False Authentications: YA TRAP – Necessary and sufficient condition for false authentication prevention - Adaptive Pipelined Neural Network Structure in Self-aware Internet of Things: self-healing systems- Role of adaptive neural network- Spatial Dimensions of Big Data: Application of Geographical Concepts and Spatial Technology to the Internet of Things- Applying spatial relationships, functions, and models
Unit III : Fog Computing 8 Hours
Fog Computing: A Platform for Internet of Things and Analytics: a massively distributed number of sources - Big Data Metadata Management in Smart Grids: semantic inconsistencies – role of metadata
Unit IV : Web Enhanced Building 8 Hours
Toward Web Enhanced Building Automation Systems: heterogeneity between existing installations and native IP devices - loosely-coupled Web protocol stack –energy saving in smart building- Intelligent Transportation Systems and Wireless Access in Vehicular Environment Technology for Developing Smart Cities: advantages and achievements- Emerging Technologies in Health Information Systems: Genomics Driven Wellness Tracking and Management System (GO-WELL) – predictive care – personalized medicine
Unit V : Sustainability Data and Analytics 8 Hours
Sustainability Data and Analytics in Cloud-Based M2M Systems - potential stakeholders and their complex relationships to data and analytics applications - Social Networking Analysis - Building a useful

understanding of a social network - Leveraging Social Media and IoT to Bootstrap Smart Environments : lightweight Cyber Physical Social Systems - citizen actuation .

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Algorithms for Advanced Analytics			
Course Code	BCSE9050			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

Course Outcome

CO1	Implement classification algorithms.
CO2	Use decision trees in analytics applications.
CO3	Use text mining techniques and probability models.
CO4	Describe support vector machines.
CO5	Discuss neural networks layers and algorithms.

Text Book (s)

1. Steele, Brian, Chandler, John, Reddy, Swarna, "Algorithms for Data Science", Springer, 2016.
2. Jared Dean, "Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners", Wiley India Private Limited, 2014.
3. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann.

Reference Book (s)

1. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010.
2. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.
3. Vojislav Kecman, "Learning and Soft Computing", MIT Press, 2010.

Course Content:

Unit-I: Classification Algorithms	**8 hours**
Issues regarding classification and prediction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods, Classification accuracy.	
Unit II: Decision Trees	**8 hours**
Introduction to Decision trees - Classification by decision tree induction – Various types of pruning methods – Comparison of pruning methods – Issues in decision trees – Decision Tree Inducers – Decision Tree extensions.	
Unit III : Text Analytics	**8 Hours**
Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.	
Unit IV : Support Vector Machines	**8 Hours**
Learning and Soft Computing: Rationale, Motivations, Needs, Basics: Examples of Applications in Diverse Fields, Basic Tools of Soft Computing: Neural Networks, Fuzzy Logic Systems, and Support Vector Machines, Basic Mathematics of Soft Computing, Learning and Statistical Approaches to Regression and Classification - Support Vector Machines - Risk Minimization Principles and the Concept of Uniform Convergence, The VC Dimension, Structural Risk Minimization, Support Vector Machine Algorithms.	

Unit V : Neural Networks	**8 Hours**
Single-Layer Networks: The Perceptron, The Adaptive Linear Neuron (Adaline) and the Least Mean Square Algorithm - Multilayer Perceptrons: The Error Backpropagation Algorithm – The Generalized Delta Rule, Heuristics or Practical Aspects of the Error Backpropagation Algorithm.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Basket-3

Name of the Course	**Internet of Things: Sensing and Actuator Devices**				
Course Code	**BCSE9006**				
Prerequisite	**Networking**				
Corequisite	**NA**				
Antirequisite	**NA**				
	L	**T**	**P**	**C**	
	0	**0**	**6**	**3**	

Course Outcome

CO1	Identify the business problems that require decision-making support from business analytics.
CO2	Establish the best search strategy to acquire evidence relevant to the business problem.
CO3	Establish the business analytics method relevant to the business process and the reliability and validity of evidence.
CO4	summarize the relevant evidence in view of finding analytics solutions to business questions.
CO5	Recognize social and ethical implications of analytics solutions to the business problem.

Text Book (s)

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015.
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

Reference Book (s)

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015.
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Ma.

Course Content:

Unit-1: Introduction **8 hours**
Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device.
Unit II: Seven Generations of IoT Sensors to Appear **8 hours**
Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap
Unit III : Technological Analysis **8 Hours**
Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module.
Unit IV : IoT Development Examples **8 Hours**
ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks - Focus on Wearable Electronics
Unit V : Preparing IoT Projects **8 Hours**
Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator projectHardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Connecting Networks				
Course Code	BCSE9060				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objective

1. To judiciously use packet-switching or circuit switched networks for IPv6
2. To understand the congestion and its control using frame- relay
3. To connect the various segments of teleworkers using VPN
4. To secure an organization and its router by applying ACLs using IPv6

Course Outcome

CO1	Plan and effectively manage any WAN network using PPP , Frame Relay or VPN.
CO2	Deploy and effectively manage the security for the given network and Frame security policy.
CO3	Explain the major techniques involved, and networks & systems issues for the design and implementation of networking of inter and intra WAN networks.
CO4	Describe the key components and technologies such as NAT, DHCP involved and to gain hands-on experiences in building the network.
CO5	Analyze the cause of congestion and related factors for Quality of Service.

Text Book (s)

1. Cisco Networking Academy Programme CCNA 3 & 4 Companion Guide, 3rd edition by Pearson Education, 2003.
2. Cisco Networking Academy Programme CCNA 3 & 4 Companion Guide, 3rd edition by Pearson Education, 2003.

Reference Book (s)

1. Cisco Networking Academy Programme CCNA 3 & 4 Engineering General, 3rd Edn by Pearson Education, 2003.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 4th edition, 2007.
3. Andrew S. Tanenbaum, Computer Networks, Pearson, Fifth Edition, 2011.

Course Content:

Unit-1: Hierarchical Network Design ad WAN Technologies	**10 hours**
Enterprise Network Design: Network Requirements, Structured Engineering Principles; Design of the Networks: Network Hierarchy, The Access Layer, Distribution Layer; Two-Tier Collapsed Core Design; Case Study: Cisco Enterprise Architecture; WAN Technologies: Purpose of WANs and WAN Operations.	
Unit II: Point to Point Connections and Frame Relay	**9 hours**
Point To Point Protocols: Serial Point to Point Overview, Configure PPP; Basic Frame Relay Concepts, Configuring. Frame Relay, Advanced Frame Relay Concept, Configuring Advanced Frame Relay Concept.	
Unit III : Network Address Translation	**9 Hours**
NAT Characteristics: Benefits and Drawbacks; Static NAT and Dynamic NAT; Configure PAT Using CLI; Configuration of Port Forwarding using CLI; Configuration of NAT in IPv6.	
Unit IV : Broadband Solutions and Securing Site-to Site Connectivity	**10 Hours**

Business Requirement for Teleworker Services, Broadband Services; Configuring xDSL Connectivity: PPPoE. Overview, Configuring PPPoE; Virtual Private Networks: Benefits and Drawbacks; Site to Site GRE Tunnels; introducing IPSec; Remote Access.
Unit V : Network Monitoring **9 Hours**
Network Monitoring using Syslog, SNMP, Netflow; Troubleshooting with Systems Approach, Network Documentation; Troubleshooting Process; Troubleshooting Tools; Symptoms and Causes of Network.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Scaling Networks**				
Course Code	**BCSE9007**				
Prerequisite	**Computer Networks**				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	**0**	**6**	**3**	

Course Objective

1. This course makes the students learn how to configure routers and switches for advanced functionality

2. By the end of this course, participants will be able to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks.
3. Participants will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network.

Course Outcome

CO1	Understand, configure and troubleshoot enhanced switching technologies such as VLANs, Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Plus Protocol (PVST+), and Ether Channel
CO2	Understand, configure, and troubleshoot first hop redundancy protocols (HSRP) in a switched network
CO3	Understand, configure, and troubleshoot wireless routers and wireless clients
CO4	Configure and troubleshoot routers in a complex routed IPv4 or IPv6 network using single-area OSPF, multi area OSPF, and Enhanced Interior Gateway Routing Protocol (EIGRP)
CO5	Manage Cisco IOS® Software licensing and configuration files

Text Book (s)

1. Behrouz Forouzan ,Data Communications and Networking ; Tata McGraw-Hill ;Edition 5; 2012.
2. Andrews S. Tanenbaum, David J Wetherall; Computer Networks; Pearson Education; Edition 5, 2012

Reference Book (s)

1. William Stallings, Data & Computer Communications, PHI, Edition 6, 2012
2. Jerry Fitzgerald and Alan Dennis, Business Data Communications & Networking, John Wiley & Sons Inc, 2010
3. CCNA-Routing & Switching, Scaling Networks, Cisco Certified Networking Academy.

Course Content:

Unit-1: Introduction to Scaling Networks 9 hours
Introduction, Implementing a Network Design, Switch Hardware, Router Hardware, Managing Devices.
Unit II: LAN Redundancy & Link Aggregation 10 hours
Introduction, Spanning Tree Concepts, Purpose of Spanning Tree, STP Operation, Varieties of STP, Spanning Tree Configuration, First Hop Redundancy Protocols, Link Aggregation Concepts, Link Aggregation Configuration, Troubleshooting Link Aggregation.
Unit III : Wireless LANs 9 Hours
Wireless LAN Concepts, Wireless LAN Standards, Wireless LAN Security, Wireless LAN Configuration.
Unit IV : Adjust and Troubleshoot Single-Area OSPF & Multi area OSPF 9 Hours

Characteristics of OSPF, Configuring Single-Area OSPFv2, Configuring Single-Area OSPFv3, Advanced Single-Area OSPF Configurations, Troubleshooting Single-Area OSPF, Multi-Area OSPF Operation, Configuring Multi-Area OSPF.
Unit V : IOS Images and Licensing **9 Hours**
Managing IOS System Files, Naming Conventions, Managing Cisco IOS Images, Software Licensing, IOS Licensing, License Verification and Management.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	**Routing and Switching Essentials**				
Course Code	**BCSE9008**				
Prerequisite	**Fundamental knowledge of Computer Networks including layered architecture & concept of LAN & WAN**				
Corequisite	**NA**				
Antirequisite	**NA**				
	L	**T**	**P**	**C**	
	0	**0**	**6**	**3**	

Course Objective

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

Course Outcome

CO1	Plan and effectively manage any LAN network using Switching.
CO2	Deploy and effectively manage the LAN.
CO3	Analyze how a router learns about remote networks and determines the best path to those networks.
CO4	Describe the relationship between router interfaces, directly connected networks and the routing table.
CO5	Categorize various dynamic routing protocols.

Text Book (s)

1. Rick Graziani , Allan Johnson, Routing Protocols & Concepts: CCNA Exploration Companion Guide, Pearson Education, Edition 1,2012.
2. Cisco Networking Academy Program :Routing & Switching Essentials Companion Guide, Pearson Education, Edition 1, 2014

Reference Book (s)

1. Behrouz Forouzan , Data Communications and Networking , Tata McGraw-Hill , Edition 5, 2012.
2. Andrews S. Tanenbaum, David J Wetherall , Computer Networks , Pearson Education , Edition 5, 2012.

Unit-1: Introduction to Switched Networks, Basic Switching Concepts and Configuration **10 hours**
LAN Design, Converged Network, Switched Network, Frames Forwarding, Switching Domains, Basic switch configuration, Switch security, Secure remote access, Security concerns in LAN, Switch port security.
Unit II: VLANs **9 hours**
Overview of VLAN, VLAN Assignment, VLAN Trunks, DTP, VLAN Security and Design.
Unit III : Routing Concepts **9 Hours**
Initial configuration of a router, Functions of a router, Routing Decision, Path determination, Router operation.
Unit IV : Inter-VLAN Routing **9 Hours**
Inter-VLAN Routing configuration, Troubleshoot Inter-VLAN Routing, Layer 3 Switching.
Unit V : Static Routing **9 Hours**
Static Routing, Types of Static Route, Configure Static Route and Default Route, Review of CIDR and VLSM, Configure Summary and Floating Static Route.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Basket-4

Name of the Course	**Artificial Intelligence and Intelligent Systems**			
Course Code	**BCSE9009**			
Prerequisite	**Pattern Recognition and Data mining**			
Corequisite	**NA**			
Antirequisite	**NA**			
	L	**T**	**P**	**C**
	0	0	6	3

Course Objective

- To understand the various characteristics of Intelligent agents.
- To learn the different search strategies in AI.
- To learn to represent knowledge in solving AI problems.
- To understand the different ways of designing software agents.
- To know about the various applications of AI.

Course Outcome

CO1	Remember the intelligent agents and problem solving techniques.
CO2	Understand the order logic and real world scenario.
CO3	Discuss probabilistic decisions over time and make decisions.
CO4	Apply probabilistic models in applications.
CO5	Discuss the expert system and its architecture.

Text Book (s)

Stuart Russel and Peter Norwig , "Artificial Intelligence: A Modern Approach", Prentice Hall third edition, 2012.

Reference Book (s)

Kevin Knight, Eline Rich B.Nair,"Artificial Intelligence", McGraw Hill Education 3rd edition 2012.

Course Content:

Unit-1: Introduction to AI **8 hours**
Introduction -Intelligent Agents -Problem Solving -Solving Problems by Searching- Beyond Classical Search - Adversarial Search - Constraint SatisfactionProblems.
Unit II: Knowledge and Reasoning **8 hours**
Logical Agents -First-Order Logic - Inference in First-Order Logic –Classical Planning - Planning and Acting in the Real World -Knowledge Representation.
Unit III : Uncertain Knowledge and Reasoning **8 Hours**
Quantifying Uncertainty -Probabilistic Reasoning - Probabilistic Reasoning over Time -Making Simple Decisions -Making Complex Decisions.
Unit IV : Learning **8 Hours**
Learning from Examples - Knowledge in Learning - Learning Probabilistic Models-Reinforcement Learning - Communicating, Perceiving, and Acting-Natural Language Processing - Natural Language for Communication- Perception
Unit V : Expert System **8 Hours**
Defining Expert Systems – Expert system architecture-Robot Architectures.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of the Course	Deep Learning			
Course Code	BCSE9070			
Prerequisite	Genetic Algorithms and Machine Learning			
Corequisite	NA			
Antirequisite	NA			
	L	T	P	C
	3	0	0	3

Course Objective

- To understand the various characteristics of Intelligent agents.
- To learn the different search strategies in DL.
- To learn to represent knowledge in solving DL problems.
- To understand the different ways of designing software agents.
- To know about the various applications of DL.

Course Outcome

CO1	To understand concept of Deep Learning and Applied Maths
CO2	To understand concept of Basis of Machine Learning
CO3	To get knowledge about Modern Practical Deep Networks
CO4	Students can able to understand the Convolutional Networks
CO5	Gaining knowledge about case studies and Deep Learning Research

Course Content:

Unit-1: Introduction **8 hours**
Introduction, Applied Math - Linear Algebra, Probability and Information Theory, Numerical Computation.
Unit II: Machine Learning Basics **8 hours**
Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, , Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.
Unit III : Modern Practical Deep Networks 8 Hours
Deep Feedforward Networks – Gradient – Based Learning, Hidden Unit, Architecture Design, Back-Propagation and Other Differentiation Algorithms. Regularization for Deep Learning - Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold, Tangent Classifier.
Unit IV : Training Deep Models and Convolutional Networks 8 Hours
How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms. Convolutional Networks - The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types.
Unit V : Deep Learning Research 8 Hours
Linear Factor Models, Representation Learning, Monte Carlo Methods, Applications.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	**Augmented Reality**				
Course Code	**BCSE9080**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objective

1. Learn the emerging technologies in augmented reality.
2. Learn Marker-based tracking and identification.
3. To enhance and use the applications.

Course Outcome

CO1	To understand the technologies in augmented reality.
CO2	To describe the marker-based tracking.
CO3	Explain the augmented reality system.
CO4	Applying the augmentation concepts.
CO5	Analyze the applications.

Text Book (s)

1. Sanni Siltanen, Theory and applications of marker-based augmented reality, VTT, 2012.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
3. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann.

Reference Book (s)

1. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.

Course Content:

Unit-1: Introduction **8 hours**
Introduction, Simple augmented reality, Augmented reality as an emerging technology, Augmented reality applications, Multi-sensory augmented reality.
Unit II: Marker-based tracking **8 hours**
Marker detection, Marker pose, Multi-marker setups. Template markers - 2D barcode markers, Imperceptible markers.
Unit III : Enhancing the augmented reality system **8 Hours**
Enhancing visual perception - Non-photorealistic rendering, Photorealistic rendering, Illumination and shadows, Diminished reality, Relation with the real world.
Unit IV : Practical experiences in AR development **8 Hours**
User interfaces, Avoiding physical contacts, Practical experiences with head-mounted displays, Authoring and dynamic content.
Unit V : AR applications and future visions **8 Hours**
How to design an AR application, Technology adoption and acceptance, Where to use augmented reality, Future of augmented reality.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of the Course	Genetic Algorithms and Machine Learning			
Course Code	**BCSE9090**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objective

1. Mathematical foundations for Genetic algorithm, operators
2. Applications of Genetic Algorithms
3. Genetic based machine learning and its applications

Course Outcome

CO1	Understand genetic algorithms.
CO2	Use fundamental theorems.
CO3	Discuss GA Operators.
CO4	Explain the applications of GA.
CO5	Investigate the applications of genetics.

Text Book (s)

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing Limited, July 2017.
2. David E. Gold Berg, "Genetic Algorithms in Search, Optimization & MachineLearning", Pearson Education, 2001

Reference Book (s)

1. Kalyanmoy Deb, "Optimization for Engineering Design, algorithms and examples", PHI 1995.
2. S.Rajasekaran, G.A.Vijayalakshmi Pai, " Neural Networks, Fuzzy Logic and Genetic Algorithms ", PHI , 2003 (Chapters 8 and 9).

Course Content:

Unit-1: Introduction **8 hours**
Introduction to Genetic Algorithm – Robustness of Traditional Optimization and Searchmethods – Goals of optimization-GA versus Traditional methods – Simple GA – GA at work – Similarity templates (Schemata) – Learning the lingo.
Unit II: Mathematical Foundations **8 hours**
The fundamental theorem - Schema processing at work. – The 2-armed & k-armed Banditproblem. –The building Block Hypothesis. – Minimal deceptive problem.
Unit III : GA Operators **8 Hours**
Data structures – Reproduction- Roulette-wheel Selection – Boltzman Selection – Tournament Selection-Rank Selection – Steady –state selection –Crossover mutation – Mapping objective functions to fitness forum. – Fitness scaling. Coding – A Multi parameter, Mapped, Fixed – point coding – Discretization – constraints.
Unit IV : Applications of GA **8 Hours**
The rise of GA – GA application of Historical Interaction. – Dejung & Function optimization-Current applications of GA - Advanced operators & techniques in genetic search. Dominance, Diploidy & abeyance.
Unit V : Applications of Genetics Based Machine Learning **8 Hours**
The Rise of GBMC – Development of CS-1, the first classifier system. Smitch's Poker player–Other Early GBMC efforts. –Current Applications.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100