GALGOTIAS UNIVERSITY

Syllabus of

Course Book B.Tech. (CSE) 2017-18

Name of School: School of Computing Science and Engineering

Department: Computer Science and Engineering

Year: 2017-18

Year:	2017-21 batch (Ist Semester)						
Subject		Name of the Course	Teaching Scheme				Credits
Code							
			L	T	P	Total Hours	
Theory							
1	BCSE1001	Introduction to Computer Science & Engineering	0	0	2	2	1
2	BCSE1002	Computer Programming and Problem Solving	0	0	4	4	2
3	MATH1001	Multivariable Calculus	3	0	0	3	3
4	PHYS1001	Engineering Physics	3	0	0	3	3
5	SLBT1001	Basic English	0	0	4	4	2
6	BTME1002	Product Design Using Graphics	0	0	4	4	2
7	UHVE1001	Universal Human Values and Ethics	0	0	4	4	2
8	CHEM1001	Engineering Chemistry	3	0	0	3	3
Practical							
1	FREN1001	French - I	0	0	2	2	1
2	MATH1002	Exploration with CAS - I	0	0	2	2	1
3	PHYS1002	Engineering Physics Lab	0	0	2	2	1
4	CHEM1002	General Chemistry Lab	0	0	2	2	1
		Total:	**9**	**0**	**26**	**35**	**22**

	Name of The Course	INTRODUCTION TO COMPUTER SCIENCE & ENGINEERING	
	Course Code	BCSE1001	
	Prerequisite		
	Co-requisite		
	Anti-requisite		

L	T	P	C
0	0	2	1

Course Objectives

1. Provide an overview of computers and different development areas.
2. Learn and Identify different domains emerging.
3. Develop for student seek and idea about Internet and application.
4. Learn about the Data Analysis, Business Process and other fields.

Course Outcomes:

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	Introduction about Data and Data Analysis with business process.
CO5	Develop idea about Internet of things and its applications.

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	**8 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-2 Domains of Computing	**8 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-3 Information System	**8 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-4 Data Analysis	**8 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-5 Internet of Things	**8 hours**
Internet, Introduction to IOT, Internet technologies, Advancement and applications in IOT, Professional society and association in computing, ethics	

Continuous Assessment Pattern

	Laboratory evaluation scheme		
Components	**Internal Exam Practical (IEP) (50)** **= [(60% of M1) + (40% of M2)]**		**EEP (50)**
Max Marks	Mid Term Lab Exam (**M1** = 50)	End Term Lab Internal Exam	50

		(**M2** = 50)	
Marks Distribution	CA (30) + Viva Voce (10) + Lab Question(10)	CA (30) + Viva Voce (10) + Lab Question(10	
Total Marks	**100**		

Name of The Course	**Computer Programming and Problem Solving**				
Course Code	**BCSE1002**				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	**T**	**P**	**C**
		0	0	4	2

Course Objectives:

1. Provide an overview of computers and problem-solving methods using 'C' language
2. Serve as a foundation for the study of programming languages.
3. Learn to develop program using 'C' language.
4. To develop the software using the concept of 'C' Language.

Course Outcomes:

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.

Text Book (s)

1. Alexis Leon and Mathews Leon (2001), Introduction to Information Technology, Tata McGraw-Hill.
2. R.G. Dromey (2001), How to Solve it by Computer, Prentice Hall of India.

3. Al Kelley and Ira Pohl (1998), A Book on C Programming in C, 4th Edition, Pearson Education.

Reference Book (s):

1. E. Balagurusamy7th Edition, Programming ANSI C, McGraw-Hill
2. Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Prentice-Hall in 1988
3. Byron Gottfried, Programming with C, Schaum's Outline.

Course Contents:

Unit I: Introduction to Computers and Algorithms	**9 lecture hours**
Parts of a computer – Overview of operating systems, assembler, compilers, interpreters and programming languages. Algorithms for exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer, flowchart.	
Unit II: Constructs of C	
Lexical elements – Operators - data types – I/O statements – format specifications – control statements – decision making and Loop control structure: while loop, for loop, do-while loop, nested loop, break, continue, case control structure, go to, exit statement	
Unit III: Arrays	**8 lecture hours**
Array handling in C – declaration – single dimensional arrays, two – dimensional arrays, multi-dimensional arrays, sorting and searching on single and two dimensional arrays. Array order reversal, string handling function, manipulation on strings.	
Unit IV:Functions	**8 lecture hours**
Prototype – declaration - arguments (formal and actual) – return types – types of functions difference between built-in and user-defined functions.	
Unit V: Structures	**7 lecture hours**
Declarations - nested structures- array of structures - structure to functions - unions-difference between structure and union.	

Continuous Assessment Pattern

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

Name of The Course	Multivariable Calculus			
Course Code	MATH1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:
• To present the fundamental concepts of multivariable calculus and to develop student understanding and skills in the topic necessary for its applications to science and engineering.
• An understanding of a parametric curve as a trajectory described by a position vector; the ability to find parametric equations of a curve and to compute its velocity and acceleration vectors.
• A comprehensive understanding of the gradient, including its relationship to level curves (or surfaces), directional derivatives, and linear approximation.
• The ability to compute derivatives using the chain rule or total differentials.
• The ability to set up and solve optimization problems involving several variables, with or without constraints.

Course Outcomes

CO1	show the convergence of a sequence, series and compute some important series expansions of a single variable function.
CO2	examine mean value theorems for real-valued functions, show the convergence of the improper integral and apply curvature to find evolutes & involutes.
CO3	use methods to find limit, continuity, derivatives of multivariable scalar functions and relate derivatives to solve the problems of optimization.
CO4	apply methods to find integrals of multivariable scalar functions and relate it to solve the problems finding areas and volumes.

CO5	explain the three elements of vector differential calculus, apply these elements for evaluation of integrals of vector valued functions and relate the three important theorems to evaluate the problems of integrations.

Text Book (s)
• Robert T. Smith and Roland B. Minton, Calculus, 4th Edition, McGraw Hill Education.
• George B. Thomas and Ross L. Finney, Calculus, 9th Edition, Pearson Education
Reference Book (s)
• R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 4th Edition, Narosa publishers.
• Michael D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education

Unit-1 Introduction Module-I **Hours: 6**
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Half range **Fourier** sine and **Fourier** cosine series.
Unit-2Module-II **Hours: 8**
Evolutes and involutes, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorem with remainders; indeterminate forms and, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.
Unit-3 Module-III **Hours: 9**
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 Module-IV **Hours: 9**
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, Applications of triple integral to find volume.
Unit-5 Module-V **Hours: 10**
Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl, line integrals, path independence, potential functions and conservative fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorem (without proof& simple problems).

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**			
Course Code	**PHYS-1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. To prepare students with fundamental knowledge of physics.
2. To develop skills necessary for higher-level Science and Engineering courses.

Course Outcomes

CO1	Discuss the Origin and basic concepts of Quantum Physics like wave function, Schrodinger wave equations and its application.
CO2	Interpret the phenomenon of Interference and Diffraction of light
CO3	Explain Maxwell's equations and their significance and utilization of these equations in EM wave propagation
CO4	Describe the principle and characteristics of LASER and its Applications.
CO5	Express and Categorize the magnetic materials and their technical aspects.

Text Book (s)

1. Arthur Beiser, S Rai Choudhury, Shobhit Mahajan, (2009), Concepts of Modern Physics, 6th Edition, Tata-McGraw Hill. ISBN- 9780070151550.

2. Neeraj Mehta, (2011), Applied Physics For Engineers, New Arrivals – PHI, ISBN-9788120342422.

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, Biprism 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 (Intergral 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	**BASIC ENGLISH**			
Course Code	**SLBT-1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

The main goal of this course is to help you improve your spoken English skills to enable you to communicate more effectively in English.

Course Outcomes

CO1	Able to communicate effectively
CO2	Able to develop neutral accent.
CO3	
CO4	
CO5	

Course Content

Unit I: Soft Skills	**16 Hours**
1. Introduction and Ice breaking 2. SWOT Analysis 3. Pronunciation - stress and intonation patterns 4. Listening and Comprehension skills **5.** Communication Games	

Unit II: English Grammar	**8 Hours**
1. Vocabulary 2. Error Detection -error in use of words: Nouns, Pronouns, Verbs, Adjectives, Adverbs, Prepositions, Articles 3. Tenses 4. Antonyms / Synonyms 5. Idioms and Phrases	

Continuous Assessment Pattern

COs	**Knowledge level**	**Assessment tools**					
		MTE Test			**End semester exam**	**Internal**	**Target**
		1	**2**	3			
CO1	K1	50	50		50	50	>80%= 10%, 60%<=M<80% = 40%,<60% = 50%
CO2	K2	50	50		50	50	>80%= 10%, 60%<=M<80% = 40%,<60% = 50%
Total :400		**100**	**100**		**100**	**100**	

Name of The Course	**PRODUCT DESIGN USING GRAPHICS**			
Course Code	**BTME-1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

The objective of the course is to enable students to

1. Provide basic foundation in computer aided design / manufacturing
2. Understand the fundamentals used to create and manipulate geometric models
3. Get acquainted with the basic CAD software designed for geometric modelling
4. Learn working principles of NC machines CNC control and part programming
5. Understand concept of Group Technology, FMS and CIM

Course Outcomes

CO1	Understand the concept and principles of engineering graphics in product design (**K2)**
CO2	make isometric and orthographic projection of solids along with free hand sketching. **(K4)**
CO3	Develop a solid model using AutoCAD**(K4)**
CO4	Make a solid modeling for a given assembly.**K3)**
CO5	Apply the concepts and techniques learnt in the course in making hands-on project.**(K2)**

Text Book (s)

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.

Reference Book (s)

1. Course material uploaded on LMS

Course Content

Unit I: Introduction – Understanding the Concept of Product Design 10 Hour
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 II:Projection of Solids 16 Hour
Concept of Projection, Object in four quadrant, 2-D description of quadrants, Orthographic Projection of Solids, Isometric Projection of Solids, Free-hand sketching
Unit III: Solid Modeling 10 Hour
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 IV:Introduction to Assembly 10 Hour
Types of assembly drawings, Accepted Norms for Assembly Drawings, Sequences of Preparing the Assembly Drawing, Solid Modeling of assembly
Unit V:Application of Design Concepts for Product Design 10 Hour
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	**UHVE-1001**			
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	**ENGINEERING CHEMISTRY**			
Course Code	**CHEM-1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. To acquire knowledge about desalination of brackish water and treatment of municipal water.
2. To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
3. To learn significance of green chemistry and green synthesis and the synthesis of nano materials.
4. To understand mechanism of corrosion and preventive methods.
5. To understand concept of semi conductivity, superconductivity and liquid crystal and solar energy.

Course Outcomes

CO1	Determine the atomic structure and predict the position of element in periodic table. (**K2)**
CO2	Determinethe properties and shape of molecules by various theories of chemical bonding. **(K4)**
CO3	Differentiate nuclear reactions and apply nuclear chemistry to calculate age of samples. **(K4)**
CO4	Demonstrate the concepts of thermodynamics and chemical kinetics.**(K3)**
CO5	Correlate the structure and properties of biomolecules and identify the photochemical reactions. **(K2)**

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 I: 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 II: 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 III: 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 IV: 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 V: 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	FRENCH-I			
Course Code	**FREN1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

Students who come prepared to class every day and who actively participate can expect to:

1. Learn about contemporary French and Francophone institutions and mores
2. Communicate and interact with other speakers of French in diverse situations and in conversations involving everyday topics
3. Develop listening skills and understand the gist of a variety of communication modes (TV, video, radio, etc.)
4. Read a broad range of printed materials for general, specific and practical information
5. Write notes, letters and compositions on familiar topics with a good command of vocabulary and sentence structure in a cohesive and organized manner

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of French society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking.(K5)

Text Book (s)

1. Tech French » :Ingrid Le Gargasson, Shariva Naik, Claire Chaize. Goyal Publishers and Distributors Private Ltd, Delhi, 2012. Units 1 & 2.

Reference Book (s)

1. CONNEXIONS 1, Méthode de français, Régine Mérieux, Yves Loiseau, Les Éditions Didier, 2004

2. CONNEXIONS 1, Le cahier d'exercices, Régine Mérieux, Yves Loiseau Les Éditions Didier, 2004
3. ALTER EGO 1, Méthode de français, Annie Berthet, Catherine Hugo, Véronique M. Kizirian, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006
4. ALTER EGO 1, Le cahier d'activités, Annie Berthet, Catherine Hugo, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006

Course Content

Unit I: Saluer **08 Hours**
S'informer sur une activité actuelle – s'informer sur une activité habituelle – dire quel sport on fait – une journée avec…
Unit II:Nommer des objets **08 Hours**
Demander et exprimer des besoins – s'informer sur des habitudes – indiquer des quantités – rapporter des évènements passés – exprimer une opinion – faire des compliments – interroger sur la durée – s'informer sur des habitudes
Unit III:Situer un lieu sur un plan **08 Hours**
Demander, donner et refuser une permission – exprimer des interdictions – exprimer la possibilité, le savoir-faire, la volonté – exprimer l'obligation – faire/ accepter/ refuser des propositions
Unit IV: Demander et donner l'heure **08 Hours**
Exprimer des gouts et des préférences – exprimer la fréquence ou l'intensité – demander et exprimer une opinion – exprimer une contestation – donner des conseils

Continuous Assessment Pattern

CO's	Assessment tools	
	Internal test	External Examination
1	25	25
2	25	25
3	25	25
4	25	25
Total	50	50

Name of The Course	**EXPLORATION WITH CAS-I**			
Course Code	**MATH-1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB, and application of such languages for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes

CO1	Have knowledge of SciLab. (**K2)**
CO2	Trace the curve using SciLab. **(K3)**
CO3	Analyze Taylor series expansion. **(K4)**
CO4	Study three dimensional figures and their point of intersections.**(K3)**
CO5	Apply double and triple integral in finding area and volume of a given surface. **(K3)**
CO6	Compute curl, divergence and gradient (**K4**)

Reference Book (s)

1. Perrine Mathieu, Philippe Roux, Scilab, Fundamentals, from theory to practiceScilab.
2. Dr. M. Affouf, Scilab, 2012ISBN: 978-1479203444.

Course Content

S. No	List of Experiment
1	Introduction to Scilab and Develop Plots for Exponential, Logarithmic, trigonometric, Hyperbolic functions with shifting and scaling.
2	Develop Plots of circle, parabola, ellipse and hyperbola in Cartesian form
3	Develop plots of 3-D surfaces: Planes, Sphere, Cylinder, Paraboloid, Ellipsoid, Hyperboloid, cone.
4	Expansion of functions in Taylor series.
5	Identifying the critical points of 3-D surface
6	Plotting the curve of intersection of two intersecting surfaces.
7	Computing double integrals in Cartesian coordinates.
8	Computing triple integrals in Cartesian coordinates.
9	Computing grad , div & curl
10	Plotting grad, div & curl

Continuous Assessment Pattern

	Laboratory evaluation scheme		
Components	**Internal Exam Practical (IEP) (50)** **= [(60% of M1) + (40% of M2)]**		**EEP (50)**
Max Marks	Mid Term Lab Exam (**M1** = 50)	End Term Lab Internal Exam (**M2** = 50)	50
Marks Distribution	CA(30) + Viva Voce(10) + Lab Question(10)	CA(30) + Viva Voce(10) + Lab Question(10	
Total Marks	**100**		

Name of The Course	**ENGINEERING PHYSICS LAB**			
Course Code	**PHYS-1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

1. To impart knowledge in basic concepts of physics relevant to engineering applications
2. To introduce advances in technology for engineering applications

Course Outcomes

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.

Course Content

S. No	**List of Experiment**
1	To determine the wavelength of He-Ne laser light by diffraction method at a single slit.

2	To study the polarization of light by simple reflection using He-Ne laser
3	To study the variation of magnetic field with distance along the axis of current carrying coil and then to estimate the radius of coil.
4	To verify the Stefan's law by electrical method.
5	To calibrate the ammeter and voltmeter with the help of potentiometer.
6	To determine the resolving power of telescope.
7	To measure the numerical aperture of an optical fiber.
8	Find the angle of a prism and calculate Cauchy's constant.
9	To determine the velocity of ultrasonic wave in liquid.
10	To find the frequency of A.C. mains using sonometer.

Continuous Assessment Pattern

	Laboratory evaluation scheme		
Components	**Internal Exam Practical (IEP) (50)** **= [(60% of M1) + (40% of M2)]**		**EEP (50)**
Max Marks	Mid Term Lab Exam (**M1** = 50)	End Term Lab Internal Exam(**M2** = 50)	50
Marks Distribution	CA(30) + Viva Voce(10) + Lab Question(10)	CA(30) + Viva Voce(10) + Lab Question(10	
Total Marks	**100**		

Name of The Course	**GENERAL CHEMISTRY LAB**			
Course Code	**CHEM1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

This Engineering Chemistry Laboratory is common to first year branches of UG Engineering. At the end of the course the student is expected to

1. Provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems.
2. Practical implementation of fundamental concepts

Course Outcomes

CO1	Employ the volumetric titrations techniques used in chemistry laboratory for analysis.(K3)
CO2	Analyse to differentiate between hard and soft water using complexometric titration.(K2)
CO3	Calculate the percentage of dissolved oxygen in water sample.(K3)
CO4	Identify the viscosity of liquid using Ostwald viscometer.(K2)
CO5	Analyse the Carbohydrate and protein in given organic compound.(K3)

Course Content

S. No	List of Experiment
1	To estimate the total permanent and temporary hardness of the given hard water sample. A standard calcium ion solution (1 mg of $CaCO_3$ in 1 ml) and an approximately 0.01M solution of EDTA are provided.

2	To estimate the amount of Zinc in the given solution by using the standard solution of Potassium Ferrocyanide.
3	To Determine the Alkalinity of a given Water Sample
4	To find out the amount of dissolved oxygen in the given sample of water.
5	To find out relative and absolute viscosity of a given liquid using Ostwald's viscometer.
6	Detection of the elements in given organic compound.
7	To estimate the amount of Copper present in the given solution using a standard solution by provided hypo solution.

Continuous Assessment Pattern

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

Year :	2017-21 batch (2nd Semester)						
Subject Code		Name of the Course	Teaching Scheme				Credits
			L	T	P	Total Hours	
Theory							
1	BCSE1003	Application Oriented Programming using Python	0	0	4	4	2
2	BEEE1002	Basic Electrical and Electronics Engineering	3	0	0	3	3
3	MATH1003	Matrices and Differential Equations	3	0	0	3	3
4	BTME1003	Product Manufacturing	0	0	2	2	1
5	PHYS1004	Physics of Semiconductor Devices	3	0	0	3	3
6	ENVS1001	Energy and Environmental Science	3	0	0	3	3
7	PSSO1001	Psychology and Sociology	2	0	0	2	2
Practical							
1	BEEE1003	Basic Electrical and Electronics Engineering Lab	0	0	2	2	1
2	MATH1003	Exploration with CAS-II	0	0	2	2	1
3	PHYS1005	Advance Physics Lab	0	0	2	2	1
4	FREN1002	French -II	0	0	2	2	1
5	SLBT1002	English Proficiency and Aptitude Building - 1	0	0	4	4	2
		Total:	**14**	**0**	**18**	**32**	**23**

Name of The Course	**APPLICATION ORIENTED PROGRAMMING USING PYTHON**			
Course Code	**BCSE1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

To understand the basic Gain knowledge of Basic Programming with Python

Course Outcomes

CO1	Gain knowledge of Basic Programming with Python **(K3)**
CO2	Familiarize with python string handling techniques and user defined functions **(K4)**
CO3	Understand and use data structures like Lists, tuples, and dictionaries **(K3)**
CO4	Understand File handling **(K3)**
CO5	Use object oriented programming techniques **(K3)**

Text Book (s)

1. Tony Gaddis, Starting Out with Python, 3rd edition, Pearson
2. Y. Daniel Liang, Introduction to Programming Using Python, Pearson
3. Budd T A, Exploring Python , 2011, Tata McGraw Hill Education
4. Learning Python, Fourth Edition, Mark Lutz, O'Re illy publication

Reference Book (s)

1. Downey, Allen B., Think Python: How to Think Like a Computer Scientist. O'Reilly, 2012. Obtain free PDF at http://www.greenteapress.com/thinkpython/
2. Python Programming: An Introduction to Computer Science (Second Edition) John Zelle, ISBN 978-1-59028-241-0-9, Franklin, Beedle & Associates Inc., 2004.

Course Content

Unit I: Introduction	**8 Lab hours**
History, Features, Working with Python, Installing Python, basic python syntax, interactive shell, editing, saving, and running a script. Tokens: Keywords, , Identifiers, Literals, Operators, data types; variables, assignments; immutable variables; numerical types; Operators and Boolean expressions. Debugging, comments in the program; understanding error messages; Built-in functions – type(), id(), eval(), random, chr(), ord();	
Unit II: Condition Control Structures & Input Output	**8 Lab hours**
Conditional Statements: If, If-else, Nested if-else; Loops: For, While, Nested loops; Control Statements: Break, Continue, Pass; Input and output: Taking input from user through keyboard, manipulation of input, formatted input, formatted output.	
Unit III: Function and Strings	**8 Lab hours**
Functions in Python: Defining a function, Calling a function, Types of functions, Function Arguments, Global and local variables. Strings: Single quoted, double quoted & triple quoted, String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.	
Unit IV: Lists, Tuples and Dictionaries	**8 Lab hours**
Basic List operators, iterating over a list, replacing, inserting, removing an element; searching and sorting lists, calculating the sum and average of items in a list ; Tuples - sequence of values , immutability, Comparing tuples, Tuple assignment: Dictionary- Store data as key-value pairs in dictionaries, search for values, change existing values, add new, key-value pairs, and delete key-value pairs, nesting objects, sorting, dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.	
Unit V: Files, Regular Expressions & Modules	**8 Lab hours**
Reading/writing text and numbers from/to a file in text files and csv files; Regular expressions, importing and creating modules: Manipulating files and directories using os module.	

Continuous Assessment Pattern

	Laboratory evaluation scheme	
Components	**End Term Internal Exam Practical (IEP) (50)**	**End Term External Exam Practical EEP (50)**
Marks Distribution	Continuous Assessment (30) [Evaluated throughout the semester] + Viva Voce(10) + Lab Question(10) [Evaluated on IEP exam day]	50 Marks Evaluated on External Exam Practical (EEP) day (Viva + Question) = 50 Marks
Total Marks	**100**	

Name of The Course	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING			
Course Code	**BEEE-1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

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 Outcomes

CO1	Learn and solve different electrical and electronic circuits applying different laws and theorems.
CO2	Develop concepts of the logic circuits, minimize and realize the digital circuits
CO3	Implement electronic circuits involving semiconductor diodes and transistors
CO4	Acquire the knowledge about working of transformers, DC, induction and synchronous machines
CO5	Explain the electrical and electronic circuit theories and verify them through experiments

Text Book (s)

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical and Electronics Engineering”, McGraw Hill, 20016.
2. V. Mittle and Arvind Mittle, “Basic Electrical Engineering”, McGraw Hill, 2005.
3. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, 9th Edition, Pearson Education, 2007.
4. A. P. Malvino and Donald Leach, “Digital Principles and Applications”, 6th Edition, Tata McGraw Hill, 2006.

Reference Book (s)

1. D. C. Kulshreshtha,"Basic Electrical Engineering", Tata McGraw Hill, 2009.
2. J. Edminister and M. Nahvi , "Electric Circuits", 3rd Edition, Tata McGraw-Hill, New Delhi, 2002.
3. Jacob Millman, Christos C. Halkias, Satyabrata Jit, "Electronics Devices and Circuits",
4. 3rd Edition, Tata McGraw Hill, 2008

Course Content

Unit I: Elementary Circuit Analysis **8 lecture hours**
Ohm's law, KCL, KVL, node voltage analysis, mesh current, circuits with independent sources, Thevenin's & Norton's equivalent, maximum power transfer and superposition theorem.
Unit II: Analysis of DC and AC Circuits **7 lecture hours**
RL and RC transients in circuits with DC source, RMS values, the use of phasors for constant frequency sinusoidal sources, steady state AC analysis of a series circuit, parallel circuits, AC power calculations.
Unit III: Digital Systems **8 lecture hours**
Basic logic circuit 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, minimization of logic circuits.
Unit IV: Semiconductor Devices **7 lecture hours**
Basic diode concepts, ideal diode model, rectifier and wave-shaping circuits, zener diode voltage regulator concepts, bipolar junction transistors, current and voltage relationship, common emitter characteristics.
Unit V: Electro-mechanics **10 lecture hours**
Transformers-Ideal and real transformers, Construction, Principle of operation of transformer, E.M.F Equation, Phasor diagram of transformer, Losses, efficiency. D.C Machines-Construction, principles of rotating DC machines, Types of Excitations-separately excited and self excited (shunt, series and compound) DC machines. Three phase induction motors-Construction, Principle of operation, synchronous speed, slip, and frequency of rotor emf. Synchronous Machines-construction, principle of operation of synchronous motor and applications.

Continuous Assessment Pattern

COs	Knowledge level	Assessment tools					
		Internal test			End semester exam	Mini Project	Target
		CAT-1	CAT-2	Assignment			
CO1	K1, K2	5			10	0	70%
CO2	K1, K2, K3	5			10	0	70%
CO3	K4	5	5	5	10	0	70%
CO4	K5		5	5	10	0	70%
CO5	K5		5	10	10	0	70%
Total		**15**	**15**	**20**	**50**	**0**	**70%**

Name of The Course	**MATRICES AND DIFFERENTIAL EQUATIONS.**			
Course Code	**MATH1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

Course Outcomes

CO1	**Apply** elementary matrix operations to find rank and **solve** a system of linear equations and **Utilize** it to solve Inverse problem, Eigen value problem and Diagonalisation problem. (**K3)**
CO2	**Solve** nth order ordinary differential equation with constant coefficients and apply it to **solve** Simple electric circuits. **(K3)**
CO3	**Produce** the Fourier series of a periodic function. **(K3)**
CO4	**Apply** separation of variable method to **solve** 1-dim wave equation, 1-dim heat and 2-dim Laplace equation.**(K3)**
CO5	

Text Book (s)

1. *Erwin Kreyszig*, **Advanced Engineering Mathematics,** 10th Edition, John Wiley &Sons.
2. *Peter V. O'Neil*, **Advanced Engineering Mathematics,** 7th Edition, CengageLearning

Reference Book (s)

1. *R. K. Jain and S. R. K. Iyengar*, **Advanced Engineering Mathematics**, 4th Edition, NarosaPublishers.
2. *Robert T. Smith and Roland B. Minton*, **Calculus**, 4th Edition, McGraw HillEducation.

Course Content

Unit I: Matrices and Eigen value Problem **12 Lectures**
Matrix algebra, Elementary transformations and Elementary matrices, Inverse of matrix using elementary transformations, Linear dependence and independence of vectors, Rank of a matrix, Solution of system of linear equations, Definition, properties and computation of Eigen values and Eigenvectors, Cayley-Hamilton theorem, Diagonalization.
Unit II:Ordinary Differential Equations **10 Lectures**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Complementary function and particular integral, Complete solution, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, Applications of linear differential equations.
Unit III: Fourier series **8 Lectures**
Periodic functions, Fourier expansion of general functions, Fourier expansion of odd and even functions, Fourier expansion of some standard waveforms, Half range sine and cosine series, Harmonic analysis.
Unit IV: Partial Differential Equations **10 Lectures**
Basic concept, Classification of second order linear PDE, Method of separation of variables and its application to solve Wave equation (one dimension), heat equation (one dimension) and heat equation (two dimension steady state only).
Unit V: Matrices and Eigen value Problem **12 Lectures**
Matrix algebra, Elementary transformations and Elementary matrices, Inverse of matrix using elementary transformations, Linear dependence and independence of vectors, Rank of a matrix, Solution of system of linear equations, Definition, properties and computation of Eigen values and Eigenvectors, Cayley-Hamilton theorem, Diagonalization.

Continuous Assessment Pattern

CO's	**Assessment tools**			
	Internal test		**QUIZ, SEMINAR/ Assignment**	**University Examination**
	1	2		

1	50	--	5	25
2		40	5	25
3	--	10	5	25
4	--		5	25
Total	**50**	**50**	**20**	**100**

Name of The Course	**PRODUCT MANUFACTURING**			
Course Code	**BTME-1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product. The course is intended to provide you with the following benefits:

- Competence with a set of tools and methods for product design and development.
- Confidence in your own abilities to create a new product.
- Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).
- Ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective.

- Reinforcement of specific knowledge from other courses through practice and reflection in an action-oriented setting.
- Enhanced team working skills.

Course Outcomes

CO1	Develop a product using Welding Process.
CO2	Develop a product out of a given sheet.
CO3	Assemble a product of wood in carpentry shop.
CO4	Create a product using casting and then machining.
CO5	Assemble different components to get final product with the help of welding.

Text Book (s)

1. Product Manufacturing Manualprepared by faculties of School of Mechanical Engineering.

Reference Book (s)

1. A.K. Hajra Choudhury, S.K. Hajra Choudhury and Nirjhar Roy (2009), Elements of Workshop Technology, Vol. – I, Media Promoters, ISBN: 978-8-185-09914-9.
2. A.K. Hajra Choudhury, S.K. Hajra Choudhury and Nirjhar Roy (2010), Elements of Workshop Technology, Vol. – II, Media Promoters, ISBN: 978-8-185-09915-6.

Course Content

S. No	List of Experiment
1	To prepare a given product using the knowledge gained in Product Manufacturing Lab while working in the lab. (To be submitted at the end of the session and evaluated in the external examination)
2	**Welding Shop** Any two of the following a. Prepare a Lap joint as per drawing using Oxy-Acetylene Gas welding. b. Prepare a T-joint as per drawing using Oxy-Acetylene Gas welding. c. Prepare a Butt-joint as per drawing using Oxy-Acetylene Gas welding. d. Prepare L- joint as per drawing using Oxy-Acetylene Gas welding. e. Prepare a Lap joint as per drawing using Electric Arc welding. f. Prepare a T-joint as per drawing using Electric Arc welding. g. Prepare a Butt-joint as per drawing using Electric Arc welding. h. Prepare L- joint as per drawing using Electric Arc welding.

3	**Fitting Shop** Prepare a Male/Female Parts as per drawing
4	**Lathe Machine Shop** Preparation of Job as per drawing.
5	**Sheet metal Shop** Preparation of funnel of given dimension. Use soldering to join lower part with upper and use riveting to join cylinder.
6	**Foundry Shop** Preparation of Job of aluminum as per drawing through casting.
7	**Black Smithy Shop** Any one of the following a. Preparation of S shaped hook of given drawing of MS rod. b. Making of chisel of given drawing of MS rod. c. Making of a wheel of given drawing of MS rod.
8	**Carpentry Shop** Any one of the following a. Preparation of T-Joint of given dimension. b. Preparation of Lap Joint of given dimension. c. Preparation of Cross Joint of given dimension. d. Preparation of Dove Tail Joint of given dimension

Continuous Assessment Pattern

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

Name of The Course	**PHYSICS OF SEMICONDUCTOR DEVICES**			
Course Code	**PHYS1004**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

Course Outcomes

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 Lecture**
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 Lecture**
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 Lecture**
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 Lecture**
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 Lecture**
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	**Energy and Environmental Science**			
Course Code	**ENVS1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. Making the students understand and appreciate the Module of life in all its forms, the implications of life style on the environment.

2. To give students a basic understanding of the major causes of environmental degradation on the planet, with specific reference to the Indian situation.

3. To inspire students to find ways in which they can contribute personally and professionally to preventing and rectifying environmental problems.

Course Outcomes

CO1	Students will understand the need for eco-balance
CO2	Knowledge on the method of pollution prevention would be acquired
CO3	To gain knowledge about conservation of natural resources and bio diversity
CO4	To understand various social issues with environmental impact.
CO5	To understand the role of population growth in environment.

Text Book (s)

1. Kurian Joseph & R. Nagendran, "Essentials of Environmental Studies", 1st Edition, Pearson Education, 2004.

Reference Book (s)

1. Keerthinarayana & Daniel Yesudian, "Environmental Science and Engineering", Edition, Hi-Tech publications, 2004.
2. Erach Bharucha, "A Text Book for Environmental Studies", Text Book of University Grants Commission, 2004.
3. Peavy, H.S., D.R. Rowe & T.George, "Environmental Engineering", New York: Mc Graw Hill, 1987.
4. Metcalf & Eddy,"Wastewater Engineering: Treatment and Reuse", New Delhi, Tata McGraw Hill, 2003.

Course Content

UNIT-I: Environment & Natural Resources **8 Lecture**
Definition, scope, importance, need for public, 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, food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, land slides, soil erosion, desertification & case studies
UNIT-II: Ecology & Bio-diversity **8 Lecture**
Concept of ecosystem, structure & function of an ecosystem, producers, con-sumers and decomposers, energy flow, ecological succession, food chains, food webs and ecological pyramids. Bio diversity: Definition, genetic, species and ecosystem diversity, bio-geographical classification of India, hotspots, threats related to habitat loss, poaching of wildlife, man-wildlife conflicts, Conservation of bio-diversity.
UNIT–III: Environmental Pollution **8 Lecture**
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 and the Environment **10 Lecture**
Urban problems related to energy & sustainable development, water conservation, rain water harvesting, watershed management, problems related to rehabilitation – case stud-ies, Wasteland reclamation, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness.

UNIT–V: Human Population and the Environment	12 **Lecture**
Population growth, variation among nations, Population explosion – Family Welfare Pro-gramme, Environment and human health, Human Rights, Value Education, HIV/ AIDS, Women and Child Welfare, Role of Information Technology – Visit to local polluted site / Case Studies. Customer Orientation - QFD – CSM – TQM Models – 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	**PSYCHOLOGY AND SOCIOLOGY**			
Course Code	**PSSO-1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

Course Objectives

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

Course Outcomes

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	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**			
Course Code	**BEEE-1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. An understanding of basic electrical wiring, measurements, and methods
2. Students understand measurement errors and non-ideal electrical devices
3. Students understand wiring and operation or operational amplifiers
4. Students demonstrate effective written communication skills

Course Outcomes

CO1	Apply and verifying basic electrical laws.
CO2	Realize and apply basic theorems in electrical network and circuits.
CO3	Verify the truth tables of logic Gates.
CO4	Analyze characteristics of basic diodes and transistors
CO5	Realize and verify the working of transformer.

Course Content

S. No	**List of Experiment**
1	To verify (i) Kirchoff's current law (ii) Kirchoff's voltage law
2	Verification of Thevenin's Theorem
3	Verification of Norton's Theorem

4	Verification of Maximum power transfer Theorem
5	Verification of Truth table for logic Gates- AND , OR, NOT, NAND, NOR and XOR and Half adder Circuit.
6	Study of P-N Junction Diode characteristics.
7	Study of ZENER Diode characteristics.
8	Study of CE characteristics of a Bipolar Junction Transistor.
9	Study of characteristics of FET.
10	Study of open circuit and short circuit tests on a single phase transformer and obtaining its equivalent circuit parameters.

Continuous Assessment Pattern

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

Name of The Course	**EXPLORATION WITH CAS-II**			
Course Code	**MATH-1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Outcomes

CO1	Find rank, determinant, inverse, trace, echelon form, Eigen value and Eigen vector , diagonalization of matrix and solution of a system of system of linear equations. (**K3)**
CO2	Find numerical and graphical solution of initial value problem of first and second order and system of simultaneous differential equations. **(K4)**
CO3	Find the Fourier coefficient and plotting the graph of different wave forms.. **(K4)**
CO4	Find numerical and graphical solution of complicated 1-dim wave equation, 1-dim heat and 2-dim Laplace equation.**(K4)**

Reference Book (s)

1. A. Vande Wouwer, P. Saucez, C. V. Fernández, : Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications, 2014.
2. Dr. M. Affouf, Scilab by example, ISBN: 978-1479203444, 2012.

Course Content

S. No	List of Experiment
1	Operation on Matrices (addition, multiplication, inverse, transpose).
2	Computation of Eigen values and Eigen vectors of a square matrix.
3	Solution of system of linear equations using matrix.

4	Solution of differential equations of order one and two.
5	Solving an initial value problem with different initial conditions.
6	Plotting the graph of the solution for different initial conditions.
7	Fourier series expansion of different wave forms and comparison with the original function.
8	Solving one dimensional wave equation under specified conditions and graphing the solution.
9	Solving one dimensional heat equation under specified conditions and graphing the solution.
10	Solving a Laplace equation to find the steady state temperature in the square plate satisfying specific boundary conditions and graphing isotherms

Continuous Assessment Pattern

CO's	Internal	External
1	15	15
2	15	15
3	10	10
4	10	10
Total	50	50

Name of The Course	**ADVANCE PHYSICS LAB**			
Course Code	**PHYS 1005**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

Course Outcomes

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.

Course Content

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

	Laboratory evaluation scheme	
Components	**End Term Internal Exam Practical (IEP) (50)**	**End Term External Exam Practical EEP (50)**
Marks Distribution	Continuous Assessment (30) [Evaluated throughout the semester] + Viva Voce(10) + Lab Question(10) [Evaluated on IEP exam day]	50 Marks Evaluated on External Exam Practical (EEP) day (Viva + Question) = 50 Marks
Total Marks	**100**	

Name of The Course	**FRENCH-II**			
Course Code	**FREN1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

Students who come prepared to class every day and who actively participate can expect to:

6. Learn about contemporary French and Francophone institutions and mores
7. Communicate and interact with other speakers of French in diverse situations and in conversations involving everyday topics
8. Develop listening skills and understand the gist of a variety of communication modes (TV, video, radio, etc.)
9. Read a broad range of printed materials for general, specific and practical information
10. Write notes, letters and compositions on familiar topics with a good command of vocabulary and sentence structure in a cohesive and organized manner

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of French society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking.(K5)

Text Book (s)

2. Tech French » :Ingrid Le Gargasson, Shariva Naik, Claire Chaize. Goyal Publishers and Distributors Private Ltd, Delhi, 2012. Units 1 & 2.

Reference Book (s)

5. CONNEXIONS 1, Méthode de français, Régine Mérieux, Yves Loiseau, Les Éditions Didier, 2004
6. CONNEXIONS 1, Le cahier d'exercices, Régine Mérieux, Yves Loiseau Les Éditions Didier, 2004
7. ALTER EGO 1, Méthode de français, Annie Berthet, Catherine Hugo, Véronique M. Kizirian, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006
8. ALTER EGO 1, Le cahier d'activités, Annie Berthet, Catherine Hugo, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006

Course Content

Unit I: Saluer **08 Hours**
S'informer sur une activité actuelle – s'informer sur une activité habituelle – dire quel sport on fait – une journée avec…
Unit II:Nommer des objets **08 Hours**
Demander et exprimer des besoins – s'informer sur des habitudes – indiquer des quantités – rapporter des évènements passés – exprimer une opinion – faire des compliments – interroger sur la durée – s'informer sur des habitudes
Unit III:Situer un lieu sur un plan **08 Hours**
Demander, donner et refuser une permission – exprimer des interdictions – exprimer la possibilité, le savoir-faire, la volonté – exprimer l'obligation – faire/ accepter/ refuser des propositions
Unit IV: Demander et donner l'heure **08 Hours**
Exprimer des gouts et des préférences – exprimer la fréquence ou l'intensité – demander et exprimer une opinion – exprimer une contestation – donner des conseils

Continuous Assessment Pattern

CO's	Assessment tools	
	Internal test	External Examination
1	25	25
2	25	25
3	25	25
4	25	25
Total	50	50

Name of The Course	**ENGLISH PROFICIENCY AND APTITUDE BUILDING - 1**			
Course Code	**SLBT1002**			
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	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.
CO2	Construct grammatically correct sentences and practicing correct pronunciation of common words in English language for effective communication.
CO3	Develop real-time problem solving skills in quantitative aptitude.
CO4	Develop basic data analyzing techniques which will help in forecasting and decision making.

Course Content

Unit I: Introduction& Communication Skills	**6 lectures**

• Ice Breaking Activity • Speaking Activity • Pronunciation • Listening Skills • Pronouns • Articles and Prepositions
Unit II: Quantitative Aptitude **6 lectures**
• Number System • Percentage • Profit and Loss

Continuous Assessment Pattern

COs	Knowledge level	Assessment tools					
		CAT Test			End semester exam	Internal	Target
		1	2	3			
CO1	K1	40	0		20	50	>80%= 10%, 60%<=M<80% = 40%,<60% = 50%
CO2	K2	20	25		20	50	>80%= 10%, 60%<=M<80% = 40%,<60% = 50%
CO3	K2	20	25		30		>80%= 10%, 60%<=M<80% = 40%,<60% = 50%
CO4	K3	20	50		30		>80%= 10%, 60%<=M<80% = 40%,<60% = 50%
Total :400		**100**	**100**		**100**	**100**	

Year :	2017-21 batch (3rd Semester)						
Subject Code		Name of the Course	Teaching Scheme				Credits
			L	T	P	Total Hours	
Theory							
1	BCSE2310	Digital Design and Computer Architecture	3	0	0	3	3
2	BCSE2340	Theory of Automata and Formal Languages	3	0	0	3	3
3	BCSE2320	Data Structures using C++	3	0	0	3	3
4	BTME2002	Engineering Thermodynamics	3	0	0	3	3
5	CSE211	Discrete Structure	3	0	0	3	3
6	BCSE2330	Introduction to Cryptographic Fundamentals	3	0	0	3	3
Practical							
1	BCSE2331	Introduction to Cryptographic Fundamentals Lab	0	0	2	2	1
2	BCSE2311	Digital Design and Computer Architecture Lab	0	0	2	2	1
3	BCSE2321	Data Structures using C++ Lab	0	0	2	2	1
4	SLBT2001	English Proficiency and Aptitude Building - II	0	0	4	4	2
		Total:	**18**		**10**	**28**	**23**

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

Course Objectives:

1. To explore the fundamentals of digital logic design.
2. To understand the concepts of computer architecture.
3. To implement the core concepts in the real scenario.

Course Outcomes

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

Text Book (s)

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

Reference Book (s):

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.
4. G. K. Kharate, “Digital Electronics”, Oxford University Press, 2010.
5. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Fourth Edition, Morgan Kaufmann / Elsevier, 2009.
6. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.

Unit 1: Introduction	**9 lecture 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 .	
Unit 2: Combinational Logic	**9 lecture hours**
Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.	
Unit 3: Synchronous Sequential Logic	**9 lecture hours**
Sequential Circuits – Storage Elements: Latches , Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters .	
Unit 4: Basic structure of Computer System	**9 lecture hours**
Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.	
Unit 5: Memory and I/O Systems	**9 lecture hours**
Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access.	

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 Objectives:

1. Course is designed to make the student familiar with the working of the FSM, PDA and TM.
2. This course helps the student to understand how a high level program is converted into a low level program by the compiler so that it becomes easy to understand the programming capabilities and function of the compiler.
3. To enable the student to differentiate between Regular and Non regular languages.
4. To enable the student to pursue R&D activities in Computational Theory.
5. To prepare the students for career in Software industry and academic

Course Outcomes

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 (s)

1. Opcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”,Pearson Education

Reference Book (s):

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation",Pearson Education

2. Languages and Computation", PHI

3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH

4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

Unit I: Introduction **9 lecture hours**
IAlphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, 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
Module II: Regular expression (RE) **9 lecture 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 Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.
Module III:Context free grammar (CFG) and Contex t Freee Languages CFL): **10 lecture hours**
Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,
Module IV: Push Down Automata (PDA): **6 lecture hours**
TDescription 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
Module V: Turing machines (TM): **6 lecture hours**

Basic model, definit ion and representatio n, Instantaneous Description,Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Chur ch'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	Data Structures using C++				
Course Code	BCSE2320				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. Introduce the fundamentals and abstract concepts of Data Structures.
2. Introduce searching, sorting techniques
3. Learn how concepts of data structures are useful in problem solving.

Course Outcomes

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 Books

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication

Reference Books

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill
3. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
4. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH
5. G A V Pai, “Data Structures and Algorithms”, TMH

Unit I:Introduction: Basic Terminology **9 lecture 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 List
Unit II: Stacks and Queues: Abstract Data Type **8 lecture 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
Unit III: Trees: Basic terminology **8 lecture 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 IV: Graphs **7 lecture 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 V: Sorting and Searching **8 lecture hours**
Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Shell sort

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 Objectives:

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 Outcomes

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 thermodynamic 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 (s)

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

Reference Book (s):

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** 9 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 Hour
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 sustances 9 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 9 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	Discrete Structure			
Course Code	CSE211			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. This course is aimed at helping students build up an understanding.
2. Cultivate clear thinking and creative problem solving.
3. Thoroughly train in the construction and understanding of mathematical proofs.
4. Exercise common mathematical arguments and proof strategies.
5. Cultivate a sense of familiarity and ease in working with mathematical notation and common concepts in discrete mathematics.
6. Teach the basic results in set theory, logic, combinatorics, and graph theory.
7. Thoroughly prepare for the mathematical aspects of other computer science course.

Course Outcomes

CO1	Explain at high levels concepts and implement basic operations in discrete mathematics.
CO2	Perform combinatorial analysis to solve counting problems.
CO3	Develop mathematical models from computation theory to programming languages through combinatorics, graphs.
CO4	Use mathematical reasoning to comprehend and construct mathematical arguments.
CO5	Develop techniques for counting, permutations and combinations.

Text Book (s)

1. Seymour lipschutz, Marc Lars Lipson, Theory and Problems of Discrete Mathematics Third Edition, Schaum's Outline Series McGRAW-HILL.

2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI
3. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill

Reference Book (s):

1. Swapan Kumar Sarkar, A Textbook of Discrete Mathematics, S.Chand Publication
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. J.L. Mott, A. Kandelad T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, PHI, 2nd Edition, 1999.

4. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill

Unit I: MATHEMATICAL LOGIC: **10 lecture hours**
Introduction, Propositions, Connectives, Truth tables, Tautologies and Contradictions, Equivalences implications, Normal forms, Methods of proof rules of inference for quantified propositions, Mathematical induction.
Unit II: COMBINATORICS: **6 lecture hours**
Basics of counting, Combinations of permutations, Enumeration of combination and permutation, Pigeonhole principle, Inclusion, Exclusion principle, Ordered and unordered portions.
Unit III: RECURRENCE RELATIONS: **8 lecture hours**
Generating function of sequences, Calculating coefficients of generating functions, Recurrence relations, solving recurrence relations by substitutious and generating functions, Method of characteristic roots, Solution of homogenous recurrence relations
Unit IV: GRAPH THEORY: **8 lecture hours**
Basic concepts of graph theory, Diagraph, Paths, Reachability connectedness, Matrix representation of graphs, Subgraphs, Isomorphisms trees, Properties, Directed tress, Binary trees.
Unit V: BOOLEAN ALGEBRA: **8 lecture hours**
Post, Hasse diagrams, Lattices, Types of Lattices, Boolean Algebra, Basic theorems, 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	**Introduction to Cryptographic Fundamentals**				
Course Code	**BCSE2330**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**
	2	**0**	2	3

Course Objectives:
The primary objective of this course is to understand Cryptography Theories, Algorithms and Systems. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

Course Outcomes

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3	Apply the different cryptographic operations of public key cryptography
CO4	Apply the various Authentication schemes to simulate different applications
CO5	Understand various Security practices and System security standards

Text Book (s)

1	William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

Reference Book (s)

1	C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2	BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3	Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

Course Contents:

Unit-1: INTRODUCTION	**9 hours**

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, Steganography.
Unit II: SYMMETRIC KEY CRYPTOGRAPHY 9 hours
Algebraic structures - Modular arithmetic-Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher mode of operation – Advanced Encryption Standard - RC4 – Key distribution.
Unit III : PUBLIC KEY CRYPTOGRAPHY 9 Hours
Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.
Unit IV : MESSAGE AUTHENTICATION 9 Hours
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications – Kerberos.
Unit V : SECURITY PRACTICE 9 Hours
Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

Continuous Assessment Pattern:

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	100

Name of The Course	**Introduction to Cryptographic Fundamentals Lab**				
Course Code	**BCSE2331**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	**0**	2	1	

Course Objectives:
The primary objective of this course is to understand Cryptography Theories, Algorithms and Systems. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

Course Outcomes

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3	Apply the different cryptographic operations of public key cryptography
CO4	Apply the various Authentication schemes to simulate different applications
CO5	Understand various Security practices and System security standards

Text Book (s)

1	William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

Reference Book (s)

1	C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2	BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3	Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

List of Experiments	
1	Demonstration of Symmetric conventional cryptographic techniques.
2	Demonstration of Symmetric classic cryptographic techniques
3	Demonstration of Asymmetric cryptographic techniques
4	Demonstration of Hashing and Message digest techniques
5	Design and implementation of new cryptographic algorithms
6	Demonstration and implementation of secure communication using standard crypto libraries
7	Implementation of smart card based server/client applications
8	Demonstration of authentication techniques
9	Developing cryptographic algorithms for innovative applications

Continuous Assessment Pattern:

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	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 Objectives:

Understand the architecture of digital system by using machine language.

Course Outcomes

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 concepts of sequential circuits.
CO4	Understand the architecture of digital system by using machine language.
CO5	Identify core concepts of Memory and I/O systems

SPECIFICATION OF APPARATIUS USED:

➢ Power Supply, Digital Trainer Kit., Connecting Leads, IC's (7400, 7402, 7404, 7408, 7432, and 7486)

Title of Lab Experiments

- Introduction to Digital Electronics lab- nomenclature of digital ICS, specifications, studyof the data sheet, concept of vcc and ground, verification of the truth tables of logic gates using TTL ICS.
- To study and verify NAND and NOR as a universal gate.
- Implementation of the given Boolean function using logic gates in both sop and pos forms.

- Design and Implementation of Half Adder and Full Adder circuits using logic gates.
- Design and Implementation of Half Subtractor and Full Subtractor circuits using logic
- gates.
- Design and Implementation of One bit and Two bit Comparators.
- Design and Implementation of 3x8 Decoder.
- Design and Implementation of 8x3 Encoder.
- Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		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 Objectives:

Understand the data structure shortest path algorithms involving complicated data structures like Graphs.

Course Outcomes

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, YedidyahLangsam and Moshe J. Augenstein “Data StructuresUsing 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
20	30	50	100

Name of The Course	English Proficiency and Aptitude Building -2				
Course Code	SLBT2001				
Prerequisite	Completion of semester 2				
Corequisite					
Antirequisite					
24 sessions of 100 minutes each, 12 hours of online tests		**L**	**T**	**P**	**C**
		3	0	4	2

Course Objectives:

1. Enhance formal writing skills
2. To understand soft-skills pertaining to industry

Course Outcomes

CO1	To further enhance grammar skills
CO2	To enhance the analytical, logical and quantitative skills of students.
CO3	Get overall personality enhancement

Text Book (s)

SLLL own text book

Reference Book (s):

1. Communication Skills for Engineers, Mishra, Sunita & C. Muralikrishna, Pearson
2. Corporate Soft skills, Sarvesh Gulati,2006.
3. Effective Communication, JohnAdair, MacmillanLtd.1997.
4. Developing Communication Skills, Krishna Mohanand Meera Bannerji, Macmillan IndiaLtd.1990

Continuous Assessment Pattern

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

Year :	2017-21 batch (4th Semester)						
Subject Code		Name of the Course	Teaching Scheme				Credits
			L	T	P	Total Hours	
1	SLBT2002	English Proficiency and Aptitude Building – 3	0	0	4	2	2
2	MATH2003	Probability and Statistics	3	0	0	3	3
3	BCSE2010	Operating Systems	3	0	0	3	3
4	BCSE2011	Data Base Management System	3	0	0	3	3
5	BCSE3004	Microprocessor & Interfacing	3	0	0	3	3
6	BCSE2012	Data communication & Networking	3	0	0	3	3
Programme Elective-I							
7	BSC9007	Introduction to cloud Comuting	3	0	0	3	3
	BCSE2017	Introduction to IOT	3	0	0	3	3
	BSCS9001	Foundations of Data Science	3	0	0	3	3
	BCSE9009	Artificial Intelligence and Intelligent System	3	0	0	3	3
Lab							
8	BCSE2013	Operating Systems lab	0	0	2	2	1
9	BCSE2014	Data Base Management System lab	0	0	2	2	1
10	EMPS3003	Java Coding - Basics	0	0	2	2	1
11	BCSE3009	Microprocessor & Interfacing Lab	0	0	2	2	1
		Total	21	0	12	31	24

Name of The Course	English Proficiency and Aptitude Building -3			
Course Code	SLBT2002			
Prerequisite	Completion of semester 2			
Corequisite				
Antirequisite				
24 sessions of 100 minutes each, 12 hours of online tests	L	T	P	C
	3	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. Communication Skills for Engineers, Mishra, Sunita & C. Murali krishna, Pearson
2. Corporate Soft skills, Sarvesh Gulati,2006.
3. Effective Communication, John Adair, MacmillanLtd.1997.
4. Developing Communication Skills, Krishna Mohanand Meera Bannerji, 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	**Operating Systems**			
Course Code	**BCSE2010**			
Prerequisite	Data S Data structures			
Corequisite	C- Programming			
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Learn fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
2. Learn how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions.
3. Learn the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software,
4. Learn basic resource management techniques (scheduling, time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection to various examples and real life applications.

Course Outcomes

CO1	Remember the classification and diversification of Operating system.
CO2	Understand the classical problems in Concurrent Processes and their solutions.
CO3	Learn and 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	Analyze the concept of memory management and paging concept in operating system.
CO5	Able to apply various scheduling techniques.

Text Book (s)

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition.

Reference Book (s):

1. Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education
2. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
3. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition.

Unit I: Introduction **8 lecture 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 II: Concurrent Processes **8 lecture 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 III: CPU Scheduling 8 lecture 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 IV: Memory Management 8 lecture 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 V: Input/ Output 8 lecture 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	"Data Structures and Algorithms", "Discrete Mathematics"			
Corequisite	"C-Programming"			
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Develop the ability to design, implement and manipulate databases.
2. Introduce students to build data base management systems.
3. Able to store and analyze data into normalized format.
4. Apply DBMS concepts to various examples and real life applications

Course Outcomes

CO1	Learn knowledge of 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 databses.
CO5	Understanding of transaction process.

Text Book (s)

1. "Database system concepts" Henry F Korth, Abraham Silberschatz, S. Sudurshan, McGraw-Hill

Reference Book (s):

1. T2. Date C J, " An Introduction to Database Systems", Addision Wesley
2. T3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
3. T4: O'Neil, Databases, Elsevier Pub.
4. T5: Leon & Leon,"Database Management Systems", Vikas Publishing House
5. T6: Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
6. T7: Majumdar & Bhattacharya, "Database Management System", TMH (14)
7. T8: Ramkrishnan, Gehrke, " Database Management System", McGraw Hill

Unit I: Introduction **9 lecture 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.
Module II: Relational data Model and Language **9 lecture 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
Module III: Data Base Design & Normalization **10 lecture 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.
Module IV: Transaction Processing Concept **6 lecture 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.
Module V: Concurrency Control Techniques **6 lecture 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	Microprocessor & Interfacing			
Course Code	BCSE3004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To Familiarize the students with the architecture of 8086
2. To introduce the concepts of Assembly language programming of 8086.
3. To make the students familiar with ICs required for interfacing 8086 with I/O devices

Course Outcomes

CO1	To understand architecture of 8086 processor
CO2	To design Assembly language program for 8086
CO3	To use advanced features of 8086
CO4	To interface 8086 with various devices and memory
CO5	To understand the architecture and principles of USART 8245

Text Book (s)

1. D.V. Hall, Microprocessors & Interfacing, TMH, 3rd edition

2. Barry B Brey, The intel microprocessor: architecture, programming and interfacing, Prentice hall of India, New Delhi, 2003.ISBN-0138027455, 4th Edition

Reference Book (s)

1. Alan Clements, "Principles of Computer Hardware", Oxford University Press, 3rd Edition, 2003, ISBN-9780198564539

Course Contents:

Unit-1: Introduction **9 hours**
History of microprocessors, Introduction of 8086, Functional diagram of 8086, Register Organization, Memory Segmentation, Programming Model, Memory addresses. Physical memory organization, signal descriptions of 8086- common function signals. Minimum and Maximum mode signals, Timing diagrams.
Unit II: Assembly Language Programming (Part-I) **9 hours**
Instruction formats, addressing modes, instruction set, assembler directives, simple programs involving logical, branch and arithmetic expressions
Unit III : Assembly Language Programming (Part-II) **9 Hours**
Procedures: Near and Far procedures, Macros, String Manipulations, searching and sorting programs, Advanced features of Assembly language programming
Unit IV : I/O Interface **9 Hours**
8255 PPI, various modes of operation and interfacing to 8086, Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter, 8251 USART architecture and interfacing, RS- 232.
Unit V : Interfacing with memory & Interrupts **9 Hours**
Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine. Introduction to DOS and BIOS interrupts, Interfacing 8259 Interrupt Controller, DMA Controller 8257.

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
	3	0	0	3

Course Objectives:

1. Understand the fundamental concepts of data communications and networking.
2. Identify the basic components/instrument/equipment and their respective roles in data communication system
3. Understand the structure of computer networks, factors affecting computer network deployment.
4. Describe emerging technology in the net-centric computing area and assess their current capabilities, limitations and potential applications.
5. Program and analyse network protocols, architecture, algorithms and other safety critical issues in real-life scenario.

Course Outcomes

CO1	Understand the different networking sub-systems and their functions in a telecommunication system.
CO2	Understand and configure the different types of network topologies and protocols.
CO3	Understand the different protocols layers of the OSI model.
CO4	Examine and analyze the network-layer concepts like Network-Layer services – Routing -IP protocol -IP addressing

CO5	Examine and analyze the different link-layer and local area network concepts like Link-Layer services –Ethernet -Token Ring -Error detection and correction -ARP protocol

Text Book (s)

1. Forouzan, Data Communications and Networking, McGraw Hill, 4th ed.
2. Tannenbaum, Computer Networks ,Pearsoned Education.

Reference Book (s):

1. William Stallings,Data and Computer Communications, Pearsoned Education
2. Hykins, Analog and Digital Communications, Wiley Publications.

Unit I:Introduction Concepts	**8 lecture hours**
Data and Signal fundamentals, Analog Signals, Digital Signals, Transmission Media: Guided and Unguided Media, Transmission Impairments, Categories of Networks, Network Topology Design - Delay Analysis, Switching methods, ISDN, The OSI reference model ,TCP/IP Protocol Suite, Comparison of OSI and TCP/IP.	
Unit II: Digital and Analog Transmission	**8 lecture hours**
Digital Transmission: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Pulse Code Modulation, Delta Modulation, Digital-to-Analog Conversion, ASK,FSK,PSK, Analog-to-Analog Conversion, Modulation Techniques.	
Unit III: Medium Access sub layer	**8 lecture hours**
Medium Access sub layer - Channel Allocations, LAN protocols -ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary DataLink Protocols, Sliding Window protocols,Error Detection and Correction: Block coding, cyclic codes, Linear block codes, checksum.	
Unit IV:Network and Transport Layer	**8 lecture hours**
Network Layer - Point - to Pont Networks, routing, Congestion control, Internetworking -TCP / IP, IP packet, IP address, IPv6. Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	

Unit V: Application Layer	**8 lecture hours**
Electronic mail, WWW, HTTP, SMTP, POP3, IMAP, FTP, SSH.	

Continuous Assessment Pattern

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

BCSE9007	Introduction to Cloud Computing	L	T	P	C
Version No. 1.2	Date of Approval: Dec XX, 2016	3	0	0	3
Prerequisite	" Computer fundamentals and IT infrastructure knowledge "				
co-requisites					
Course Coordinator	N. Arul				

Course Objectives

The objective of this course is to:

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

Course Outcomes

At the end of the course student will be able to:

1. To Understand the Importance of Virtualization in Cloud.
2. To Introduce the Cloud deployment models and Cloud delivery models
3. To Learn the stepping stones for the development of cloud
4. To Learn the Decision Factors for Cloud Implementations
5. To Understands the Public, Private and Hybrid Cloud
6. To Learn about the workloads most suitable and not suitable for Cloud

Catalog Description

This course covers a series of current cloud computing technologies, including technologies for Virtualization like server virtualization, storage virtualization, network virtualization and application virtualization. The cloud introduction part also covered as the part of this course

Text Books

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 Books

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 I: Introduction to Virtualization **7 lecture hours**

Traditional IT Infrastructure, Benefits of Virtualization, Types of Virtualization, History of Virtualization.

Unit II: Server, Storage, Network and Application Virtualization 8 lecture 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: Introduction to Cloud 8 lecture hours

History, Importance of Virtualization in Cloud, Anatomy of Cloud, Cloud deployment models, Cloud delivery models, Stepping stones for the development of cloud, Grid Computing, Cloud Computing.

Unit IV: Cloud Implementations / Cloud Deployment Models, 9 lecture 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 lecture 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.

CSIO101/BCSE2017	Introduction to IOT	L	T	P	C
Version No. 1.0		3	0	0	3
Prerequisite					
co-requisites					

Mode of Evaluation: Class Quiz / Class Assignment / Group-Class Discussion

	Theory without PBL						
Components	**Internal (50)**						**SEE**
Marks	Cat-1 (15)	Cat-2 (15)	Quiz (3)	Assignment (3)	Class Discussion (5)	Attendance (5)	Semester End Exam (50)
Total Marks	100						

Course Objectives

The objective of this course is to:

1. Explain in a concise manner how the general Internet as well as Internet of Things work.
2. The focus will be more on the possibilities offered by the different technologies, and on the creative thinking techniques.
3. To find innovative applications of combinations of such technologies in real-life scenarios.

Course Outcomes

At the end of the course student will be able to:

1. To introduce the terminology, technology and its applications.
2. To introduce the concept of M2M (machine to machine) with necessary protocols.
3. Understand constraints and opportunities of wireless and mobile networks for IoT.
4. Use basic needs of IoT with respect to recent advancement.
5. Understand the implementation of web based services on IoT devices along with ethical challenges and privacy requirement in IoT .
6. Understanding the need of IoT, deployment challenges and characteristics of the IoT.

Catalog Description

The scope of the course is to describe the recent development of IoT and major application areas. The objective is to understand various levels of IoT. Why IoT will be the integral part of our life in coming days as well today. The emphasis is given on various application areas. The course designed as foundation course of IoT, which comprises the basic concepts essential to understand advance courses.

Text Books

1. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga, University Press, First Edition, 2014.

Reference Books

1. Internet of Things: Principles and Paradigms edited by Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufmann, First Edition, 2016.
2. Recent research/white papers.

Course Content

Unit I: INTRODUCTION **8 lecture hours**

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and lifestyle.

Unit II: IoT & M2M **8 lecture hours**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, and SNMP NETOPEER.

Unit III: WIRELESS SENSOR NETWORKS AND THE INTERNET OF THINGS 8 lecture hours

Introduction of wireless sensor networks, wireless sensor network applications, security integration challenges, integration approaches, the TCP/IP solution issues.

Unit IV: ENABLING TECHNOLOGIES, PROTOCOLS, AND APPLICATIONS 8 lecture hours

Market opportunity, IOT architecture, IoT Elements, IoT common standards, QoS criteria, IoT challenges and future directions.

Unit V: IoT Ethics and Privacy **8 lecture hours**

Ethical Challenges of the Internet of Things, Privacy matters in the 'internet of things, The Importance of the Internet of Things (IoT) in Society, Does Privacy Exist on the Internet of Things? 80% of consumers fear privacy invasion in the Internet of Things revolution

Mode of Evaluation: Quiz/Assignment/ Seminar/Written Examination

	Theory without PBL						
Components	**Internal (50)**						**SEE**
Marks	Cat-1 (15)	Cat-2 (15)	Quiz (6)	Assignment (5)	Class Discussion (5)	Attendance (4)	Semester End Exam (50)
Total Marks	100						

Name of The Course	**Foundations of Data Science**				
Course Code	BSCS9001				
Prerequisite	PYTHON BASICS, STATISTICS, LINEAR ALGEBRA				
Co requisite	DBMS, MACHINE LEARNING.				
Antirequisite					
	L	**T**	**P**	**C**	
	3	**0**	0	3	

Course Objectives:
The primary objective of this course is to develop both theoretical knowledge on data analysis skills, which can be applied to practical problems for explain how math and information sciences can contribute to building better algorithms and software. To develop applied experience with data science software, programming, applications and processes.

Course Outcomes

CO1	To acquire good introducing knowledge of the essentials in Statistical Fundamentals used in Data science.
CO2	An ability to apply algorithmic principles and Programming knowledge using Python language on Data Science.
CO3	Understand the fundamentals of statistics and probability used in data science.
CO4	To establish basic knowledge about optimization techniques in Data Virtualization.
CO5	Apply and Implement ML processing principles using Probability and Statistics **.**

Text Book (s)

1	Data Science from Scratch: First Principles with Python 1st Edition, by Joel Grus , O'Reilly Publication,2020.
2	James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
3	Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.

Reference Book (s)

1	"Data Science for business", F. Provost, T Fawcett, 2013.
2	Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services , 2015.
3	Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press, 2012

Course Contents:

Unit-1: Introduction with Statistical Fundamentals 9 hours
Introduction : Intermediate Algebra& Linear Algebra: Functions, Exponentials and Logarithm's, Polynomial's, Alternate Coordinate systems, Binomial Distribution, Poisson distribution and Normal distribution its properties, Assumption of ANOVA, Measures of Central Tendency in Data.
Unit II: Python for Data Science 9 hours
Introduction about NumPy, Different NumPy Operations, Broadcasting with NumPy, Introduction about Pandas, Reading or Loading data into Data frame, Pandas Data Frame Manipulations, Data Loading /Reading in different formats(CSV,Excel,Json,HTML).
Unit III : Data Science with R 9 Hours
Intro to R Programming, Understanding data structures in R - lists, matrices, vectors, Basic Building Blocks in R, Basic Operations Operators and Types, Matrices and Data Frames in R, Logical Statements in R, Lapply, sapply, vapply and tapply Functions. Summarizing and Visualizing the Important Characteristics of Data.
Unit IV : Data Visualizations & Data Cleaning 9 Hours
Introduction to data Visualizations, Principles Behind Data Visualizations, Histograms-Visualize, Box plots-Visualize, the Distribution of Continuous Numerical Variables (Bar Plots · Pie Chart · Line Chart). Data Visualization using R- Line Plots and Regression.
Unit V : Statistics and Probability concepts to understanding Machine learning 9 Hours
Unsupervised Learning in Python: K- Means Theory/ Implementation, Quantifying K-Means Clustering Performance, Hierarchical Clustering Theory, Principal Component Analysis (PCA) theory / Implementation. Selection criteria for number of clusters choosing.

Continuous Assessment Pattern:

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	100

Name of The Course	Artificial Intelligence and Intelligent System			
Course Code	BCSE9009			
Prerequisite				
Co requisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: **The objective of this course is to:**

1. Develop the ability to design and implement agents.
2. Introduce students to search concepts for complex AI problem.
3. Apply AI concepts to various real life applications exploration of research problems..

Course Outcomes: At the end of the course student will be able to:
1. Analyze the dimensions along which agents and environments.
2. Implement agents using search algorithms
3. Develop strategies for agents in games of perfect and imperfect information
4. Ability to handle knowledge representation.
5. Understand Bayesian network to make quantitative (probabilistic) and qualitative inferences
6. Understanding of Pattern Recognition and network.

Text Books:
1. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill

Reference Books
References:
1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson
Education
3. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

Unit – I: **Scope of AI:** Introduction to AI Foundations and History. Intelligent Agents- application domains - natural language processing, vision and speech processing, robotics, expert systems, AI techniques- Agent types

Unit –II: **Problem solving State space search:** Production systems, search space control: depth first, breadth-first search, heuristic search - hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End

Unit –III:.**Knowledge Representation & Logical Agents**: Knowledge-Based Agents, Wumpus WorldNet, Propositional Logic, Propositional Theorem, Propositional Model Checking, Agents Based on Propositional Logic. First-Order Logic: Representation, Syntax and Semantics, Using First-Order Logic and Knowledge Engineering. Inference in First-Order Logic: Unification and Lifting, Forward and Backward Chaining, Resolution.

Unit–IV: **Uncertain Knowledge and Reasoning**: Acting under Uncertainty, Probability Notation, Inference, Independence and Bayes' Rule. Probabilistic Reasoning: Semantics and Inference of Bayesian Networks, Relational and First-Order Probability Models, Probabilistic Reasoning over Time: Inference, Hidden Markov Models, Kalman Filters and Dynamic Bayesian Networks. Making Simple Decisions: Utility Theory and Functions and Decision Networks.

Unit – V: **Learning from Examples**: Forms, Decision Trees, Theory of Learning, Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning. Knowledge in Learning: Logical Formulation, Explanation-Based Learning, Reinforcement Learning: Passive and Active Reinforcement Learning and Generalization

Continuous Assessment Pattern:

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	100

SLBT3002	**Campus to Corporate**	L	T	P	C
Version 1.0	Date of Approval:	0	0	4	2
Pre-requisites/Exposure	Completion of Semester 5				
Duration	24 sessions of 100 minutes each, 12 hours of online tests				

Course Objectives

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 Outcomes

At the end of this course, the learner will be:

1. Able to analyze self and make necessary corrections
2. Able to recognize and make use of the strengths
3. Able to structure and express their thoughts during interviews , GD and presentations
4. Able to develop skills for career enhancement

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.

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

Real world HR interviews from companies across various sectors like IT, ITES, Manufacturing, etc. in and around NCR region.

BCSE3015	Computer Graphics Lab	L	T	P	C
Version 1.0	Date of Approval:	0	0	4	2
Pre-requisites/Exposure	Completion of Semester 5				
Duration	24 sessions of 100 minutes each, 12 hours of online tests				

LIST OF EXPERIMENTS

Sr. No	Topic
1.	Study of basic graphics functions defined in "graphics.h"
2.	To implement DDA (Digital Differential Algorithms) and Bresenham's algorithm for line drawing.
3.	To implement Mid Point and Bresenham's algorithms for circle drawing.
4.	To implement Midpoint algorithms for Ellipse drawing.
5.	To perform 2D Transformations such as translation, rotation, scaling with respect to origin as well as pivot point.
6	To perform 2D Transformations reflection and sharing.
7	To implement Cohen-Sutherland 2D Line clipping.
8	To implement Liang-Barsky 2D Line clipping.
9.	To implement Sutherland Hodgeman Polygon clipping algorithm.
10.	To implement window-viewport Transformation.
11.	To perform 3D Transformations such as translation, rotation and scaling.
12	To visualize 3D objects as 2D display using Parallel Projection.
13.	To implement Depth buffer Algorithm for Hidden Surface removal.
14.	To implement Hermite curves for a given set of control points.
15.	To generate a smooth curve by using Bezier curve technique for a given set of control points.
16.	To generate an interpolation and approximation curve by using B-Spline curve
	Value Added List of Experiments
17.	Designing animations using transformations. a. Bouncing Ball Animation. b. Create Scenery [with mountain, sun & tree] and solar system using Line, Circle & Ellipse generating algorithms. c. Character Generation and Font Generation Animation. d. Draw Cube using Wireframe Model

Name of The Course	Operating Systems Lab			
Course Code	BCSE2013			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

To understand the services provided by and to design an operating system
To understand what a process is and how processes are scheduled
To understand different approaches to memory management.

Course Outcomes

CO1	Understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks
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	Produce algorithmic solutions to process synchronization problems
CO5	

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.

List of Experiments	
1	Introduction to basis Linux commands and application development through C on Linux environment.
2	Program to report the behaviour of the OS to get the CPU type and model, kernel version.
3	Program to get the amount of memory configured into the computer, amount of memory currently available.
4	Create a process using fork, where one parent process generates Fibonacci series for ‘n’ terms and child calculates no of vowels in a file. The values of ‘n’ and file name are taken as command line arguments.
5	Write a program using P-thread, where main thread calculates number of lines in a file and child calculates number of words.
6	Write a program to implement the FCFS, SJRF, Priority, Round – Robin process scheduling algorithms.
7	Write a program to implement Inter Process Communication (IPC) using Message Queues.
8	Write a program to implement IPC using pipes.
9	Implementation of wait and signal using counting semaphores.
10	Implementation of wait and signal using binary semaphores.
11	Implement the solution for reader – writer’s problem.
12	Implement the solution for dining philosopher’s problem.
13	Implement banker’s algorithm.
14	Implement the first fit; best fit and worst fit file allocation strategy.
15	Implementation of page replacement algorithms.

Continuous Assessment Pattern

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

Name of The Course	Database Management Systems Lab
Course Code	BCSE2014
Prerequisite	
Corequisite	
Antirequisite	

	L	T	P	C
	0	0	2	1

Course Objectives:

To understand design of ER Dirgrams and represent using Relational model
To understand the concept of normal forms in the design of databases.
To comprehend the structure of SQL Queries to retrieve data from the databases

Course Outcomes

CO1	Apply ER concepts to design databases.
CO2	Apply programming concepts using DDL and DML commands in SQL.
CO3	Design simple database using a tool and implement it using SQL.
CO4	Apply all constrains to develop a business application using cursors, triggers and stored procedures.
CO5	Design the storage structures and indexed structures

Text Book (s)

"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.

List of Experiments
Write the queries for Data Definition and Data Manipulation Language.
Write SQL queries using Comparison operators (=,<,>,etc).
Write SQL queries using Logical operators.
Write SQL query using SQL Operators.
Write SQL queries for relational algebra.
Write SQL queries for extracting data from more than one table.
Write SQL queries for sub queries, nested queries.
Write programme by the use of PL/SQL.
Concepts for ROLL BACK, COMMIT & CHECK POINTS.
Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
Create FORMS and REPORTS

Continuous Assessment Pattern

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

Name of The Course	Java Coding - Basics			
Course Code	EMPS3003			
Prerequisite				
Co requisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

CO1: outline the fundamentals of object-oriented programming in Java
CO2: create applications using thread and exception handling
CO3: understand I/O streams and applet programming in Java
CO4: experiment with Java packages and collections.
CO5: construct the GUI based application with AWT controls

TEXT BOOKS:

1. Scheldt, Herbert. —Java: The Complete Reference‖, 9th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2014.
REFERENCE BOOKS:
1. Buyya Rajkumar., Thamarai Selvi S. and Xingchen Chu., —Object Oriented Programming with Java Essentials and Applications‖, Tata McGraw Hill, 2009.
2. Deitel, Paul and Deitel, Harvey. —Java How to Program‖, 8th Edition, Eastern Economy Edition, 2009. 3. www.javatpoint.com
4. https://www.w3schools.in/java-tutorial/

List of Experiments
1. Simple java programs using operators, arrays and control statements

2. Develop a stack data structure using class and object
3. Program to demonstrate inheritance & polymorphism
4. Develop an application using interfaces and packages
5. Program to illustrate exception handling in java and creation of user defined exception
6. Program to illustrate multithreads and Inter thread Communication
7. Program to copy the contents of one file into another file.
8. Develop and configure a simple banner applet
9. Program to demonstrate the features of generics types
10. Program to demonstrate the use of Array List, Linked List, HashSet and Map classes.
11. Program to capture the various keyboard and mouse events.
12. Develop a scientific calculator using event-driven programming paradigm of Java
13. Develop a simple text editor with basic file and edit functionalities

Name of The Course	**Microprocessor & Interfacing Lab**			
Course Code	**BCSE3009**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	2	1

Course Objectives:

This course facilitates the students to familiar with Micro Processor (MP) based system design which includes hardware, software and interfacing. After completing this course, the student should be able to design a complete Microprocessor based system for a real-world application. Course covers the introduction to basic digital devices and microcomputer components, Architecture and programming of 8086 Microprocessors, Interrupts, peripheral interfacing and direct memory access.

Course Outcomes

CO1	Write assembly language program for basic mathematical and logical operations.
CO2	Explain the interrupts of 8086 microprocessor
CO3	Explain the 8086 based system with programmable peripheral interface, programmable timer interface and Programmable interrupt controller interface.
CO4	Summarize the concept of peripheral / interfacing
CO5	Analyze the 8086 based system with DMA.

Text Book (s)

1	Brey Barry B. & C R Sarma The Intel Microproc,: Arch, Prog. & Interfacing Pearson Edu.,8thEdition, 2008.

Reference Book (s)

1	The x86 processors, Architecture, programming and interfacing. Lyla B Das, Pearson 2010.
2	Morris Mano, Digital Design ,PHI, 5th edition, 2012.

List of Experiments	
1	Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
2	Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3	By using string operation and Instruction prefix: Move Block, Reverse string, Sorting,
4	Inserting, Deleting, Length of the string, String comparison.
5	Reading and Writing on a parallel port.
6	Timer in different modes.
7	Serial communication implementation.
8	8259 – Interrupt Controller: Generate an interrupt using 8259 timer.
9	8279 – Keyboard Display: Write a small program to display a string of characters.
10	Traffic Controller Interface.
11	ADC & DAC Interface.
12	8255- Interface.
13	8251- UART Interfacing

Continuous Assessment Pattern

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

50		50	100

Year :	2017-21 batch (5th Semester)							
Subject Code		Name of the Course	Teaching Scheme					Credits
			L	T	P	Total Hours		
1	BSCS2350	Design and Analysis of Algorithms	3	0	0	3	3	
2	BCSE3002	Compiler Design	3	0	0	3	3	
3	BSCS2440	Software Engineering	3	0	0	3	3	
4	BSCS9003	Introduction to Cyber Security	3	0	0	3	3	
5	SLBT3001	English Proficiency and Aptitude Building -4	0	0	4	4	2	
Practical								
6	BCSE3007	Compiler Design Lab	0	0	2	2	1	
7	BSCS2351	Design & Analysis of Algorithms Lab	0	0	2	2	1	
8	BSCS2441	Software Engineering Lab	0	0	2	2	1	
9	BCSE3071	Industry Oriented Java-2	0	0	2	2	1	
10	BCSE3072	Industry Oriented Python-2	0	0	2	2	1	
Programme Elective-II								
11	BCSE3066	Machine Learning	3	0	0	3	3	
	CSDT1001	Disruptive Technology	3	0	0	3	3	
		Total	15	0	14	29	22	

Name of The Course	Design & Analysis of Algorithms			
Course Code	BCSE2350			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

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 Outcomes

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 Contents:

Unit-1: Introduction	**9 hours**
Introduction : 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 II: Tree	**9 hours**
Advanced Data Structures: Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	
Unit III : 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 IV : 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 V : 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	BCSE3002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

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 Outcomes

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.

Contents:

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 II: Basic Parsing Techniques **9 hours**
Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive 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 III : 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 IV : 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 V : 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	**BSCS2440**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	**0**	0	3

Course Objectives:

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 Outcomes

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.

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 II: Software Requirement Specifications (SRS) and Design	**9 hours**
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design Data Flow Diagrams, Entity Relationship Diagrams.	
Unit III : Software Testing Methods and Selection	**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 IV : 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 V : 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	BSCS9003				
Prerequisite	Network security, System security				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	**0**	0	3	

Course Objectives:
1. Define the area of cybercrime and forensics.
2. Explain the motive and causes for cybercrime, detection and handling.
3. Investigate Areas affected by cybercrime.
4. Illustrate tools used in cyber forensic
5. Infer legal Perspectives in cyber security

Course Outcomes

CO1	Define cyber security, cyber law and their roles
CO2	Identify cyber security cybercrime and forensics.
CO3	Apply tools and methods used in cyber crime.
CO4	Integrate the tools and methods used in Cyber Forensics.
CO5	Comprehend the Security Policies and Cyber Laws.

Text Book (s)

1	Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81-265- 21791, Publish Date 2013
2	Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI. “Introduction to information security and cyber laws”. Dreamtech Press. ISBN: 9789351194736, 2015

Reference Book (s)

1	Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 -1- 118 - 84965 -1
2	James Graham, Ryan Olson, Rick Howard, "Cyber Security Essentials", CRC Press, 15- Dec 2010.
3	Anti- Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.

Course Contents:

Unit-1: INTRODUCTION TO CYBERCRIME 9 hours
I Cybercrime- Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyber offenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.
Unit II: CYBERCRIME 9 hours
Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.
Unit III : TOOLS AND METHODS USED IN CYBERCRIME: 9 Hours
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan-horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction to Phishing, Identity Theft (ID Theft).
Unit IV : UNDERSTANDING COMPUTER FORENSICS 9 Hours
Introduction, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.

Unit V : SECURITY POLICIES AND CYBER LAWS	**9 Hours**
Need for An Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property – Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.	

Continuous Assessment Pattern

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	100

Name of The Course	English Proficiency and Aptitude Building -4			
Course Code	SLBT3001			
Prerequisite				
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	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)

SLLL own text book

Reference Book (s):

- Communication Skills for Engineers, Mishra, Sunita & C. Murali krishna, Pearson
- Corporate Soft skills, Sarvesh Gulati,2006.
- Effective Communication, JohnAdair, MacmillanLtd.1997.
- Developing Communication Skills, Krishna Mohanand Meera Bannerji, 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	Compiler Design Lab			
Course Code	BCSE3007			
Prerequisite				
Corequisite				
Antirequisite				
L	**T**	**P**	**C**	
0	**0**	2	1	

Course Objectives:

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 Outcomes

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.

Text Book (s) / 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		50	100

Name of The Course	Design & Analysis of Algorithms Lab			
Course Code	**BSCS2351**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	2	1

Course Objectives:

To identify and apply the concept of computational intractability.

Course Outcomes

CO1	To analyze the running time of asymptotic algorithm.
CO2	To develop algorithms for sorting, searching, insertion and matching.
CO3	To identify and apply the concept of computational intractability.
CO4	Apply the algorithms and design techniques to solve problems
CO5	Analyze the complexities of various problems in different domains.

Text Book (s)

Reference Book (s)

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, “Introduction to the Design and Analysis of Algorithms”, Mc Graw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul,” Algorithms”, Cengage Learning.
5. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008.

List of Experiments:

1. Write a program to sort given set of numbers in ascending/descending order using Bubble sort and also search a number using binary search.
2. Write a program to sort given set of numbers in ascending/descending order using Insertion sort and also search a number using linear search.
3. Write a program to sort given set of numbers in ascending/descending order using Quick sort and any other sorting algorithm. Also record the time taken by these two programs and compare them.
4. Write a program to sort given set of numbers using Heap sort.
5. Write a program to sort given set of numbers Merge Sort.
6. Write a program to sort given set of numbers Counting Sort.
7. Write a program to implement Strassen's Matrix Multiplication by Divide and Conquer
8. Write a program to implement Knapsack using Greedy technique.
9. Write a program to implement Knapsack using Dynamic programming.
10. Write a program to implement Dijkstra's Algorithm.
11. Write a program to implement n-Queen Problem using backtracking.
12. Write a program to implement String Matching using Rabin-Karp algorithm.

Continuous Assessment Pattern

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

Name of The Course	Software Engineering Lab			
Course Code	**BSCS2441**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	2	1

Course Outcomes

CO1	Understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry.
CO2	Discuss the distinctions between validation testing and defect testing.
CO3	Understand the principles and need for various types of testing.
CO4	Describe strategies for generating system test cases.
CO5	Understand the essential characteristics of tool used for test automation.

Text Book (s)

Reference Book (s)

1. S. Desikan and G. Ramesh, “Software Testing: Principles and Practices”, Pearson Education.
2. Aditya P. Mathur, “Fundamentals of Software Testing”, Pearson Education.
3. Naik and Tripathy, “Software Testing and Quality Assurance”, Wiley
4. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International Publication.

Sr. No.	Title of Lab Experiments
1.	Demonstration on Manual testing a. Write Programs in „C‟ Language to demonstrate the working of the following constructs: i)do…while ii) while…do iii)if…else iv)switch v)for b. Write a program in ‟C‟ language to demonstrate the working of palindrome using do…while.
2.	Demonstration on Unit testing a. Create a test plan document for any application (e.g. Library Management System). b. Study of any testing tool (e.g. Win runner). c. Create a test plan document for cellular phone.
3.	Demonstration on Integration testing Take a mini project (e.g. University admission, Placement Portal) and execute it. During the life cycle of the mini project create the various testing documents and final test report document.
4.	Demonstration on System testing a. Take any system (e.g. ATM system) and study its system specifications and report the various bugs. b. Write down the test cases for any known applications (e.g. Banking Application).
5.	Demonstration on Blackbox testing a. Design a usecase diagram for an ATM system. b. Design a class diagram for an ATM system. c. Design a usecase diagram for Library system.

6.	Demonstration on WhiteBox testing a.Create various testing document for robot control system. b.“A Program written in „C“ Language for Matrix Multiplication fails” Introspect the causes for its failure and write down the possible reasons for its failure. c. Write a Program in „C“ Language to demonstrate the working of Addition of diagonal elements in a matrix.
7.	Demonstration on Regression testing a. Study of any web-testing tool (eg. Selenium). b. Study of any bug-tracking tool (eg. Bugzilla, bug bit). c. Study of any test management tool (eg. Test Director). d. Compare different testing tools.
8	Demonstration on Mutation testing Write down the test cases for any known applications (e.g. Banking Application).
9	Demonstration on Alpha testing. Make a Case Based study on the experiment
10.	Demonstration on Beta testing. Make a Case Based study on the experiment
11.	Demonstration on User Acceptance testing. Make a Case Based study on the experiment

Continuous Assessment Pattern

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

Name of The Course	**Industry Oriented Java-2**			
Course Code	BCSE3071			
Prerequisite	Industry oriented Java 1			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

1. Learn logical building with java programming as the application of a set of methodologies and technologies.
2. Learn how the java programming can be used in developing user interface design and development .
3. Learn the how java technologies can be used for design and development of application using servlet.
4. Learn the how java technologies can be used for design and development of application using jsp.
5. Learn how to establish database connectivity using JDBC, servlet and JSP technologies.

Course Outcomes

CO1	Implement logical building programmes based on java 2 and java 3.
CO2	Apply user interface design using key technologies in JEE.
CO3	Apply servlet and session handling technologies used for java application development.
CO4	Apply JSP technologies java application development.
CO5	Implement the Database connectivity using JDBC by means of Servlet and JSP.

Text Book (s)

1.JDBC 4.2, Servlet 3.1, and JSP 2.3 Includes JSF 2.2 and Design Patterns, Black Book

Wiley India; 2nd edition (January 1, 2016)

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 Book (s):

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.

Course Contents:

Days	Topics	Description	Lectures
1	IO	Java input and output, Streams, byte streams and character streams, InputStream, OutputStream, Reader, Writer	2
		File, FileInputStream, BufferedInputStream, FileOutputStream, BufferedOutputStream,	
		FileReader, BufferedReader, FileWriter, BufferedWriter	
		InputStreamReader, OutputStreamWriter	
		Assessment	
2	Serialization	Serialization-Object writing in file and reading	
		Marker Interface	2
		Assessment	2
3	Multithreading	Multithreaded programs, Thread class and Runnable interface, Synchronization	
		Assessment	
4	Collection	Collection framework and collection interfaces List, Queue, Set and Map	2
		List classes	
		For-each method for collection and iterators	
		Assessment	
5	Map	Set classes	2
		Map classes	
		Assessment	
6	Collections Class	The equals method and hashcode method	2
		Comparator and hashCode ()	

		Collections Class	
		Assessment	
7	SQL	Introduction to SQL	2
		Creating table	
		Inserting data	
		Selecting data using SELECT clause	
		Restrict using WHERE clause	
		Comparison operators	
		Logical operators	
		Sorting data using ORDER BY clause	
		Updating data	
		Deleting data	
		Dropping the table	
		Assessment	
8	Connectivity	Introduction to JDBC API	2
		Types of drivers	
		Statement, Prepared Statement and Callable Statement	
		Performing insert, update and delete operations	
		Assessment	
9	JDBC	ResultSet	2
		Performing Select operations	
		Transaction management - commit and rollback	
		Assessment	
10	Project	Create a mini project using JDBC to perform Insert, Delete, Update and Select Operations	4
		Assessment	
11	Grand Test		2

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 Python–II			
Course Code	BCSE3072			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

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 Outcomes

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
CO5	

Text Book (s)

Reference Book (s)

List of Exercise (Industrial oriented Python-3)

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

Continuous Assessment Pattern

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

Name of The Course	Machine Learning			
Course Code	BCSE3066			
Prerequisite				
Co requisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives
The objective of this course is to introduce the students about the knowledge of basic concepts of machine learning systems, types of learning etc.
Course Outcomes
At the end of the course students will be able to:
1. Understand learning systems.
2. Apply learning and classification algorithms.
3. Use regression techniques.
4. Apply unsupervised learning algorithms.
5. Understand reinforcement learning techniques

Text Books
1. Tom M Mitchell, Machine Learning, McGraw Hill Education, McGraw Hill Education; First edition, 2017.
2. Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
3. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Inderscience, 2000. ISBN: 9780471056690.

Reference Books

1. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
2. Introduction to Machine Learning – Ethem Alpaydin, MIT Press, Prentice hall of India.
3. Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.
4. Elaine Ric, Kevin Knight and Shiv Shankar B. Nair, Artificial Intelligence, 3rd edition, Tata McGraw Hill, 2009.

Course Content

Unit I: Introduction **8 Lecture hours**

Basic concepts: Definition of learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation

Unit 2 Learning and Classification **8 Lecture hours**

Types of Learning: Supervised learning and unsupervised learning. Overview of classification: setup, training, test, validation dataset, over fitting. Classification Families: linear discriminative, non-linear discriminative, decision trees, probabilistic (conditional and generative), nearest neighbour.

Unit 3 Regression **8 Lecture hours**

Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naive Bayes, Support vector machines: Optimal hyper plane, Kernels. Model selection and feature selection. Combining classifiers: Bagging, boosting (The Ada boost algorithm), Evaluating and debugging learning algorithms, Classification errors.

UNIT4 Unsupervised learning **9 Lecture hours**
Clustering, K-means, EM Algorithm, Mixture of Gaussians, Factor analysis, PCA (Principal components analysis), ICA (Independent components analysis), latent semantic indexing, Spectral clustering, Markov models Hidden Markov models (HMMs).
UNIT-5 Reinforcement Learning **9 Lecture hours**
MDPs. Bellman equations, Value iteration and policy iteration, Linear quadratic regulation (LQR). LQG, Q-learning, Value function approximation, Policy search, Reinforce, POMDPs

Continuous Assessment Pattern

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

Name of The Course	**Disruptive Technology**			
Course Code	CSDT1001			
Prerequisite	Basic programming Languages			
Corequisite				
Antirequisite	No Antirequisite for Disruptive technology			
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:
Able to outline the strength of various systems and their role in an Industry 4.0 world
Learners will gain deep insights into the fundamental concepts of disruptive technologies, their promises as well as their current limitations
To provide an overview with the fundamental techniques and principles in the exciting growing field of big data analytics.
To understand the state of the art of Arduino architecture and Sensors
To study about different tools like Python, Tableau and Arduino

Course Outcomes

CO1	Understand the drivers and enablers of Industry 4.0 and how organizations and individuals should handle challenges to reap the benefits.
CO2	Build the deep insight into the main methods used in machine learning (ML) and artificial intelligence (AI) Utilize the potential impact of Artificial Intelligence and machine learning
CO3	Acquire fundamental enabling techniques and scalable algorithms to Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
CO4	Analyse basic IOT protocols and its characteristics to determine the performance
CO5	Implement the basic IoT applications on embedded platform

Unit-1	**Introduction to Industry 4.0**	**9 hours**
Introduction - Business and IT Trends - Enterprise Software Trends- Key Emerging, Invention & Innovation, Industry 4.0, Industry Evolution, Key Technologies - AR/VR- Digital currencies and Block chain Technology- Intelligent Computing AI and Autonomous Robots– Data Science and Deep learning- Computer Vision – Industrial IoT.		
Unit-2	**Introduction AI & ML using Python**	**8 Lectures**
Introduction, Scope of AI & ML, Applications, Challenges, Types of learning: Supervised, Unsupervised, Reinforcement. Preparation of Data-Training and Testing. Introduction to Python, Data types, Variables, Conditions, Loops, List, Dictionary, Functions, Class and Objects, NumPy array and operations, Pandas Data frame and operations, Matplotlib Visualization, Scikit-Learn usage, installation of Anaconda distribution, End-to-end AI & ML Project.		
Unit-3	**Introduction Data Analytics using Tableau**	**9 lecture hours**
Introduction - Big data, challenges, applications, Big data analytics algorithms , Big data system, Big Data Life Cycle, data representation, cleansing, validation, Data analysis and visualization. Tableau Introduction- Installation, connecting to data, Aggregate functions, sorting, Calculation, grouping, Set, Action, Dashboard creation.		
Unit IV: Introduction to Embedded system & Arduino	**9 lecture hours**	
Overview of Embedded Systems, Components of Embedded Systems, about arduino IDE , Arduino architecture and pin details, Digital & Analog I/O's, Types of Arduino boards, Installing and Setting up the Arduino development environment and simulation software, Software simulation on LED and switches, Software simulation on motor with driver, Software simulation on analog and digital sensors .		
Unit V: Introduction to IoT & Programming Concepts	**9 lecture hours**	
Introduction to IoT , IoT Protocols, IoT open source platform and sensors, Basic programming Structure, Variables, constants and data types, Operators, Control Structure, Library Functions, Creating account in open source IoT platform, Configuring and programming Wi-Fi module with MCUs, Interfacing switches and LEDs with MCUs , Interfacing motor and driver with MCUs , Interfacing analog and digital sensors with controller. Line follower robot.		

Continuous Assessment Pattern

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

Year :	2017-21 batch (6th Semester)							
Subject Code		Name of the Course	Teaching Scheme					Credits
			L	T	P	Total Hours		
1	BCSE3012	Web Technologies	3	0	0	3		3
2	BCSE3011	Computer Graphics	3	0	0	3		3
3	BCSE3019	IOT and Applications	3	0	0	3		3
4	BCSE9020	Artificial Intelligence and Intelligence System	3	0	2	5		4
5	SLBT3002	Campus to Corporate	0	0	2	2		1
6	BCSE3016	Web Technologies Lab	0	0	2	2		1
7	BCSE3015	Computer Graphics Lab	0	0	2	2		1
10	BCSE3073	Industry Oriented Python-III	0	0	2	2		1
11	BCSE3074	Industry Oriented Java-III	0	0	2	2		1
Programme Elective -III								
12	BCSE9021	Digital Image Processing	**3**	**0**	**0**	3		3
	BCSE9031	Pattern Recognition	**3**	**0**	**0**	3		3
	BCSE9011	Robotic Process Automation	**3**	**0**	**0**	3		3
		Total	21	0	12	33		21

Name of The Course	Web Technologies			
Course Code	BCSE3012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

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 Outcomes

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	IvanBayross -Web Enabled Commercial Application Development Using HTML, DHTML, Java Script, Perl, CGI-2000
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	UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.

Unit I: **8 lecture hours**
Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team.
Unit II: **8 lecture hours**
HTML: list, table, images, frames, forms, CSS;XML: DTD, XML schemes, presenting and using XML
Unit III: **8 lecture hours**
Java script: Introduction, documents, forms, statements, functions, objects; Event and event handling; introduction to AJAX.
Unit IV: **8 lecture hours**
Java server pages (JSP), JSP application design, declaring variables and methods, debugging, sharing data between JSP pages, JSP objects, Session, development of java beans in Jsp, data base action with JSP.
Unit V: **8 lecture hours**
Unit V: PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

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	BCSE3011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

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 Outcomes

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, JhonF.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.

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-2Transformations **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-3Three Dimensional **9 hours**
3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.
Unit-4Curves and Surfaces **9 hours**
Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Unit-5Hidden 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	**IOT and Applications**			
Course Code	**BCSE3019**			
Prerequisite	Theoretical understanding of basic electronics.			
Co requisite	Understand general theoretical concepts of Internet of Things.			
Antirequisite	None			
	L	**T**	**P**	**C**
	3	**0**	0	3

Course Content:

UNIT - I Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.
UNIT - II IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, SNMP NETOPEER.
UNIT - III Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib. R16 B.TECH CSE.
UNIT - IV IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.
UNIT - V IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs. Web server – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API

Continuous Assessment Pattern

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

Name of The Course	Artificial Intelligence and Intelligent Systems-II			
Course Code	BCSE9020			
Prerequisite	Pattern Recognition and Data mining			
Corequisite	NA			
Antirequisite	NA			
	L	T	P	C
	3	0	2	4

Course Objective:

Build awareness of AI facing major challenges and the complexity of typical problems within the field. Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

Course Outcomes

CO1	Exhibit strong familiarity with a number of important AI techniques, including in particular search, knowledge representation, planning and constraint management.
CO2	Interpret the modern view of AI as the study of agents that receive percepts from the environment and perform actions.
CO3	Build awareness of AI facing major challenges and the complexity of typical problems within the field.
CO4	Assess critically the techniques presented and apply them to real world problems.
CO5	Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

Text Book (s)

1. Stuart Russel and Peter Norwig, “Artificial Intelligence: A Modern Approach”, Prentice Hall thirdedition, 2012.

Reference Book (s)

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill- 2012.
2. Parag kulkarni and Prachi Joshi, **“**Artificial Intelligence-Building Intelligent Systems”, PHI-2015
3. S. Gupta “Artificial Intelligence”, Shubham Publications-2014.

Course Contents:

Unit-1: Introduction to AI **8 hours**
Brief Overview of AI and Intelligence system, AI Terminlogy: Intelligent Agent, Types of Agent, Backward Chaining, Forward Chaining, Heuristics Search Techniques.
Unit II: Adversarial Search, Planning and Understanding **8 hours**
Adversarial Search Methods:Mini-max Algorithm, Alpha-Beta pruning. Planning: Introduction, component of planning, Goal stack planning. Understanding: What is understanding, Complexity of understanding, Understanding as constraint satisfaction.
Unit III : Computational Learning Models **8 Hours**
Introduction, Statistical learning, Learning with complete data, Learning with hidden data, Naïve Bayes Models, EM Algorithm, Neural Network-based Learning.
Unit IV : Decision Theory and Pattern Recognition **8 Hours**
Introduction Decision Theory: Bayesian Network, Decision Network, Introduction of Pattern Recognition, Pattern Recognition System, Design Principles of Pattern Recognition Systems.
Unit V : Computer Vision **8 Hours**
Introduction, Phases of computer vision: (Low level processing, Intermediate level image processing, and High level processing), Role of AI in computer vision, Application areas of computer vision.

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 Python–III			
Course Code	BCSE3073			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

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 Outcomes

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
CO5	

Text Book (s)

Reference Book (s)

List of Exercise (Industrial oriented Python-3)

40. 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.
41. 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?*

42. Take a list, and write a program that prints out all the elements of the list that are less than 5.
43. 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.)
44. 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.
45. 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.)
46. 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.
47. 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

48. 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.
49. 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.
50. 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.).
51. 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.
52. 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, …*)
53. 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.
54. 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.

55. 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.

56. 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.

57. 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.
58. 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.
59. Given two `.txt` files that have lists of numbers in them, find the numbers that are overlapping.

60. 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.

61. 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.
62. 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.
63. Implement a function that takes as input three variables, and returns the largest of the three. Do this without using the Python `max()` function!.

64. 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).
65. 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.
66. Write a Program to print an appropriate message if the number is positive.
67. Program to find the sum of all numbers stored in a list.
68. Program to iterate through a list using indexing.
69. Take values of length and breadth of a rectangle from user and check if it is square or not.
70. Take two int values from user and print greatest among them.
71. 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.
72. 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.
73. 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.
74. WAP to construct list of countries and using list comprehension write the initial letter of the countries.
75. Create a list with multiple programming language and display I
76. Love “Programming Language” for each entry.
77. 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.

78. 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

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 Java-3**			
Course Code	BCSE3074			
Prerequisite	Industry oriented Java 1 EMPS3003			
Corequisite	Industry oriented Java 2 BCSE3071			
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

6. Learn logical building with java programming as the application of a set of methodologies and technologies.
7. Learn how the java programmimg can be used in developing user interface design and development .
8. Learn the how java technologies can be used for design and development of application using servlet.
9. Learn the how java technologies can be used for design and development of application using jsp.
10. Learn how to establish database connectivity using JDBC, servlet and JSP technologies.

Course Outcomes

CO1	Implement logical building programmes based on java 2 and java 3.
CO2	Apply user interface design using key technologies in JEE.
CO3	Apply servlet and session handling technologies used for java application development.
CO4	Apply JSP technologies java application development.
CO5	Implement the Database connectivity using JDBC by means of Servlet and JSP.

Text Book (s)

1.JDBC 4.2, Servlet 3.1, and JSP 2.3 Includes JSF 2.2 and Design Patterns, Black Book

Wiley India; 2nd edition (January 1, 2016)

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 Book (s):

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.

Course Contents:

Unit-1 REVISION OF INDUSTRY ORIENTED JAVA 1 AND INDUSTRY ORIENTED JAVA 2 9 Hours
Basic Programming Concepts Control Statements OOPs String Arrays Exception Handling Assessment IO Serialization Multithreading Collection SQL JDBC Assessment
Unit-2: USER INTERFACE 9 Hours
Introduction to web development. What is JEE, Key technologies in JEE, JEE application architecture Basic code of HTML,CSS Validations with Java scripts Assessment
Unit-3 : Servlet 9 Hours
What is a servlet Servlet Lifecycle classes for handling request and response Simple servlet example Working with form data Initialization in init Initialization through Servlet Config Initialization through Servlet Context send Redirect()Servlet communication forward() and include() Request Attributes Assessment Session Introduction Ways to maintain state HttpSession, Session Destruction Internal working Session tracking API Assessment
Unit-4 : JSP 9 Hours
JSP introduction MVC JSP lifecycle Syntactic Elements of a JSP Page JSP scripting elements Implicit objects JSP directives Assessment Scriptlets JSP JSP Standard Action tags Java Bean , , Assessment
Unit-5 : Database Connectivity using JSP and Servlet 9 Hours
JSP,Servlet, 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	Digital Image Processing			
Course Code	BCSE9021			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Imparts knowledge in the area of image and image processing.
2. Understand fundamentals of digital image processing.
3. Provide knowledge of the applications of the theories taught in Digital Image Processing. This will be achieved through the project and some selected lab sessions.
4. Knowledge of advanced topics in digital image processing and skill base that would allow them to carry out further study.

Course Outcomes

CO1	Understand Basics of Image formation and transformation using sampling and quantization.
CO2	Understand different types signal processing techniques used for image sharpening and smoothing.
CO3	Perform and apply compression and coding techniques used for image data.
CO4	Detect and verify an image properly.
CO5	Understand the practical application on implementation of the image.

Text Book (s)

1. Ganzalez and Wood, “Digital Image Processing”, Addison Wesley, 1993.
2. Anil K.Jain, “Fundamental of Image Processing”, Prentice Hall of India.

Reference Book (s):

1. Rosenfeld and Kak, “Digital Picture Processing” vol.I & vol.II, Academic,1982
2. Ballard and Brown, “Computer Vision”, Prentice Hall, 1982
3. Wayne Niblack, “An Introduction to Digital Image Processing”, Prentice Hall, 1986
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”,

Course Contents:

Unit I: Introduction to Image processing	**8 lecture hours**
Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception. Digital Image-sampling and quantization serial & parallel Image processing.	
Module II: Signal Processing	**8lecture hours**
Signal Processing - Fourier, Walsh-Hadmard discrete cosine and Hotelling transforms and their properties, filters, correlators and convolvers. Image enhancement-Contrast modification, Histogram specification, smoothing, sharpening, frequency domain enhancement, pseudo-colour	
Module III: Image Restoration	**8lecture hours**
Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.	
Module IV: Segmentation Techniques	**8 lecture hours**
Segmentation Techniques-thresh holding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications	
Module V: Shape Analysis	**8 lecture hours**
Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, Skelton detection, Hough transform, topological and texture analysis, shape matching. Practical Applications – Finger print classification, signature verification, text recognition, map understanding, bio-logical cell classification.	

Continuous Assessment Pattern

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

Name of The Course	Pattern Recognition			
Course Code	BCSE9031			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Learn the fundamentals of Pattern recognition and to choose an appropriate feature.
2. Classification algorithm for a pattern recognition problems and apply them properly using modern computing tools such as Matlab, C/C++ etc.
3. Analyze, and report the results using proper technical terminology

Course Outcomes

CO1	Understand the nature and inherent difficulties of the pattern recognition problems.
CO2	Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques such as Bayesian, maximum-likelihood, etc.
CO3	Select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.
CO4	Demonstrate algorithm implementation skills using available resources and be able to properly interpret and communicate the results clearly and concisely using pattern recognition terminology.

Text Book (s)

1. R.O. Duda, P.E. Hart, D.G. Stork, “Pattern Classification” Second EditionJohn Wiley,2006.

Reference Book (s):

1. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
2. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press,2009.

Course Contents:

Unit I: Introduction	**8 lecture hours**
Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	
Module II: Statistical Patten Recognition	**8lecture hours**
Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.	
Module III: Parameter estimation methods	**8lecture hours**
Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM),Gaussian mixture models.	
Module IV: Nonparametric Techniques	**8 lecture hours**
Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.	
Module V:	**8 lecture hours**
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.	

Continuous Assessment Pattern

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

Name of The Course	Robotic Process Automation			
Course Code	BCSE9011			
Prerequisite	None			
	L	**T**	**P**	
	3	0	0	

Course Objectives:
The objective of this course is to:
1. Familiarize the students with the basic of Robotics & Automation
2. Design how to automate the process using RPA

Course Outcomes:

CO1	Understand Basic Programming concepts and the underlying logic/structure.
CO2	Learn how to install UiPath community edition and Analyze the different types of variables.
CO3	Control Flow and various activities used for it.
CO4	Develop understanding and application of Data Manipulation & recording techniques.
CO5	Understand Selectors, Image, Text and Data Tables Automation and how they are used in UiPath Studio.

Text Book (s)
Alok Mani Tripathi, “Learning: Robotic Process Automation”, Kindle Edition.
Reference Book (s)
Richard Murdoch, "Learning: Robotic Process Automation”, Kindle Edition.

Module I
Programming Concepts Basics –: Understanding the application, Basic Web Concepts, Data Structures, Control structures and functions, Variables & Arguments.RPA Basics: History of Automation, RPA, Robot VS Automation, Processes & Flowcharts, What process can be automated, Types of Bots, Robotic control flow architecture,
Module II
Introduction to UiPath: Installing UiPath Studio community edition, The user Interface, Keyboard Shortcuts, Automation Debugging, Variables: Managing Variables, Naming Best Practice, The Variables Panel, Data Types, Managing Arguments, The Arguments Panel, Using Arguments, and About Imported Namespaces. Activities: Message Box, Input Dialog, Type into, Click, Send HotKey, Write line, Read text File, Write Text File. Types of Button.
Module III
Control Flow: Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity
Module IV
Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data, Recording Introduction, Basic and Desktop Recording, Web Recording, Input/output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques
Module V
Selectors, Image, Text & Advanced Citrix Automation, Excel Data Tables & PDF, Email Automation, Exceptional Handling, Introduction to Orchestrator.

Continuous Assessment Pattern:

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

Year :	2017-21 batch (7th Semester)						
Subject Code		Name of the Course	Teaching Scheme				Credits
			L	T	P	Total Hours	
1	BCSE4036	APP DEVELOPMENT FOR ANDROID	0	0	6	6	3
2	BCSE3067	Cloud Computing Technologies	3	0	0	3	3
Programme Elective -IV							
3	BCSE 3052	Bioinformatics	3	0	0	3	3
	BCSE 3053	Information Technology Infrastructure & its Management	3	0	0	3	3
	BCSE3055	Enterprise Resource Planning	3	0	0	3	3
Programme Elective -V							
4	BCSE3061	Simulation and Modelling	2	0	2	4	3
	BCSE3063	Big Data Analytics	2	0	2	4	3
	BCSE3060	Wireless Sensor Network	2	0	2	4	3
	BCSE3065	Mobile Computing	2	0	2	4	3
5	BCSE9998	Capstone Design -I	0	0	6	6	3
		Total	8	0	14	22	15

Name of The Course	**APP DEVELOPMENT FOR ANDROID**			
Course Code	**BCSE4036**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	6	3

Course Objectives:

- Develop Basic and advance Android Apps
- Publishing and Monetizing the app
- To learn the Architecture of Android.

Course Outcomes

CO1	Understand about Android OS and its Development Environment.
CO2	Learn Basic and advance android app development for android devices.
CO3	To apply from app development
CO4	To learn the how to provide Security to Android devices.
CO5	To be able to gain knowledge on how to create activities and fragments

Text Book (s)

1. OSS Mobile Platform (IBM ICE Publication)

Reference Book (s):

1. Beginning Android 4 Application Development, Wei-Meng Lee
2. Burnette, Ed, Hello, Android: Introducing Google's Mobile Development Platform.
3. Mobile Computing: Concepts Methodologies, Tools & Applications – David Tainar.

4. Mobile technology consumption – Barbara L Ciaramtaro

Course Contents:

Unit I: Introduction and Architecture of Android **5 lecture hours**
History of Android, Features of Android, Android Devices, Android Versions, Open Handset Alliance (OHA) , Advantages of Android, Comparing Android with other platform, Architecture of Android. Android Directory Structure, Structure of Manifest files, Android Development Tools.
Unit II: Component s of Android **10 lecture hours**
Activities, Activity life cycle, Fragment, fragment lifecycle, Services, service life cycle, Broadcast receivers, Content providers, Intents, types of intents, Intent Filter, Starting a new activity, Sending and Receiving of data, Notifications
Unit III: User Interfaces **10 lecture hours**
Views, Views Group, Widgets - Button, EditText, CheckBox, ToggleButton, Spinner, Picker, Layouts, Styles, Themes, Events, Event listener, Orientation, Screen Size and Density, Unit of measurement - px, dp, sp and dpi,pt, conversion of dp to px .
Unit IV: Advance App Development **10 lecture hours**
SQLite database, SQLiteOpenHelper, Cursors and content values, Opening and closing Database, Sensors, Bluetooth, GeoLocation, SMS & MMS, Graphics and Animation.
Unit V: Security, Publishing, Monetizing **5 lecture hours**
Security Creating a signing certificate, Signing your applications for distribution, Publishing on Google Play, Monetization strategies, Application promotion strategies, Using Google Analytics.

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 Computing Technologies			
Course Code	BCSE3067			
Prerequisite				
Co requisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	**0**	0	3

Course Objectives:

To understand the concepts of cloud computing technologies. To gain expertise in server, network and storage cloud.· To understand and deploy practical cloud solutions and enterprise solutions· To gain knowledge on the concept of virtualization that is fundamental to cloud computing· To understand the various issues in cloud computing· To be able to set up a private cloud· To understand the security issues in the grid and the cloud environment·

Course Outcomes

CO1	Identify the architecture, infrastructure and delivery models of cloud computing
CO2	Understand advanced and emerging cloud computing technologies
CO3	Obtain skills to do advanced Cloud Platform Architecture
CO4	Develop services using Cloud computing
CO5	Apply the security models in the cloud environment.

Text Book (s)

1	Nick Antonopoulos, Cloud computing, Springer Publications, 2010
2	Humble Devassy,“Mastering KVM Virtualization”,Kindle edition, ISBN-13: 9781784396916,2016
3	Enterprise Cloud Computing by GautamShroff, Cambridge,2010

Reference Book (s)

1	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012
2	John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010
3	Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012
4	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
5	Tim Mather, Subra Kumaraswamy, and Shahed Latif ,"Cloud Security and Privacy", O‘Reilly Media, Inc.,2009
6	https://www.amazon.com/Value-Virtualization-Cloud-Computing-accelerate/dp/1492198331 Data centres and cloud computing: https://www.youtube.com/watch?v=_fGrYN5rxhs

Course Contents:

Unit I: Introduction	**8 hours**
Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.	

Unit II: Trends and Technologies Development **8 hours**
Introduction about recent development in cloud, trends and technologies innovations in cloud, discuss about IBM cloud, AWS cloud, Microsoft cloud, etc, and explore the future of cloud computing, use of cloud computing technologies in various fields
Unit III : Cloud Platform Architecture **9 Hours**
Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery – Architectural Design Challenges
Unit IV : Programming Model **9 Hours**
Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus
Unit V : Cloud Security **9 Hours**
Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust 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	**Bioinformatics**			
Course Code	**BCSE 3052**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Impart knowledge on basic techniques of Bioinformatics and on analysis of biological data using computational methods.
2. Investigating problems in molecular and biology from a computational perspective.

Course Outcomes

CO1	**Extract information from different types of bioinformatics data (gene, protein, disease, etc.), including their biological characteristics and relationships**
CO2	**Employ different data representation models and formats used for bioinformatics data representation, including markup languages such as SBML and CellML, and ontologies such as GO ontology**
CO3	**Apply the different approaches used for data integration and data management, including data warehouse and wrapper approaches**
CO4	**Analyze processed data with the support of analytical and visualization tool**
CO5	**Interact with non-bioinformatics professionals, such as biologists and biomedical researchers, to better understand their bioinformatics needs for improved support and service delivery**
CO6	**Analysis various tools related to Bioinformatics**

Text Book (s)

1.D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi

Reference Book (s):

1. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", McGraw Hill.
2. O'Reilly, " Developing Bio informatics computer skills", CBS
3. Forsdyke, "Evolutionary Bioinformatics", Springer

Course Contents:

Unit I:	Bioinformatics	**9 lecture hours**

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary 40 & reference systems, finding new types of data online. Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, overview of the bioinformatics applications.
Unit II: Quaternary structure **8 lecture hours**
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA, DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.
Unit III: Perl **7 lecture hours**
Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/ unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.
Unit IV: Genomic sequencing **8 lecture hours**
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.
Unit V: Macromolecular **8 lecture hours**
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics BLAST.

Continuous Assessment Pattern

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

Name of The Course	**Information Technology Infrastructure & its Management**			
Course Code	**BCSE 3053**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. To provide a roadmap for students why information systems are so important today for business and management.
2. Evaluate the role of the major types of information systems in a business environment and their relationship to each other.
3. Assess the impact of the Internet and Internet technology on business electronic commerce and electronic businesses.
4. Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges.

Course Outcomes

CO1	Define an IT infrastructure and describe its components. Learn the core activities in the systems development process.
CO2	Cultivate skills and experience in the development and implementation of information systems projects.
CO3	Understand the basic concepts and technologies used in the field of management information systems.

CO4	Understand the processes of developing and implementing information systems and understand the role of information systems in organizations, the strategic management processes, and the implications for the management.
CO5	Develop an understanding of how various information systems work together to accomplish the information objectives of an organization.
CO6	Analysis various tools related to Enterprise Resource Planning

Text Book (s)

1. Phuguni Gupta, Surya Prakash, Tata McGraw Hill

Reference Book (s):

1. IT Service Management based on ITIL – Colophon- Van Haren Publishing

Course Contents:

Unit I: INTRODUCTION **8 lecture hours**
Information Technology, Computer Hardware, Computer Software, Network and Internet, Computing Resources. IT INFRASTRUCTURE- Design Issues, Requirements, IT System Management Process, Service Management Process, Information System Design, IT Infrastructure Library.
Unit II:SERVICE DELIVERY PROCESS **8 lecture hours**
Service Delivery Process, Service Level Management, Financial Management, Service Management, Capacity Management, Availability Management
Unit III:SERVICE SUPPORT PROCESS **8 lecture hours**
Service Support Process, Configuration Management, Incident Management, Problem Management, Change Management, Release Management (9). STORAGE MANAGEMENT- Backup & Storage, Archive & Retrieve, Disaster Recovery, Space Management, Database & Application Protection, Bare Machine Recovery, Data Retention.
Unit IV:SECURITY MANAGEMENT **8 lecture hours**

Security, Computer and internet Security, Physical Security, Identity Management, Access Management. Intrusion Detection, Security Information Management.
Unit V:IT ETHICS **8 lecture hours**
Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes. EMERGING TRENDS in IT- Electronics Commerce, Electronic Data Interchange, Mobile Communication Development, Smart Card, Expert 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	Enterprise Resource Planning			
Course Code	**BCSE3055**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Describe the concept of ERP and the ERP model; define key terms; explain the transition from MRP to ERP; identify the levels of ERP maturity.
2. Explain how ERP is used to integrate business processes; define and analyze a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation.

3. Describe the elements of a value chain, and explain how core processes relate; identify how the organizational infrastructure supports core business processes; explain the effect of a new product launch on the three core business processes.

Course Outcomes

CO1	Develop model for ERP for large project
CO2	Develop model for E-commerce architecture for any application
CO3	Describe the advantages, strategic value, and organizational impact of utilizing an ERP system for the management of information across the functional areas of a business: sales and marketing, accounting and finance, human resource management, and supply chain.
CO4	Demonstrate a working knowledge of how data and transactions are integrated in an ERP system to manage the sales order process, production process, and procurement process.
CO5	Evaluate organizational opportunities and challenges in the design system within a business scenario.

Text Book (s)

1. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI.
2. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thomson Course Technology.

Reference Book (s):

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – A Concepts and Practice", PHI.

Course Contents:

Unit I:	**8 lecture hours**
ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP.	
Unit II:	**8 lecture hours**

Business Process Reengineering, 16SCSE101084, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.
Unit III: **8 lecture hours**
ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.
Unit IV: **8 lecture hours**
ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.
Unit V: **8 lecture hours**
ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.

Continuous Assessment Pattern

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

Name of The Course	**Simulation & Modelling**
Course Code	**BCSE3061**
Prerequisite	Java, C
Co-requisite	

Anti-requisite				
	L	**T**	**P**	**C**
	2	0	2	3

Course Objectives

Introduce computer simulation technologies and techniques, provides the foundations for the student to understand computer simulation needs, and to implement and test a variety of simulation and data analysis libraries and programs. This course focuses on what is needed to build simulation software environments, and not just building simulations using pre-existing packages.

Course Outcomes

CO1	understand the techniques of modeling in the context of hierarchy of knowledge about a system
CO2	Related to systems development, originating the basic source requirements and goals.
CO3	Analyze and fit the collected data to different distributions
CO4	Develop skills to apply simulation software to construct and execute goal-driven system models.
CO5	Interpret the model and apply the results to resolve critical issues in a real world environment

CO1	Basic Model Forms for simulation.
CO2	Understand the Simulation Approaches dynamical and complex model simulations.
CO3	Handling Stepped and Event-based Time in Simulations converting

CO4	Discrete versus Continuous Modelling Probability and Statistics
CO5	Numerical Techniques analysis and Viewing Tools

Text Books:

1. Jerry Banks, John S Carson II, Berry L Nelson, David M Nicol, Discrete Event system Simulation, Pearson Education, Asia, 4th Edition, 2007, ISBN: 81-203-2832-9.
2. Geoffrey Gordon, System Simulation, Prentice Hall publication, 2nd Edition, 1978, ISBN: 81-203-0140-4.

References :

1. Averill M Law, W David Kelton, Simulation Modelling & Analysis, McGraw Hill International Editions – Industrial Engineering series, 4th Edition, ISBN: 0-07-100803-9.
2. Narsingh Deo, Systems Simulation with Digital Computer, PHI Publication (EEE), 3rd Edition, 2004, ISBN : 0-87692-028-8.
3. Banks C M , Sokolowski J A, Principles of Modeling and Simulation, Wiley
4. Kelton, W. David, Sadowski, Randall P., and Swets, Nancy B. (2010). Simulation with Arena, Fifth Edition. McGraw-Hill Higher Education (ISBN: 978-0-07-337628-8)

Course Content

Unit – I Introduction to Discrete Event System Simulation 8 hours

System Simulation, Advantages, Disadvantages, Areas of application, System environment, components of a system, Model of a system, types of models, steps in a simulation study. Simulation Examples: Simulation of Queuing systems, Simulation of Inventory System, Other simulation examples.

Unit – II General Principles and Queuing model 8 hours

Concepts in discrete - event simulation, event scheduling/ Time advance algorithm, simulation using event scheduling. Queuing Model theory, Simulation of single-server queue, Simulation of two-server queue

Unit – III Analysis of Simulation Data 8 hours

Input Modeling - Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis. Verification and Validation of Model – Model Building, Verification, Calibration and Validation of Models.

Unit – IV Output Analysis for a single model **8 hours**

Types of Simulations with Respect to Output Analysis, Stochastic Nature of output data, Measures of Performance and their estimation, Output analysis of terminating simulation, Output analysis of steady state simulations. Simulation Software's: MATLab, NS2, Data Processing tools, Etc.,

Unit - V Case Study **8 hours**

Simulation of Computer networks, Simulation of Computer 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	**Big Data Analytics**
Course Code	**BCSE3063**

Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	2	0	2	3

Course Objectives

This course provides practical foundation level training that enables immediate and effective participation in big data projects. The course provides grounding in basic and advanced methods to big data technology and tools, including spark and MongoDB and its ecosystem.

Course Outcomes

CO1	Learn tips and tricks for Big Data use cases and solutions.
CO2	Learn to build and maintain reliable, scalable, distributed systems with Apache Hadoop and spark.
CO3	Able to apply MongoDB ecosystem components.
CO4	Learn to build and maintain reliable, for Big Data Analytics using Spark.
CO5	Learn to build and maintain reliable, scalable, distributed systems with MongoDB.

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. http://www.bigdatauniversity.com/
5. Jy Liebowitz, “Big Data and Business analytics”,CRC press, 2013

Course Contents:

Unit I: Introduction to Big Data	**8 lecture hours**
Introduction of Big Data, Big Data- Four Vs, Advantages of Big Data, Big Data Architecture & Patterns, Big Data: Ingestion, Storage, Data Quality, Data Operations, Data Scalability and Security, Big Data Analytics Big Data Applications-Industry Examples	
Unit II: Working With Data Models	**8 lecture hours**
Static and Streaming data, Data Models and Data Formats, Data Stream: Definition and application, Data lakes: Definition and application, Exploring streaming sensor data, Exploring streaming twitter data, DBMS and non DBMS approaches to Big Data, From DBMS to BDMS	
Unit III: Introduction to Hadoop Architecture	**8 lecture hours**
Big Data – Apache Hadoop & Hadoop EcoSystem, Overview of HDFS, Comparison with traditional Databases, Understanding MapReduce- Map and Reduce, Hive and HBase	
Unit IV: Big Data Analytics using Spark	**8 lecture hours**
Introduction to Apache Spark, Programming In Spark using RDDs in Pipelines, Transformations, Actions, Spark SQL, Spark Streaming, Spark MLLib, Spark GraphX, Discussion; The Spark Ecosystem, Configuring VirtualBox for Spark Streaming, Analyzing Sensor Data with Spark Streaming	
Unit V: Putting MongoDB and Spark to Work	**8 lecture hours**
Understanding NoSQL- advantages of NoSQL, SQL vs NoSQL, Types of NoSQL, MongoDB, Word Count in Spark, Discussion on word count in spark, Analyze tweets of a domain, Expressing Analytical Questions as MongoDB Queries, Exporting Data from MongoDB to a CSV File.	

Continuous Assessment Pattern

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

Name of The Course	Wireless Sensor Networks			
Course Code	BCSE3060			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	2	3

Course Objectives:
1. To learn about the issues and challenges in the design of wireless ad hoc networks.
2. To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
3. To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
4. To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

Course Outcomes

CO1	Identify different issues in wireless ad hoc and sensor networks .
CO2	To analyze protocols developed for ad hoc and sensor networks .
CO3	To identify and understand security issues in ad hoc and sensor networks.
CO4	To analyze protocols developed sensor networks .
CO5	To identify and understand various security issues in ad hoc and sensor networks and the corresponding solutions.

Text Book (s)

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Reference Book (s):

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

2.

Unit I: OVERVIEW OF WIRELESS SENSOR NETWORKS	**8 lecture hours**
Introduction and Overview of cvbmhh Wireless Sensor Networks.Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks	
Unit II:ARCHITECTURES	**8 lecture hours**
Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.	
Unit III: COMMUNICATION PROTOCOLS	**8 lecture hours**
Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts.	

Unit IV:ROUTING PROTOCOLS 8 lecture hours
Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing. Geographic Routing.
Unit V: INFRASTRUCTURE ESTABLISHMENT 8 lecture hours
Time Synchronization, Localization and Positioning Topology Control, Clustering Techniques: Topology Discovery and Clusters - Topology Discovery Algorithm, Topology Discovery Algorithm, Applications of Topology Discovery.
Unit VI: SENSOR NETWORK PLATFORMS, Tools AND APPLICATIONS 8 lecture hours
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming. Applications of Wireless Sensor Networks-Home Control, Building Automation, Industrial Automation, Medical Applications, Military Applications, Civil and Environmental Engineering Applications..

Continuous Assessment Pattern:

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	100

Name of The Course	**Mobile Computing**
Course Code	**BCSE3065**
Prerequisite	
Co-requisite	

Anti-requisite				
	L	**T**	**P**	**C**
	2	0	2	3

Course Objectives

1. To introduce the basic concepts and principles in mobile computing. This includes the major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
2. To explore both theoretical and practical issues of mobile computing.
3. To provide an opportunity for students to understand the key components and technologies involved in building mobile applications.
4. To Understand the concept of Wireless LANs, PAN, Mobile Networks.

Course Outcomes

CO1	Grasp the concepts and features of mobile computing technologies and applications.
CO2	Understand how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support.
CO3	Identify the important issues of developing mobile computing systems and applications.
CO4	Develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools.
CO5	Acquire the knowledge to administrate and to maintain a Wireless LAN.

Text Book (s)

1. Jochen, M Schiller, “Mobile Communications, 2nd Edition Pearson Education, India, 2009

Reference Book (s)

1. Charles Perkins, Ad hoc Networks, Addison Wesley.
2. Upadhyaya, “Mobile Computing”, Springer
3. Kurnkum Garg “Mobile Computing”,Pearson 2010

Course Content

Unit I:Introduction	**8 lecture hours**
Introduction of mobile computing, overview of wireless telephony: cellular concept, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, Multiple access techniques like Frequency division multiple access (FDMA), Time division multiple access (TDMA), Code division multiple access (CDMA), Space division multiple access (SDMA).	
Unit II: Wireless Networking	**8 lecture hours**
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.	
Unit III: Global System for Mobile Communications	**8 lecture hours**
GSM Architecture, GSM Entities ,Call Routing in GSM, GSM Addresses and Identifiers ,Network Aspects in GSM , GSM Frequency Allocation, Authentication and Security, Mobile Computing over SMS, Short Message (SMS) , Value Added Services through, MS, Accessing the SMS Bearer, GPRS and packet Architecture GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS ,Application for GPRS, Limitation of GPRS, Billing and Charging in GPRS, WAP , MMS , GPRS Applications, Spread – Spectrum Technology.	
Unit IV: Data Management	**8 lecture**
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.	
Unit V: Routing Ad Hoc Network & Security Issues	**8 lecture hours**
Routing Protocols: Ad Hoc Network Routing Protocols, Destination Sequenced Distance Vector Algorithm, Cluster Based Gateway Switch Routing, Dynamic Source Routing, Ad Hoc on-demand Routing, Location Aided Routing, Zonal Routing Algorithm. Mobile Computing Security Issues, Authentication, Encryption, Cryptographic Tools: Hash, Message Authentication Code (MAC), Digital Signature, Certificate. Secure Socket Layer (SSL). Characteristics of SIM, Equipment Identification.	

Continuous Assessment Pattern:

Theory			**Practical**		
Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**(Continuous Assessment) IA**	**ETE**	**Total Marks**
20	15	30	15	20	100

Semester-8							Credits
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total hrs**	
Practical							
1	BCSE9991	Industrial Internship	**0**	**0**	**4**	**4**	**2**
2	BCSE9999	Capstone Design -II	0	0	1	16	8
		Total:				**20**	**10**