MAULANA AZAD NATIONAL URDU UNIVERSITY

SCHOOL OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & IT

B.Tech. (Computer Science & IT)

General, Course structure & Theme & Semester-wise credit distribution

A. Definition of Credit:		
1	1 Hr. Lecture (L) per week	1 credit
2	1 Hr. Tutorial (T) per week	1 credit
3	2 Hours Practical(Lab)/week	1 credit

B. Range of credits:
A student require to complete total 175 credits to be eligible to get Under Graduate degree in Engineering.

C. Structure of Undergraduate Engineering program:		
S. No.		Credit Breakup for CSE students
1	Humanities and Social Sciences including Management courses	09
2	Basic Science courses	24
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	27
4	Professional core courses	62
5	Professional Elective courses relevant to chosen specialization/branch	32
6	Open subjects – Electives from other technical and/or emerging subjects	6
7	Project work, seminar and internship in industry or elsewhere	15
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution]	(non-credit)
Total		**175**

PROFESSIONAL CORE COURSES [PCC]

SL. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	BTCS311PCT	Data Structure & Algorithms	3	1	4	6	3
2	BTCS360PCP	IT Workshop Python	0	0	4	2	3
3	BTCS411PCT	Discrete Mathematics	3	1	0	4	4
4	BTCS511EST	Computer Organization	3	1	0	4	5
5	BTCS413PCT	Operating Systems	3	1	4	6	4
6	BTCS513PCT	Design & Analysis of Algorithms	3	1	4	6	5
7	BTCS412PCT	Database Management Systems	3	1	4	6	4
8	BTCS511PCT	Formal Language & Automata Theory	3	1	0	4	5
9	BTCS414PCT	Object Oriented Programming	3	1	4	6	4
10	BTCS611PCT	Complier Design	3	1	4	6	6
11	BTCS612PCT	Computer Networks	3	1	4	6	6
12	BTCS312PCT	Digital Electronics	3	1	4	6	3
					Total	**62**	

PROFESSIONAL ELECTIVE [PEC]

SL. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	PEC	Elective – I	3	1	0	4	5
2	PEC	Elective – II	3	1	0	4	6
3	PEC	Elective – III	3	1	0	4	6
4	PEC	Elective – IV	3	1	0	4	7
5	PEC	Elective – V	3	1	0	4	7
6	PEC	Elective – VI	3	1	0	4	8
7	PEC	Elective – VII	3	1	0	4	7
8	PEC	Elective – VIII	3	1	0	4	8
					Total	**32**	

OPEN ELECTIVE [OEC]

SL. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	OEC	Open Elective – I	3	0	0	3	6
2	OEC	Open Elective – II	3	0	0	3	7
					Total	**6**	

MAULANA AZAD NATIONAL URDU UNIVERSITY

DEPARTMENT OF CS&IT

SCHEME OF INSTRUCTIONS, EXAMINATION & EVALUATION

(Effective for Batch Admitted from 2018-19 Academic Year)

B.Tech. (Computer Science)

Total Credits (4 Year Course): 160

I. **SEMESTER WISE STRUCTURE OF CURRICULUM**

II.

[L= Lecture, T= Tutorials, P=Practical, C= Credits]

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	I	I

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS101BST	Basic Science	Engineering Mathematics-I	3	1	0	4	30	70	3 Hrs
BTCS102BST	Basic Science	Engineering Physics	3	1	0	4	30	70	3 Hrs
BTCS101EST	Engineering Science	Basic Electrical Engineering	3	1	0	4	30	70	3 Hrs
BTCS111EST	Engineering Science	Engineering Graphics & Design	1	0	5	3	30	70	3 Hrs
BTCS150BSP	Basic Science	Engineering Physics Lab.	0	0	4	2	50	50	3 Hrs
BTCS150ESP	Engineering Science	Basic Electrical Engineering Lab	0	0	4	2	50	50	3 Hrs
Total Credits per semester						**19**	**600**		

Mandatory Induction Program- 3 Weeks Duration

Note: End Semester Examinations of the subject(s) weighted more than 2 credits will be for three Hrs duration with maximum 100 marks score (30+70)

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	I	II

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS201BST	Basic Science	Engineering Mathematics – II	3	1	0	4	30	70	3 Hrs
BTCS211BST	Basic Science	Engineering Chemistry	3	1	0	4	30	70	3 Hrs
BTCS211EST	Engineering Science	Programming for Problem Solving	3	0	0	3	30	70	3 Hrs
BTCS211HST	HSMC	English Communication	2	0	0	2	15	35	2 Hrs
BTCS212EST	Engineering Science	Engineering Mechanics	3	1	0	4	30	70	3 Hrs
BTCS260BSP	Basic Science	Engineering Chemistry Lab	0	0	4	2	50	50	3 Hrs
BTCS260ESP	Engineering Science	Basic Programming Lab	0	0	4	2	50	50	3 Hrs
BTCS251ESP	Engineering Science	Engineering workshop	0	0	6	3	50	50	3 Hrs
BTCS260HSP	HSMC	English Communication LAB	0	0	2	1	50	50	3 Hrs
		Total				**25**	**850**		

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	II	III

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS311EST	Engineering Science Course	Analog Electronic Circuits	3	1	0	4	30	70	3 Hrs
BTCS311PCT	Professional Core Courses	Data structure & Algorithms	3	1	0	4	30	70	3 Hrs
BTCS312PCT	Professional Core Courses	Digital Electronics	3	1	0	4	30	70	3 Hrs
BTCS311BST	Basic Science course	Engineering Mathematics-III	3	1	0	4	30	70	3 Hrs
BTCS311HST	Humanities & Social Sciences including Management courses	Technology & Society	2	0	0	2	15	35	2 Hrs
BTCS360ESP	Engineering Science Course	Analog Electronic Circuits LAB	0	0	4	2	50	50	3 Hrs
BTCS360PCP	Professional Core Courses	Data structure & Algorithms LAB	0	0	4	2	50	50	3 Hrs
BTCS361PCP	Professional Core Courses	Digital Electronics LAB	0	0	4	2	50	50	3 Hrs
BTCS362PCP	Professional Core Courses	IT Workshop Python	0	0	4	2	50	50	3 Hrs
		Total				**26**	**850**		

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	II	IV

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS411PCT	Professional Core Courses	Discrete Mathematics	3	1	0	4	30	70	3 Hrs
BTCS402PCT	Professional Core Courses	Database Management Systems	3	1	0	4	30	70	3 Hrs
BTCS403PCT	Professional Core Courses	Operating Systems	3	1	0	4	30	70	3 Hrs
BTCS412PCT	Professional Core Courses	Object Oriented Programming	3	1	0	4	30	70	3 Hrs
BTCS413PCT	Professional Core Courses	Software Engineering	3	1	0	4	30	70	3 Hrs
BTCS450PCP	Professional Core Courses	Database Management Systems LAB	0	0	4	2	50	50	3 Hrs
BTCS460PCP	Professional Core Courses	Operating Systems LAB	0	0	4	2	50	50	3 Hrs
BTCS461PCP	Professional Core Courses	Object Oriented Programming LAB	0	0	4	2	50	50	3 Hrs
BTCS411HST	Mandatory Courses	Environmental Sciences	2	0	0	-	15	35	2 Hrs
		Total				**26**	**850**		

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	III	V

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS511PCT	Professional Core Courses	Computer Organization	3	1	0	4	30	70	3 Hrs
BTCS512PCT	Professional Core Courses	Formal Language & Automata Theory	3	1	0	4	30	70	3 Hrs
BTCS503PCT	Professional Core Courses	Design & Analysis of Algorithms	3	1	0	4	30	70	3 Hrs
BTCS511HST	Humanities & Social Sciences including Management	Organizational Behaviour	2	0	0	2	15	35	2 Hrs
BTCS512HST	Humanities & Social Sciences including Management	History of Sciences & Technology in India	2	0	0	2	15	35	2 Hrs
BTCS511PET	Professional Elective Courses	Elective-I Principles of Programming Languages	3	1	0	4	3	70	3 Hrs
BTCS560PCP	Professional Core Courses	Design & Analysis of Algorithms LAB	0	0	4	2	50	50	3 Hrs
BTCS511NCT	Mandatory Courses	Constitution of India	2	0	0	-	15	35	2 Hrs
		Total				**22**	**650**		

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	III	VI

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS611PCT	Professional Core Courses	Complier Design	3	1	0	4	30	70	3 Hrs
BTCS612PCT	Professional Core Courses	Computer Networks	3	1	0	4	30	70	3 Hrs
BTCS611PET	Professional Elective Courses	Elective-II Data Mining	3	1	0	4	30	70	3 Hrs
BTCS615PET	Professional Elective Courses	Elective-III Computer Graphics	3	1	0	4	30	70	3 Hrs
BTCS613GET	Open Elective Courses	Open Elective-I Cyber Law and Cyber Security	3	0	0	3	30	70	3 Hrs
BTCS660PCP	Professional Core Courses	Complier Design LAB	0	0	4	2	50	50	3 Hrs
BTCS661PCP	Professional Core Courses	Computer Networks LAB	0	0	4	2	50	50	3 Hrs
BTCS662PCP	Project	Project-1	0	0	6	3	50	50	Viva-voce & Demonstration
		Total				**26**	**800**		

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	IV	VII

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS711PET	Professional Elective Courses	Elective-IV Artificial Intelligence	3	1	0	4	30	70	3 Hrs
BTCS715PET	Professional Elective Courses	Elective-V Internet-of-Things	3	1	0	4	30	70	3 Hrs
UGCS715GET	Open Elective Courses	Open Elective-II Intellectual Property Rights	3	0	0	3	30	70	3 Hrs
BTCS760PCP	Project	Project-II	0	0	12	6	100	100	Viva-voce & Demonstration
		Total				**17**	**500**		

PROGRAM	YEAR	SEMESTER
B.Tech. (CS)	IV	VIII

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
BTCS811PET	Professional Elective Courses	Elective-VI Image Processing	3	1	0	4	30	70	3 Hrs
BTCS815PET	Professional Elective Courses	Elective-VII Cloud Computing	3	1	0	4	30	70	3 Hrs
BTCS819PET	Professional Elective Courses	Elective-VIII Cryptography and Network Security	3	1	0	4	30	70	3 Hrs
BTCS860PCP	Project	Project-III	0	0	12	6	100	100	Viva-voce & Demonstration
		Total				**18**	**500**		

PROFESSIONAL COURSES –ELECTIVE-I IN FIFTH SEMESTER									
Course Code	**Course Title**	**Hours/Week**			Credits	**Score**		**End Exam Duration**
		L	T	P		Internal	External	
BTCS511PET	Principles of Programming Languages	3	1	0	4	30	70	3 Hrs
BTCS512PET	Parallel and Distributed Algorithms	3	1	0	4	30	70	3 Hrs
BTCS513PET	Signal and Systems	3	1	0	4	30	70	3 Hrs
BTCS514PET	xx							
BTCS515PET	XX							
BTCS516PET	XX							

PROFESSIONAL COURSES –ELECTIVE-II & ELECTIVE-III FOR SIXTH SEMESTER									
Course Code	**Course Title**	**Hours/Week**			Credits	**Score**		**End Exam Duration**
		L	T	P		Internal	External	
BTCS611PET	Data Mining and Data Ware Housing	3	1	0	4	30	70	3 Hrs
BTCS612PET	Python Programming	3	1	0	4	30	70	3 Hrs
BTCS613PET	Advanced Computer Architecture	3	1	0	4	30	70	3 Hrs
BTCS614PET	Distributed Systems	3	1	0	4	30	70	3 Hrs
BTCS615PET	Computer Graphics	3	1	0	4	30	70	3 Hrs
BTCS616PET	Advanced Operating Systems	3	1	0	4	30	70	3 Hrs
BTCS617PET	Embedded Systems	3	1	0	4	30	70	3 Hrs
BTCS618PET	xx							
BTCS619PET	Xx							
BTCS620PET	xx							

PROFESSIONAL COURSES -ELECTIVE-IV & ELECTIVE-V FOR SEVENTH SEMESTER								
Course Code	**Course Title**	**Hours/Week**			Credits	**Score**		**End Exam Duration**
		L	T	P		Internal	External	
BTCS711PET	Artificial Intelligence	3	1	0	4	30	70	3 Hrs
BTCS712PET	Block Chain Technology	3	1	0	4	30	70	3 Hrs
BTCS713PET	Real Time System	3	1	0	4	30	70	3 Hrs
BTCS714PET	Ad-Hoc and Sensor Network	3	1	0	4	30	70	3 Hrs
BTCS715PET	Internet-of-Things	3	1	0	4	30	70	3 Hrs
BTCS716PET	Machine Learning	3	1	0	4	30	70	3 Hrs
BTCS717PET	Xx							
BTCS718PET	xx							

PROFESSIONAL COURSES -ELECTIVE-VI, VII FOR EIGTH SEMESTER								
Course Code	**Course Title**	**Hours/Week**			Credits	**Score**		**End Exam Duration**
		L	T	P		Internal	External	
BTCS811PET	Image Processing	3	1	0	4	30	70	3 Hrs
BTCS812PET	Data Analytics	3	1	0	4	30	70	3 Hrs
BTCS813PET	Neural Networks and Deep Learning	3	1	0	4	30	70	3 Hrs
BTCS814PET	Cloud Computing	3	1	0	4	30	70	3 Hrs
BTCS815PET	Human Computer Interaction	3	1	0	4	30	70	3 Hrs
BTCS816PET	Web and Internet Technology	3	1	0	4	30	70	3 Hrs
BTCS817PET	Cryptography and Network Security	3	1	0	4	30	70	3 Hrs
BTCS818PET	Soft Computing	3	1	0	4	30	70	3 Hrs
BTCS819PET	Speech and Natural Language Processing	3	1	0	4	30	70	3 Hrs
BTCS820PET	xx							
BTCS821PET	xx							

OPEN ELECTIVE-I: **A Student need to opt any one subject from the following open electives to be offered by the other Departments**								
Course Code	**Course Title**	**Hours/Week**			Credits	**Score**		**End Exam Duration**
		L	T	P		Internal	External	
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs
OPEN ELECTIVE-II: **A Student need to opt any one subject from the following open electives to be offered by the other Departments**								
Course Code	**Course Title**	**Hours/Week**			Credits	**Score**		**End Exam Duration**
		L	T	P		Internal	External	
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs
		3	0	0	3	30	70	3 Hrs

Course Code	Course Title	Lecture			
BTCS101BST	Engineering Mathematics-I	L	T	P	Semester: I
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have basic knowledge of Mathematics at 10+2 level

Course Objectives:

1. The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra.
2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
2. The essential tools of matrices and linear algebra including linear transformations, eigenvalues, diagonalization and orthogonalization.

Detailed Contents:

Unit: 1	**Matrices:** Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination. Cayley-Hamilton's theorem (without proof) and its applications
Unit: 2	**Vector spaces:** Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank-nullity theorem, composition of linear maps, Matrix associated with a linear map.
Unit: 3	**Vector spaces:** Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigen bases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.
Unit: 4	**Calculus- I: Mean value theorems:** Rolle's mean value theorem, Lagrange's mean value theorem and Cauchy's mean value theorem (All Theorems without proof); problems on it. **Successive differentiation** : standard results; Leibnitz"s theorem; Expansions of functions: , Taylor's and Maclaurin's series with remainders (All Theorems without proof); Maxima and minima for function of one variable.
Unit: 5	**Calculus-II:** **Partial Differentiation:** Partial derivatives of first and higher orders, Homogeneous functions, Euler's Theorem; Total derivative; Change of variables. Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. **Multiple Integrals and Their Applications:** Double integrals and their evaluation; Change of order for integration; Double integrals in polar coordinates; Triple integrals; Application of multiple integrals to find area, volume, surface area

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3	D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

Reference Books:	
1	H. Anton, C. Rorres, Elementary Linear Algebra with Supplemental Applications, 11th Edition, Wiley Student Edition, New Delhi (2011)
2	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3	M. D. Weir, J. Hass, Thomas' Calculus,12th Edition, Pearson India Education Services Pvt Ltd., New Delhi (2016).
4	V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

Course Code	Course Title	Lecture			
BTCS102BST	Engineering Physics	L	T	P	Semester: I
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have basic knowledge of Physics at 10+2 level

Course Objectives:

1. To acquire competency in the field of engineering with adaptability to new development in science and technology.
2. Demonstrate various scientific principles, engineering methods and technological development.
3. Learning basic properties and characteristics of light, double slit and triple slit interference, Newton's rings, interference in thin films.

Course Outcomes:

1. Bragg's Law and introduced to the principles of lasers, types of lasers and applications.
2. Various terms related to properties of materials such as, permeability, polarization, etc.
3. Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials.
4. Simple quantum mechanics calculations.

Detailed Contents:

Unit: 1	Physics of Motion: Conservative & non conservative forces, Potential energy function in one, two and three dimensions, equation of motion for a conservative system (in one dimension), effect of friction on simple harmonic motion. Special theory of relativity: Non relativistic view point, inertial and non-inertial frames, Galilean transformations, principle of relativity, Lorentz transformations and their consequences, mass, momentum and energy in relativity.
Unit: 2	Optics: Interference of light, Double slit and triple slit interference, Newton's rings, interference in thin films, single slit diffraction, N slit diffraction. Introduction to lasers: qualitative introduction to lasers, uses of lasers. Principle of laser action, population inversion, Einstein coefficients, elementary laser types, applications of lasers.
Unit: 3	Electromagnetism: Maxwell's equations, wave equation, plane electromagnetic wave, Pointing vector, electromagnetic spectrum. Quantum theory: Wave function, probability density, Schrodinger equation, free article, particle in a box, system of two dissimilar particles, system of two identical particles.
Unit: 4	Quantum Ideas: Photoelectric effect, Compton effect, Planck hypothesis, Bohr theory, de Broglie hypothesis, wave particle duality, uncertainty principle and its implications. Physics of Solids: Classification of solids, Bragg diffraction technique, Electrical properties of solids, thermal properties, classical free electron model for metals, critical assessment of the model. Classical and quantum statistics, quantum free electron model of metals, critical assessment of the model, Fermi energy, intrinsic and extrinsic semiconductors, electron and hole densities, properties of semiconductors.
Unit: 5	Frontiers of Physics: Big bang model of the universe, critical assessment of the model, elementary particles and conservation laws, Last Nobel Prize in Physics. Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization(XRD&TEM) and Applications.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Beiser : Modern Physics
2	Mani and Damask : Modern Physics

Reference Books:

1	Resnick and Halliday : Physics
2	M. Ratner & D. Ratner (Pearson Ed.): Nanotechnology
3	A.J. Decker (Macmillan): Solid State Physics

Course Code	Course Title	Lecture			Semester: I
BTCS101EST	Basic Electrical Engineering	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s) : It is expected that the students have basic knowledge of Maths and Physics

Course Objectives:

1. To understand the basic concepts of magnetic, AC & DC circuits.
2. To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.
3. To Gain knowledge about the fundamentals of wiring and earthling.

Course Outcomes:

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low voltage electrical installations.

Detailed Contents:

Unit: 1	**DC Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.
Unit: 2	**AC Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.
Unit: 3	**Transformers:** Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.
Unit: 4	**Electrical Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.
Unit: 5	**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference Books:

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course Code	Course Title	Lecture			
		L	T	P	Semester: I
BTCS111EST	Engineering Graphics & Design				
Version:	Date of Approval: 13th BoS 16-08-2019	1	0	5	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	6	Internal Evaluation	:	30
Credits	:	3	End Semester	:	70
Instruction Mode	:	Theory & Practical	Exam Duration	:	3 Hrs.

Prerequisite(s) : It is expected that the students have basic knowledge of Maths and Physics

Course Objectives:

1. Learn to sketch and take field dimensions.
2. Learn to take data and transform it into graphic drawings.
3. Increase ability to communicate with people & prepare the student for future Engineering positions.

Course Outcomes:

1. Introduction to engineering design and its place in society.
2. Exposure to the visual aspects of engineering design.
3. Exposure to engineering graphics standards.
4. Exposure to solid modeling.

Detailed Contents:	
Unit: 1	**Introduction to Engineering Drawing** covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.
Unit: 2	**Projections of Points and Straight Line**: Point placed in different quadrants. Projections of straight lines - Parallel, perpendicular, inclined to one plan and inclined to planes. True lengths and true angle of a line.Traces of a line. **Projections of Planes:** Projections of regular planes parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference plane.
Unit: 3	**Projections of Solids**: Projections of regular solids, cube, prism, pyramids, tetrahedran, cylinder and cone,axis inclined to one and both the references plane
Unit: 4	**Sections and Sectional Views:** True shape of section, Right Regular Solids- Prism, Cylinder, Pyramid, Cone.
Unit: 5	**Isometric Projections**: Principles of Isometric Projection, Isometric scale, Isometric views-Conventions Plane Figures, Simple and Compound Solids. **Customisation & CAD Drawing** consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.

Reference Books:

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
3. (Corresponding set of) CAD Software Theory and User Manuals

Course Code	Course Title	Lecture			Semester: I
		L	T	P	
BTCS150BSP	Engineering Physics Lab.	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done Engineering Physics Course (BTCS102BST)

Course Objectives:

1. To acquire competency in the field of engineering.
2. Demonstrate to new development in physics laboratory by successfully completing the experiments.
3. Understand and learn basic theory and principles of science.

Course Outcomes:

1. Learn basic properties and characteristics of light, Double slit and triple slit interference, Newton's rings, interference in thin films.
2. Understand the working principle of LASER, laser action, population inversion, Einstein coefficient elementary laser types and applications of LASER.
3. Understand magnetic field and forces, electric field and usage of quantum theory.

Detailed Contents:

Experiments on electromagnetic induction and electromagnetic breaking:

1. Dispersive power of the material of a prism – Spectrometer.
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Study the characteristics of p-i-n and avalanche photodiode detectors.
10. Bending losses of fibres.
11. Evaluation of numerical aperture of given fibre.
12. Energy gap of a material of p-n junction.
13. Thermo electric effect – Seebeck effect and Peltier effect.
14. Torsional pendulum.
15. Single slit diffraction using laser.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Beiser : Modern Physics
2. Mani and Damask : Modern Physics

Reference Books:

1. Resnick and Halliday : Physics
2. C. Kittel (Wiley Eastern): Introduction to Solid Stat

Course Code	Course Title	Lecture			Semester: I
BTCS150ESP	Basic Electrical Engineering Lab	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	2	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS101EST Course

Course Objectives:

1. To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
2. To analyze performance aspects of various testing methods.

Course Outcomes:

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of power electronic converters.

Detailed Contents:

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Thevenin's and Norton Theorems.
3. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
4. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
6. To Determine the Performance Characteristics of a Series Motor.
7. To Determine the Performance Characteristics of a Shunt Motor.
8. To Determine the Performance Characteristics of a Compound Motor.
9. Speed Control of DC Shunt Motor.
10. To Determine the Load Characteristics of a Shunt Generator.
11. To Determine the Load Characteristics of a Single Phase Induction Motor.
12. To Determine the Performance Characteristics of a Three Phase Induction Motor.
13. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement).
14. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
15. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
16. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Basic Electrical Engineering, S.N. Singh, PHI, Learning Private Limited.
2. Electrical Machines M. N. Bandyopadhya, PHI, Learning Private Limited.

Reference Books:

1. Electrical Machines, Ashfaq Husain, Dhanpatrai Company, 4th edition.
2. Basic Electrical Engineering, D.C. Kulshreshtha, revised 1st edition, Tata Mc-Graw Hill education pvt. Ltd.
3. Testing Commissioning Operation & Maintenance Of Electrical Equipment – S. Rao Khanna Publication.

Course Code	Course Title	Lecture			
BTCS201BST	Engineering Mathematics-II	**L**	**T**	**P**	**Semester:** II
Version:	**Date of Approval: 13th BoS 16-08-2019**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS101BST Course

Course Objectives:

1. The objective of this course is to familiarize the students with statistical techniques.
2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

Course Outcomes:

1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2. The basic ideas of statistics including measures of central tendency, correlation and regression.
3. The statistical methods of studying data samples.

Detailed Contents:	
Unit: 1	**Basic Probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.
Unit: 2	**Continuous Probability Distributions:** Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. **Bivariate Distributions:** Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.
Unit: 3	**Basic Statistics:** Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.
Unit: 4	**Applied Statistics:** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.
Unit: 5	**Small samples:** Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2	P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003.
3	S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4	W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
Reference Books:	
1	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
2	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3	Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Course Code	Course Title	Lecture			Semester: II
		L	T	P	
BTCS211BST	Engineering Chemistry	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have basic knowledge of Chemistry

Course Objectives:

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
3. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
4. To impart the knowledge of synthetic aspects useful for understanding reaction pathways.
5. To acquire the skills pertaining to spectroscopy and to apply them for medical and other field.

Course Outcomes:

1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
2. The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
3. The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.
4. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.

Detailed Contents:	
Unit: 1	**Molecular structure and Theories of Bonding:** Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N2, O2 and F2 molecules. π molecular orbitals of butadiene and benzene. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance
Unit: 2	**Water Treatment:** Hardness of water, types of hardness, unites of hardness of water, determination of hardness of water by EDTA method. Boiler troubles - scale and sludge formation in boilers, caustic embrittlement, priming and foaming, Softening of water- Lime soda, permutit and ion exchange process. Problems
Unit: 3	**Electrochemistry and corrosion:** Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery). Causes and Theories of corrosion – Chemical and electrochemical corrosion, Water line and pitting corrosion; Factors affecting rate of corrosion – Nature of metal and Nature of environment. Corrosion control Methods: using pure metal and alloys, modifying the environment, cathodic protection (sacrificial anodic and impressed current cathodic). Surface coatings: Metallic coatings & methods of application of metallic coatings – hot dipping (galvanization & tinning), electroplating
Unit: 4	**Reactivity of Organic Molecules & Types of Reaction and Mechanism :** Inductive effect, Resonance or Mesomeric effect, Electromeric effect, Hyper conjugation, Carbocation, Carbanion & Free radical. Substitution, Addition and Elimination reaction.;Mechanism of the following reactions Aldol condensation, Cannizzaro reaction, Hoffmann reaction & Diels-Alder reaction
Unit: 5	**Spectroscopic techniques and applications**: Principles of spectroscopy, selection rules and applications of electronic spectroscopy. vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
2	Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008)
Reference Books:	
1	Fundamentals of Molecular Spectroscopy, by C. N. Banwell
2	Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

3	Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co,New Delhi(2006)
4	Engineering Chemistry – Shasi Chawla, Dhantpat Rai publishing Company, NewDelhi (2008).
5	Engineering Chemistry – R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan – Vikas Publishers (2008)
6	Enginering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi (2004).

Course Code	Course Title	Lecture			Semester: II
BTCS211EST	Programming for Problem Solving	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	3	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No specific requisites

Course Objectives:

1. To 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.

Course Outcomes:

1. The student would acquire various problem solving techniques and implement them in 'C' language.
2. Understand the basic terminology used in computer programming and write, compile and debug programs in C language.
3. Develop programs involving decision structures, loops and functions using different data types and data structures.

Detailed Contents:	
Unit: 1	Introduction to Programming, Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Introduction to programming – definitions and developing Algorithms and flowcharts for simple programs. Introduction to C Programming: Origin and history of c programming character set, Identifiers and keywords data types, constants, variables operators, symbolic constants, Expressions, compound statements, structure of C program, Input and output function.
Unit: 2	C Statements – selection statements – if nested if's, the if-else –if ladder the conditional expressions, switch statement nested switch statements, iteration statements – the for loop, for loop variations, the while loop, the do-while loop, declaring variable with in selection and iteration statements, jump statement, the return statement, the go to submit, break statement, exit ( ) function, the continue statement, expression statement. Block statements.
Unit: 3	Arrays – Array what is an array? – Array Declaration, Array Initialization – Accessing individual elements of an array – Two Dimensional Arrays – Passing an array element to a function – Rules of using an array. What are strings? String I/O, string Manipulation Functions – The General Form of a Function, elements of function, function categories, types of functions, Function Arguments Call by value, Call by Reference, return statement. Uses of functions. C pre – processor, storage classes – Automatic – Register, Static and external.
Unit: 4	Pointers – definition, pointer variables, pointer expressions, arithmetic pointers, pointers and arrays, initializing pointers and functions and problems with pointers. Structures – definition, accessing structure members, structure assignments, array of structures, passing structures, structure pointers, uses of structures Unions – definitions, difference between structure and union, type def. Files – introduction to streams and files, basics of files – file pointer, opening and closing files, writing and reading character, file functions.
Unit: 5	Principles of OOP: Programming paradigms, basic concepts, benefits of OOP, applications of OOP Introduction to C++: History of C++, structure of C++, basic data types, type casting, type modifiers, operators and control structures, input and output statements in C++. Classes and objects: class specification, member function specification, scope resolution operator, access qualifiers, instance creation.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Let Us C by Yashwanth Kanethar.
2	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
Reference Books:	
1	Object Oriented Programming with C++ By E.Balaguruswamy.
2	Programming in C, 2nd Edition, Oxford by Pradip Dey, Mannas Ghosh.

Course Code	Course Title	Lecture			Semester: II
		L	T	P	
BTCS211HST	English Communication	2	0	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	50
Periods/ Week	:	4	Internal Evaluation	:	15
Credits	:	2	End Semester	:	35
Instruction Mode	:	Lecture	Exam Duration	:	2 Hrs.

Prerequisite(s): No specific requisites

Course Objectives:

1. Enhancement of the soft and communication skills.
2. Understanding the phonetics & developing vocabulary.
3. Writing applications, letters formal and non-formal, technical writing.

Course Outcomes:

1. Read and write paragraphs in English confidently & Differentiate among homonyms, homophones, synonyms and antonyms.
2. Read and write the specific details and information such as writing applications, formal letters, CVs, technical reports and project reports.
3. Communicate with more confident among students, teachers & other stakeholders of the society.

Detailed Contents:	
Unit: 1	Oral Communication: 1.1. Communication: Verbal and Non-Verbal 1.2. Conversations and Dialogues 1.3. JAM Sessions and Group Discussions 1.4. Presentation Skills and Interview Skills
Unit: 2	Writing Communication: 2.1. Subject-verb agreement 2.2. Précis Writing and Essay Writing 2.3. Letter Writing and Cover Letters 2.4. Portfolio Writing and Resume Writing

Examination and Evaluation Pattern: It include both internal evaluation (15 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (35 marks) which is mainly end semester examination.

Text Books:

1. Habeeb,G. (2013) *English for Speakers of Urdu: A Proficiency Course*: Orient Black swan
2. Koneru, A. (2015) *Professional Speaking Skills.*OUP.
3. Kumar, S. & P. Lata (2015).*Communication Skills*. New Delhi: OUP.

Reference Books:

1. O'Brien, T. (2011). *Modern Writing Skills*. New Delhi: Rupa
2. Raymond, M. (2013). *English Grammar in Use*. Cambridge: CUP.
3. Taylor, G. (2009). *English Conversation Practice.* Tata McGraw-Hill.

Course Code	Course Title	Lecture			Semester: II
BTCS212EST	Engineering Mechanics	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS101BST and BTCS102BST Course

Course Objectives:

1. To provide an introductory treatment of *Engineering Mechanics* to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.
2. A working knowledge of statics with emphasis on force equilibrium and free body diagrams. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behaviour of materials under various load conditions.

Course Outcomes:

1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures.
2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
3. Apply basic knowledge of maths and physics to solve real-world problems
4. Understand measurement error, and propagation of error in processed data
5. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
6. Understand basic dynamics concepts – force, momentum, work and energy;
7. Understand and be able to apply Newton's laws of motion;
8. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution.

Detailed Contents:

Unit: 1	**Introduction to Engineering Mechanics covering-** Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.
Unit: 2	**Friction covering-** Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.
Unit: 3	**Centroid and Centre of Gravity covering-**Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.
Unit: 4	**Review of Particle Dynamics-** Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique)
Unit: 5	**Introduction to Kinetics of Rigid Bodies covering-**Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill.
2. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

Reference Books:

1. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications.
2. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

Course Code	Course Title	Lecture			Semester: II
		L	T	P	
BTCS260BSP	Engineering Chemistry Lab.				
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211BST Course

Course Objectives:

1. To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
2. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.
3. Students should develop the experimental skills both manually and by instrumentation of "qualitative and quantitative analysis" of solutions.
4. Students undergoing this course are expected to be conversant with basic titration set up and methodologies for determining strength, hardness and alkalinity of various unknown solutions and water samples.

Course Outcomes:

1. The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
2. The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis
3. Gain acquaintance in the determination the amount of hardness and chloride in the various samples of water for general purpose and their use it industries involving boilers.
4. Skills in estimating acidity/alkalinity in given water samples.

Detailed Contents:

List of experiments/demonstrations:

1. Determination of carbonate and bicarbonate in a given mixture
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution
3. Determination of copper using standard sodium thiosulphate
4. Determination of chloride content in bleaching powder
5. Determination of iron content in the given water sample by Mohr's methods
6. pH- metric titration of acid and base
7. Conductometric titration of acid and base
8. Titration of acid and base by Potentiommetry
9. Recording of Cu +2 Spectrum, absorptivity (demo only) determination of λmax and molar concentration by Spectrophotometer
10. Preparation of organic compound benzoic acid
11. Determination of surface tension and viscosity
12. Ion exchange column for removal of hardness of water
13. Synthesis of a polymer/drug
14. adsorption of acetic acid by charcoal

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

	Text Books:
1	Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2	Inorganic quantitative analysis, Vogel.
	Reference Books:
1	Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel.
2	A text book on experiments and calculation Engg. S.S. Dara.
3	Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

Course Code	Course Title	Lecture			Semester: II
		L	T	P	
BTCS260ESP	Basic Programming Lab	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	2	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST Course

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.

Course Outcomes:

1. The student would acquire various problem solving techniques and will be able to implement them in 'C' language.
2. Understand the basic terminology used in computer programming and write, compile and debug programs in C language.
3. Develop programs involving decision structures, loops and functions using different data types and data structures & Understand difference between call by value and call by reference.

Detailed Contents:

List of Experiments:

1. Write C program to input and output the text message.
2. Write C Program to perform all arithmetic operations.
3. Write C Program to utilize the math function.
4. Write C Program to perform the mathematical expressions.
5. Write C Program for Local and Global Variables.
6. Write C Program for internal static and external static variables.
7. Write C Program to find the roots of a Quadratic equation.
8. Write C Programs for all the Operators. (Arithmetical, Logical, Relational, Bitwise).
9. Write C Programs for Increment and Decrement Operators.
10. Write C Programs to implement the Ternary Operator.
11. Write C Programs for special Operators.
12. Write C Programs for all the Control Structures. (Sequential Control Structures, Conditional Control Structures, Iterative Control Structures).
13. Write C Programs to display the different types of patterns using nested for loop.
14. Write C Program for Statements. (switch, break, goto, continue etc.,).
15. Write C Program to print biggest number from n numbers.
16. Write a C Program to find the given integer number is even or odd number.
17. Write a C Program to calculate the factorial of a given number.
18. Write a C Program to swap the two numbers using temp variable and without using temp variable.
19. Reading and Printing a single dimensional array of elements.
20. Ascending and descending of an array.
21. Sum of all odd numbers and sum of all even numbers in a single dimensional array.
22. Mathematical operations on single dimensional arrays.
23. Reading and Printing a multi-dimensional array of elements.
24. Mathematical operations on multi-dimensional array of elements.
25. Passing an array element to a function.
26. Reading and Printing a string.
27. C Programs on String functions.
28. Write a C program to calculate string length by writing the user-define function.
29. Function declaration and initialization.
30. C Program to differentiate the parameters and arguments in functions.
31. Programs for different types of inbuilt functions.
32. Call by value and Call by reference programs in functions.
33. Write a program to swap the given 2 number using passing by reference.
34. Write C Programs to perform all valid arithmetic operations using pointers.
35. C programs on Structures and accessing of members of the structures.
36. Write a C program to print a book information (Book name, Book no, author name) by writing a structure.
37. Write a C program by passing structure elements to a function and display employee Information (emp no, emp name, emp salary, and emp address).
38. C Programs on Reading a file from the secondary storage device.
39. C Program on writing and appending a file on the secondary storage device.
40. C Program on Opening and closing a file.
41. Programs on Classes using C++.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2	Object Oriented Programming with C++ By E.Balaguruswamy

Reference Books:

1	Programming in C, 2nd Edition, Oxford by Pradip Dey, Mannas Ghosh
2	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Code	Course Title	Lecture			
		L	T	P	Semester: II
BTCS251ESP	Engineering workshop				
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	6	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	6	Internal Evaluation	:	50
Credits	:	3	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS212EST Course

Course Objectives:

1. To understand the physical aspects of engineering through laboratory technology.
2. Understand the working of carpentry, fitting and plumbing techniques.
3. Learn the characteristic engineering workshop with hands on practice on machine tools.

Course Outcomes:

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

Detailed Contents:

1. **Carpentry:** Study of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints. Practice in planning, chiselling, marking and sawing. Joints –Cross joint, T joint, Dove tail joint.
2. **Fitting:** Study of different fitting tools. Use and setting of fitting tools for marking, center punching, chipping, cutting, filing, drilling, their use, different measuring tools, Files – Material and Classification. Practice in filing, cutting, drilling and tapping. Male and female joints, Stepped joints.
3. **Plumbing:** Study of different plumbing tools. Details of plumbing work in domestic and industrial applications. Study of pipe joints, cutting, threading and laying of pipes different fittings using PVC pipes. Use of special tools in plumbing work. Practice of a domestic line involving fixing of a water tap and use of coupling, elbow, tee, and union etc.

TRADES FOR DEMONSTRATION & EXPOSURE:

1. **House Wiring:** Study of wiring tools, industrial wiring, accessories, earthling, and safety precaution. Practice to make parallel and series connection of three bulbs, stair case wiring, florescent lamp fitting.
2. **Machine Tools:** Study and demonstration on working of machine tools. Specification and block diagram of lathe, Drilling machine and grinder. Common lathe operations such as turning, parting, chamfering and facing. Difference between drilling and boring.
3. **Casting:** Study of Moulding Sands, Pattern, Core Prints, Role of Gate runner, riser, core, casting defects like blow holes & cavities. Practical Work: Mould of any pattern Casting of simple pattern, Solid pattern, Split pattern, multi-piece pattern.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Elements of Workshop Technology (Volume - 1): Hajra Choudhury.
3. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition.

Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Code	Course Title	Lecture			Semester: II
		L	T	P	
BTCS260HSP	English Communication LAB	0	0	2	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	1	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211HST Course

Course Objectives:

1. To achieve the perfection of understanding in English language.
2. To understand the spoken English.
3. To understand the written English.

Course Outcomes:

1. Student will be able to understand, comprehend and analyse the professional and soft communication skills
2. Learn the perfection of understanding in English language.
3. Can read, write and communicate effectively in English.

Detailed Contents:

Unit: 1	Introduction to Phonetics – Speech Sounds – Vowels & Consonants
Unit: 2	Structure of Syllables – weak forms & strong forms
Unit: 3	Minimal pairs – word accent and stress shifts
Unit: 4	Intonation and common errors in pronunciation
Unit: 5	Conversation practice – oral presentation skills a. Greeting and leave taking, introducing oneself and others b. Apologizing, interrupting, requesting and making polite conversation c. Giving instructions and directions: speaking of hypothetical situations d. Narrating, expressing opinions and telephone interactions

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. "Enjoying Every day English", Published by Sangam Books, Hyderabad
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.

Reference Books:

1. English Grammar Practice, Raj N Bakshi, Orient Longman
2. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi
3. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
4. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
5. Spoken English, R.K. Bansal & JB Harrison, Orient Longman
6. Technical Communication, Meenakshi Raman, Oxford University Press
7. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education

Course Code	Course Title	Lecture			Semester: III
BTCS311EST	Analog Electronic Circuits	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS102BST Course

Course Objectives:

1. To learn and explore the techniques of advanced circuit analysis.
2. To Understand signals, Laplace transformation, frequency response
3. To experiment with analog electronic circuits and signal processing

Course Outcomes:

Understand the characteristics of transistors.
Design and analyse various rectifier and amplifier circuits.
Design sinusoidal and non-sinusoidal oscillators.
Understand the functioning of OP-AMP and design OP-AMP based circuits.

Detailed Contents:

Unit: 1	P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave Rectifiers, Zener diodes, clamping and clipping circuits. Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits
Unit: 2	MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans conductance, high frequency equivalent circuit..
Unit: 3	Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)
Unit: 4	Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.
Unit: 5	Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Robert Boylested, Louis Nashelky, "Electronic Devices and Circuit Theory", Pearson Education, New Delhi, India.
2	A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
3	Jacob Millman, Christor C. Halkias, " Electronic Devices and Circuits" , McGraw Hill Book company, New Delhi, India.

Reference Books:

1	E. Norman lurch, "Fundamental of Electronics" , John Wiley and Sons, New York, USA.
2	Donald L. Schilling, Charles Belove, "Electronic Circuits: Discrete and Integrated," McGraw Hill Book company, Singapore.
3	P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.
4	J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

Course Code	Course Title	Lecture			Semester: III
BTCS311PCT	Data structure & Algorithms	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST Course

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Course Outcomes:

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

Detailed Contents:

Unit: 1	Introduction to data structures and objectives, basic concepts Arrays: one dimensional, multi-dimensional, Elementary Operations. Analysis of Algorithm: Time Complexity and Space Complexity, Big-O Notation, Omega Notation, Theta Notation.
Unit: 2	Stacks: Representation, elementary operations and applications such as infix to postfix, postfix evaluation, parenthesis matching Queues: Simple queue, circular queue, dequeue, elementary operations and applications. Recursion Technique, Tower of Honoi Problem.
Unit: 3	Linked lists: Linear, circular and doubly linked lists, elementary operations and applications such as polynomial manipulation. Sorting: what is sorting, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merging, Merge Sort, Radix Sort, Quick Sort, Heap Sort, Binary Tree Sort, Address Calculation Sort, Binary Search.
Unit: 4	Trees: Binary tree representation, tree traversal, complete binary tree, heap, binary search tree, height balanced trees like AVL tree, Huffman Tree, B Tree, B+ Tree and other operations and applications of trees.
Unit: 5	Graph: Undirected Graph, Directed Graph, Representation of Graph, Operation on Graph, Traversal in Graph, BFS (Breadth First Search), DFS (Depth First Search), Spanning Tree. Algorithm: Warshall's Algorithm, Shortest Path Algorithm (Dijkstra), Prim's Algorithm, Kruskal's Algorithm.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
2	Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.

Reference Books:

1	Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition
2	Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
3	Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4	Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

Course Code	Course Title	Lecture			Semester: III
BTCS312PCT	Digital Electronics	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS102BST Course

Course Objectives:

1. To impart the basic concepts of Digital Electronics.
2. To understand concepts about various logical gates.
3. To understand basic concepts about Boolean Algebra.
4. To enable them to design the digital logic.

Course Outcomes:

1. Implement working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Be able to use PLDs to implement the given logical problem.

Detailed Contents:

Unit: 1	**Fundamentals of Digital Systems and logic families** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.
Unit: 2	**Combinational Digital Circuits** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.
Unit: 3	**Sequential circuits and systems** A 1-bit memory, the circuit properties of Bi stable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers , serial to parallel converter, parallel to serial converter, ring counter, sequence generator ,ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.
Unit: 4	**A/D and D/A Converters** Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs , sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter ,A/D converter using voltage to frequency and voltage to time conversion ,specifications of A/D converters, example of A/D converter ICs
Unit: 5	**Semiconductor memories and Programmable logic devices.** Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
2. Mansaf Alam, Bashir Alam, "Digital Logic Design", PHI,2016

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. Anil K.Maini,"Digital Electronics", Wiley,2016.

Course Code	Course Title	Lecture			Semester: III
BTCS311BST	Engineering Mathematics-III	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS201BST Course

Course Objectives:

1. Introduce the basic concepts of differential equations, partial differential equations, Laplace transformation and numerical analysis
2. Explore a variety of various mathematical structures by focusing on mathematical objects, operations, and resulting properties
3. Understand and learn uses and applications of Ordinary and Partial differential equations, Laplace transformation and Numerical analysis in the field of engineering and technology

Course Outcomes:

1. Demonstrate the ability to solve problems using Ordinary and Partial differential equations, Laplace transformation and Numerical analysis
2. Learn the overview of differential equations and use of equations reducible to exact form using Integrating factors - Linear, Bernoulli 's equations
3. Learn the applications to Newton's Law of Cooling – Law of natural growth and decay

Detailed Contents:

Unit: 1	**Differential Equations I-** Differential Equations an overview –Exact Differential Equations, Equations reducible to Exact Differential Equations using Integrating factors, Linear, Bernoulli`s Equations, Applications to Newton's Law of Cooling Law of Natural Growth and Decay, Orthogonal Trajectories in Cartesian and Polar form
Unit: 2	**Differential Equations II-** Linear Differential Equations of Higher Order with Constant Coefficients, Complementary Function and Particular Integral, General form of Particular Integral and Special types such as e^{ax} , *cos (ax), sin(ax),* x^m , e^{ax}. *V, x.V*, Method of Variation of Parameters for a Second Order Differential Equation, Applications to Bending of Beams, Electrical Circuits and Simple Harmonic Motion
Unit: 3	**Partial Differential Equations-** Formation of Partial Differential Equations by eliminating the arbitrary constants and arbitrary functions, Solution of Partial Differential Equations (Lagrange's method), Nonlinear Differential Equations of order one (Special forms), Method of Separation of Variables for Solving One Dimensional Wave Equation and Heat Equation and Problems.
Unit: 4	**Laplace Transforms-** Laplace Transform of Standard Functions, Inverse Transform, First Shifting Theorem, Transform of Derivatives and Integrals, Unit Step Function, Second Shifting Theorem, Dirac-delta Function, Convolution Theorem, Periodic Function, Differentiation and Integration of Transforms, Application of Laplace Transform to Ordinary Differential Equations.
Unit: 5	**Numerical Analysis-** Numerical Integration, Trapezoidal rule, Simpson's One-Third rule, Simpson's Three-Eighth rule and Weddle's rule, Numerical Differentiation, Numerical Solution of Ordinary Differential Equations by Euler's Method, Euler's Modified Method and Runge-Kutta Method.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Differential Calculus by shantinarayana
2	Partial Differential Equation by Sneddon
3	Laplace Transform by Schaum's series
Reference Books:	
1	Numerical Analysis by Shastry
2	Engineering Mathematics by B.V Ramana

Course Code	Course Title	Lecture			Semester: III
BTCS311HST	Technology and Society	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	2	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	50
Periods/ Week	:	2	Internal Evaluation	:	15
Credits	:	2	End Semester	:	35
Instruction Mode	:	Lecture	Exam Duration	:	2 Hrs.

Prerequisite(s): No specific requisite

Course Objectives:

1. To understand how profoundly scientific and technological developments affect society and the environment.
2. To understand the applications of science and technology in societal context
3. To address science and technology to real-world problems

Course Outcomes:

1. Able to analyze the scientific debates and ethical concerns of such issues as global warming, biotechnology, GMO foods, healthcare, innovation, and economic competitiveness
2. Able to articulate ways in which society is transformed by science and technology
3. Able to integrate, synthesize, and apply knowledge of the relationship between science and technology and societal issues in both focused and broad interdisciplinary contexts

Detailed Contents:

Unit: 1	**Technology and Society** : Relationship between technology and society, Role of Technology in Society, social structure and practice, technologies impact society.
Unit: 2	**Social media and civic engagement** : Internet and cause social isolation, Social Construction of Technology (SCOT) perspective.
Unit: 3	**Technology and Risk**: Automation in the workplace: Role of human skill? Socially constructing automation in the workplace, Technology and inequality, ethics and implications of GMOs and potential future impacts, the major impacts of nanotechnology on society
Unit: 4	**Interrelatedness of society, environment, and health** Gene therapy and its various forms, Assess the issue's potential benefits and detriments to global health, Identify the causes of climate change, Assess the various impacts of climate change including economic, geopolitical, biological, meteorological, etc.
Unit: 5	**Gender and Technology**: Gender influences technologies and social organization of scientific and technical workspaces, technologies as both 'liberating' and 'limiting' women. **Public Engagement with Technology**: Contributions, governance and ethical issues in the context of emerging technologies, constructing risk, role of State, civil society organizations and industry

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Science Technology And Society – 2014,By K Siddhartha, Publisher: Kisalaya Publication; 1 Edition
2	Impact of Science and Technology on Society – 2012,by Ishwar Singh , Publisher: S.K. Kataria & Sons; Reprint 2012 edition

Reference Books:

1	Technology and Society – 2010,by R.V.G Menon, Publisher: Pearson Education India; First edition (2010)
2	Book: "The Future: Six Drivers of Global Change"

Course Code	Course Title	Lecture			Semester: III
BTCS360ESP	Analog Electronic Circuits LAB	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have studied BTCS311EST Course

Course Objectives:

1. Understand the design procedure of various electronic circuit configurations
2. How to design the frequency response of amplifiers
3. Identify and understanding of operation of oscillators and power supplies

Course Outcomes:

1. An ability to design and conduct experiments on amplifiers, oscillators and multivibrators
2. An ability to use the techniques, skills and modern engineering tools of electronic circuits for engineering practice

Detailed Contents:

1. Diode Characteristics.
2. Transistor characteristics.
3. Series and Shunt feedback amplifiers
4. Design of Wein bridge oscillator
5. Design of transistor RC phase shift oscillator
6. Integrators and Differentiators
7. Clippers and Clampers
8. Darlington Emitter follower
9. Complementary Symmetry Push-pull amplifier
10. Design of Monostable Multivibrato
11. Design of BistableMultivibrator.
12. Arduino and Raspberry Pi based experiments.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1	Analog Electronic circuits Laboratory Manual 2.

Reference Books:

1	David A. Bell, "Electronic Devices and Circuits", 5thEdition, Oxford University Press, 2008
2	Microelectronics circuits, Sedra and Smith, Oxford University Press, 1998.

Course Code	Course Title	Lecture			Semester: III
		L	T	P	
BTCS360PCP	Data structure & Algorithms LAB	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311PCT Course

Course Objectives:

1. To understand the linear and non linear data structures and algorithms.
2. To identify the suitable data structure and algorithm for the given real world problem.
3. It enables them to gain knowledge in practical applications of data structures and algorithms.

Course Outcomes:

1. To design and analyze the time and space efficiency of the data structure and algorithms.
2. To implement the appropriate data structure for given problem and algorithms.
3. To Design and analyze data structure and algorithms

Detailed Contents:

1. Implementation of array operations, Structures & Unions.
2. Stacks, Queues, Circular Queues, Priority Queues, Multiple stacks and queues.
3. Infix to postfix expression using stack
4. Implementation of linked lists: stacks, queues, single linked lists.
5. Implementation of polynomial operations. Doubly linked lists
6. Tree traversal: AVL tree implementation, application of trees.
7. Implementation of Hash Table.
8. Searching and sorting
9. Traversal of graph

Note: Students can write the more programs based on prescribed syllabus.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd
2	Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
Reference Books:	
1	Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition
2	Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
3	Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

Course Code	Course Title	Lecture			Semester: III
		L	T	P	
BTCS361PCP	Digital Electronics LAB	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS312PCT Course

Course Objectives:

1. To impart the basic knowledge of Various Logic Gates
2. To understand Combinational and Sequential Circuits

Course Outcomes:

1. Deign Logic circuit for a given Boolean Expression
2. Design Logic circuit by using Universal gates
3. Design Combinational circuits
4. Design Flip Flops

Detailed Contents:

1. Bread Board Implementation of various logic gates
2. Bread Board Implementation of various logic gates using NAND gate.
3. Bread Board Implementation of various logic gates using NOR gate.
4. Bread Board implementation of Binary Adder (Half and Full) using general gates.
5. Bread Board implementation of Combinational Circuts.
6. Bread Board implementation of Adder/Subtractor.
7. Bread Board Implementation of Flip-Flops.
8. Experiments with clocked Flip-Flop.
9. Design of Counters.
10. Bread Board implementation of counters & shift registers.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
2. Mansaf Alam, Bashir Alam, "Digital Logic Design", PHI,2016

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. Anil K.Maini,"Digital Electronics", Wiley,2016.

Course Code	Course Title	Lecture			Semester: III
BTCS362PCP	IT Workshop with Python	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done any computer programming Course

Course Objectives:

1. Learn the fundamentals of writing Python programming.
2. Learn core Python scripting elements such as variables and flow control structures.
3. Use Python to read and write files.
4. Work with the Python standard library and Explore Python's object-oriented features.

Course Outcomes:

1. Implement scripting and the contributions of scripting languages.
2. Apply Python especially the object-oriented concepts,
3. Implement built-in objects of Python,

Detailed Contents:	
Unit: 1	**Introduction:** History, Features, Setting up path, Working with Python , Basic Syntax, Variable and Data Types, Operator, Input-Output, Printing on screen, Functions, If, If- else, Nested if-else, Looping, For, While, Nested loops, Control Statements, Break, Continue, Pass
Unit: 2	**String Manipulation and Lists:** **Strings:** Accessing Strings, Basic Operations, String slices, Function and Methods **Lists:** Introduction, Accessing list, Operations, Working with lists, Function and Methods
Unit: 3	**Functions and modules:** Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables, Importing module, Math module, Random module, Packages, Composition
Unit: 4	**Regular expressions:** Match function, Search function, Matching VS Searching, Modifiers, Patterns
Unit: 5	Reading data from keyboard, Opening and closing file, Reading and writing files, **Database:** Introduction, Connections, Executing queries, Transactions, Handling error
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Sheetal Taneja and Naveen Kumar, "Python Programming - A Modular Approach", Pearson education.
2	Cay S. Horstmann and Rance D. Necaise, "Python for Everyone", Wiley.
Reference Books:	
1	Allen Downe, "Learning With Python", Wiley.
2	Jake VanderPlas, "Python Data Science Handbook", O'Reilly' Publisher

Course Code	Course Title	Lecture			
BTCS411PCT	Discrete Mathematics	L	T	P	Semester: IV
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311BST Course

Course Objectives:

1. Explore a variety of various mathematical structures by focusing on set theory, mathematical objects, operations, and resulting properties
2. Develop formal logical reasoning techniques and notation and Demonstrate the application of logic to analysing and writing proofs, techniques for counting, permutations and combinations
3. Develop the concept of relation through various representations of Graphs, DFS, BFS, Spanning Trees, and Planar Graphs. Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

Course Outcomes:

1. Construct Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers.
2. Perform operations on set theory, mathematical objects, operations, and resulting properties
3. Perform the application of logic to analysing and writing proofs, techniques for counting, permutations and combinations and apply the concepts of Graphs, DFS, BFS, Spanning Trees, and Planar Graphs. Graph Theory and other engineering applications

Detailed Contents:

Unit: 1	**Mathematical Logic:** Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.
Unit: 2	**Relations:** Properties of binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram. Functions: Inverse Function, Composition of functions, recursive Functions, Lattice and its Properties, Pigeon hole principles and its application.
Unit: 3	**Elementary Combinatorics:** Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorem, the principles of Inclusion – Exclusion.
Unit: 4	**Recurrence Relations:** Generating Functions, Function of Sequences, Calculating Coefficients of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, solution of Inhomogeneous Recurrence Relations.
Unit: 5	**Graph Theory:** Representation of Graphs, DFS, BFS, Spanning Trees, Planar Graphs. Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Mathematical Foundation of Computer Science – Shahnaz Bathul, PHI.
2	Elements of Discrete Mathematics- A Computer Oriented Approach,C.L.Liu, D.P. Mohapatra,3edition,TMH.
3	Discrete Mathematics for Computer Scientists & Mathematicians, second edition, J.L.Mott, A. Kandel, T.P. Baker, PHI
4	Discrete and Combinatorial Mathematics- An Applied Introduction-5th Edition– Ralph. P.Grimaldi, Pearson Education

Reference Books:

1	Discrete Mathematics and its applications, 6th edition, K.H. Rosen, TMH.
2	Discrete Mathematical Structures, Mallik and Sen, Cengage Learning
3	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI/ Pearson Education
4	Discrete Mathematics with Applications, Thomas Koshy, Elsevier.
5	Logic and Discrete Mathematics, Grass Man and Tremblay, Pearson Education

Course Code	Course Title	Lecture			Semester: IV
BTCS402PCT	Database Management Systems	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311PCT Course

Course Objectives:

1. To understand the concept of data planning and database design for serving different types of users with varying skill levels.
2. Handling different user views of the same stored data, combining interrelated data , setting standards, controlling concurrent updates so as to maintain data integrity.
3. Managing, planning and coordinating restart and recovery operations across multiple users for a large complex systems.

Course Outcomes:

1. Apply relational database theory, and be able to write relational algebra expressions for queries, logical design of databases, including the E-R method and normalization approach.
2. Apply and analyze the database storage structures and access techniques like file and page organizations, indexing methods including B-tree, hashing, query evaluation techniques and and query optimization.
3. Understand various issues of transaction processing and concurrency control by designing and development of a database application system as part of a team.

Detailed Contents:

Unit: 1	Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor. History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.
Unit: 2	Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.
Unit: 3	Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases. Schema refinement – Problems Caused by redundancy Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.
Unit: 4	Transaction Concept- Transaction State- Implementation of Atomicity and Durability Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Base Protocols – Multiple Granularity. Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.
Unit: 5	Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2	Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition

Reference Books:

1	Fundamentals of Database Systems, Elmasri Navrate Pearson Education
2	Introduction to Database Systems, C.J.Date Pearson Education

Course Code	Course Title	Lecture			Semester: IV
BTCS403PCT	Operating Systems	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST/BTCS312PCT Course

Course Objectives:

1. Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
2. Understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions,
3. Understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software.

Course Outcomes:

1. Demonstrate how to manage multiple tasks that execute at the same time and share resources including processes and threads, context switching, synchronization, schedule CPU time, and deadlock.
2. Design, implement and evaluate a computer-based system, process, components, or program to meet desired needs in context of operating system
3. Identify the System calls, protection, interrupts and know Input/output, disk access, file systems facilities.

Detailed Contents:

Unit: 1	**System Software:** Machine, Assembly and High-Level Languages; Compilers and Interpreters; Loading, Linking and Relocation; Macros, Debuggers. **Basics of Operating Systems:** Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation; System Boot.
Unit: 2	**CPU Scheduling:** Scheduling Criteria and Algorithms; Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling. **Deadlocks:** Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection; Recovery from Deadlock.
Unit: 3	**Memory Management:** Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files. **Storage Management:** Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure.
Unit: 4	**File and Input/Output Systems:** Access Methods, Directory and Disk Structure; File-System Mounting, File Sharing, File-System Structure and Implementation; Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance; Recovery, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations. **Security:** Protection, Access Matrix, Access Control, Revocation of Access Rights, Program Threats, System and Network Threats; Cryptography as a Security Tool, User Authentication, Implementing Security Defenses.
Unit: 5	**Windows Operating Systems:** Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking. **Linux Operating Systems:** Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Interprocess Communication, Network Structure.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2	SibsankarHalder and Alex A Aravind, "Operating Systems", Pearson Education

Reference Books:

1	Harvey M Dietel, " An Introduction to Operating System", Pearson Education
2	D M Dhamdhere, "Operating Systems :A Concept basedAproach", McGraw Hill
3	Charles Crowley, "Operating Systems: A Design-Oriented Aproach", Tata McGraw Hill Education".
4	Stuart E. Madnick & John J. Donovan. Operating Systems. McGraw Hill

Course Code	Course Title	Lecture			Semester: IV
BTCS412PCT	Object Oriented Programming USING Java	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST Course

Course Objectives:

1. Course introduces object-oriented programming principle using JAVA programming language.
2. Elaborate variable scopes, memory management, and reference versus value types in relation to parameters and arguments in function calls.
3. Demonstrate the principles of object oriented features of Java programming language with security features

Course Outcomes:

1. Understand the principles of object oriented programming paradigm specifically including abstraction, encapsulation, inheritance and polymorphism.
2. Demonstrate best practices in designing classes and class hierarchies from problem statements using sub-classing, abstract classes, and interfaces to achieve polymorphism in object oriented software.
3. Demonstrate informed use of encapsulation within and across software components and packages & Apply exception handling, generation and escalation mechanisms and practices in writing Java programs.

Detailed Contents:

Unit: 1	**Java Basics** - Review of OOP concepts, History of Java, Java buzzwords, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow-block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, encapsulation, inheritance, polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this keyword, overloading methods and constructors, recursion, garbage collection, String Handling, Enumerations.
Unit: 2	**Inheritance** – Inheritance concept, benefits of inheritance ,Super classes and Sub classes, Member access rules, Inheritance hierarchies, super keyword, preventing inheritance: final classes and methods, casting, polymorphism - dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.
Unit: 3	**Interfaces** – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface. **Inner classes** – Uses of inner classes, local inner classes, anonymous inner classes, static inner classes. **Packages**-Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.
Unit: 4	**Exception handling** – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally , re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes, Guide lines for proper use of exceptions. **Multi-threading** - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, thread groups, daemon threads.
Unit: 5	**Applets, JAVA GUI And Database Connectivity**, **Networking - Applets** – Applet life cycle methods – Applets based GUI – AWT Introduction - GUI components – Basics of Swings – Accessing database with JDBC basics- Types of Drivers – Basics of Networks Programming, Addresses, Ports, Sockets, Simple Client and Server Program, Multiple Clients and Single Server.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Java; the complete reference, 7 th editon, 2007, Herbert schildt, TMH
2	Understanding OOP with Java, updated edition, T. Budd, Pearson education.

Reference Books:	
1	An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2	Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education.
3	Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education
4	Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education

Course Code	Course Title	Lecture			Semester: VI
		L	T	P	
BTCS617PET	Software Engineering	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311PCT Course

Course Objectives:

1. To Study the fundamentals of software engineering including analysis, design, construction, maintenance, quality assurance and project management
2. To understand appropriate computer science and mathematics principles in the development of software systems.
3. To understand software requirement elicitation,
4. To understand the methods of coding and testing software products
5. To understand the measurement techniques, quality control aspects

Course Outcomes:

1. To apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science and mathematics, to the development and maintenance of complex software systems.
2. To verify and validate various software prototypes and to develop quality software metrics.
3. To Design and test specific software requirements through a productive working relationship with project stakeholders.

Detailed Contents:	
Unit: 1	**Software Engineering Fundamentals:** Definition of software product and process, Software Characteristics, Components, Applications, Layered Technologies, Processes and Product, Methods and Tools, Generic View of Software Engineering, Software Crisis, Software development paradigms, Techniques of Process Modelling, Software Process and lifecycle models
Unit: 2	**Software Requirements Analysis & Specification:** System specification, Software requirements specification (SRS) standards, Analysis and Design Modelling: ER Diagram, Dataflow Model, Control Flow Model, Control and Process Specification, Data Dictionary.
Unit: 3	**Software Design:** Software architecture, Modular Design-cohesion and coupling, Process-oriented design, Process and Optimization, Data-oriented design, User-interface design, Real-time software design, Architectural Designing, Interface Design, Procedural Design, Object Oriented Design. **CASE Tools:** Computer-aided software engineering, Introduction to CASE, Building Blocks of CASE, Relevance of CASE tools, High-end and low-end CASE tools, automated support for data dictionaries, DFD, ER diagrams, Integrated Case Environment, CASE workbenches.
Unit: 4	**Coding and Testing:** Choice of Programming languages, Coding standards for Software. User Interface Design: Concepts of Ui, Interface Design Model, Internal and External Design, Evaluation, Interaction and Information Display Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing
Unit: 5	**Configuration Management:** Concepts in Configuration Management, The Configuration Management Process: Planning and Setting up Configuration Management, Perform Configuration Control, Status Monitoring and Audits. **Software Maintenance:** What is software maintenance, Maintenance Process & Models, Reverse Engineering, Software re-engineering, Configuration Management issues and concept, Configuration planning & techniques, Software versions and change control process, Documentation.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	R. Pressman, "Software Engineering", 7th Edition, 2010, McGraw-Hill.
2	Yogesh Singh "Software Engineering" , 3rd Edition, 2007, New Age Publications, Delhi.
Reference Books:	
1	W.S. Jawadekar, "Software Engineering", 2008, A Primer, TMH.
2	Shari Pfleeger, "Software Engineering", 2010, Pearson Education.
3	Stephen Schach, "Software Engineering", 2007, TMH.

Course Code	Course Title	Lecture			Semester: IV
BTCS450PCP	Database Management Systems LAB	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS402PCT Course

Course Objectives:

1. Knowledge of DBMS, in terms of use and implementations.
2. Understand the concept of data planning and database design for serving different types of users with varying skill levels.
3. Handling different user views of the same stored data, combining interrelated data , setting standards, controlling concurrent updates so as to maintain data integrity.

Course Outcomes:

1. Understand the relational database theory, and be able to write relational algebra expressions for queries, logical design of databases, including the E-R method and normalization approach.
2. Illustrate commercial relational database system by writing SQL.
3. Understand and analyze the database storage structures and access techniques like file and page organizations, indexing methods including B-tree, hashing, query evaluation techniques and and query optimization.

Detailed Contents:

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using logical operations (=, <,>, etc.)
3. Write SQL queries using SQL operators
4. Write SQL query using character, number, date and group functions
5. Write SQL queries for relational algebra
6. Write SQL queries for extracting data from more than one table
7. Write SQL queries for sub queries, nested queries
8. Write programme by the use of PL/SQL
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS
10. Create VIEWS, CURSORS and TRIGGERS & write ASSERTIONS.
11. Create FORMS and REPORTS

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1	Fundamentals of Database Systems, Elmasri Navrate Pearson Education
2	Introduction to Database Systems, C.J.Date Pearson Education

Reference Books:

1	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2	Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition

Course Code	Course Title	Lecture			Semester: IV
		L	T	P	
BTCS460PCP	Operating Systems LAB	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS403PCT Course

Course Objectives:

1. To write programs in Linux environment using system calls.
2. To implement the scheduling algorithms
3. To develop solutions for synchronization problems using semaphores.

Course Outcomes:

1. Ability to develop application programs using system calls in UNIX.
2. Ability to implement interprocess communication between two processes.
3. Ability to design and solve synchronization problems.

Detailed Contents:

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement ll File Organization Techniques
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1	An Introduction to Operating Systems, P.C.P Bhatt, 2nd edition, PHI.
2	

Reference Books:

1	Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI
2	Unix System Programming Using C++, Terrence Chan, PHI/Pearson.

Course Code	Course Title	Lecture			Semester: IV
		L	T	P	
BTCS461PCP	Object Oriented Programming LAB	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS412PCT Course

Course Objectives:

1. Demonstrate the features of advanced java programming language such as AWT, Applet, JDBC, Servlets etc.
2. Elaborate variable scopes, memory management, and reference versus value types in relation to parameters and arguments in function calls.
3. Demonstrate the principles of object oriented features of Java programming language with security features

Course Outcomes:

1. Understand the principles of object oriented programming paradigm specifically including abstraction, encapsulation, inheritance and polymorphism.
2. Demonstrate informed use of encapsulation within and across software components and packages & Apply exception handling, generation and escalation mechanisms and practices in writing Java programs.
3. Describe and explain the factors that contribute to a good object oriented solution, reflecting on your own experiences and drawing upon accepted good practices.

Detailed Contents:

1. Write a Java Program to find the maximum of two numbers using command line arguments?
2. Write a program to print the Fibonacci series up to a given number?
3. Write a program to swap the numbers without using third variable in Java?
4. Write a Java Program to find the sum and product of digits of a given number?
5. Write a Java Program to display multiplication table?
6. Write a Java Program to find whether the given number is palindrome or not?
7. Write a Java Program to demonstrate the concept of conditional statement?
8. Write a Java Program to demonstrate the concept of iterative statement?
9. Write a Java Program to demonstrate about switch case?
10. Write a Java Program to demonstrate continue and break?
11. Write a Java Program to describe about abstract class?
12. Write a Java Program to demonstrate the concept of method overriding?
13. Write a Java Program on the operation of this keyword?
14. Write a Java Program on concept of method overloading?
15. Write a Java Program to explain single inheritance concept?
16. Write a Java Program to explain multiple inheritance concept?
17. Write a Java Program to demonstrate about the final method?
18. Write a Java Program to demonstrate the operation of super keyword in Java?
19. Write a Java Program to define and implements an interface?
20. Write a Java program to demonstrate the operation of scanner class?
21. Write a Java Program to define and import the user defined package?
22. Write a Java Program to describe about try and catch blocks for handling exceptions?
23. Write a Java Program to raise and handle custom or user defined exceptions in java?
24. Write a Java Program to demonstrate about throw and throws keywords?
25. Write a Java Program to create threads in java by extending Thread Class?
26. Write a Java Program to create threads in java by implementing Runnable Interface?
27. Write a Java program to print a message using applet concept?
28. Write a Java Program to pass the parameters using applet concept?
29. Write a Java Program demonstrating accessing of database with JDBC?

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Understanding OOP with Java, updated edition, T. Budd, Pearson education.
2. Programming with Java, Balaguruswamy, TMH

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.

Course Code	Course Title	Lecture			Semester: IV
		L	T	P	
BTCS411MCT	Environmental Sciences	2	0	0	
Version:	Date of Approval: 13th BoS 16-08-2019				

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	50
Periods/ Week	:	4	Internal Evaluation	:	15
Credits	:	-	End Semester	:	35
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No specific requisite

Course Objectives:

1. Study and aware the students about need and importance of Natural resources: Water resources; use and over utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems, water logging, salinity. Energy resources, growing energy needs, renewable and non – renewable energy sources.
2. Understand the concepts of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, aquatic ecosystem (ponds, lakes, streams, rivers, oceans, estuaries).
3. Study and aware the students about causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste management.

Course Outcomes:

1. Develop the mechanism to control and measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste management.
2. Apply the Environment Protection Act, in order to handle disaster management and enforcement of environmental legislation.
3. Understand the working principles of disaster mitigation, disaster management cycle, and disaster management in India

Detailed Contents:

Unit: 1	**Evironmental Studies:** Definition, scope and importance, need for public awareness. Natural resources: Water resources; use and over utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems, water logging, salinity. Energy resources, growing energy needs, renewable and non – renewable energy sources.
Unit: 2	**Ecosytems:** Concepts of an ecosystem, structure and functions of an ecosystem, producers,consumers and decomposers, energy flow in ecosystem, food chains, aquatic ecosystem (ponds, lakes, streams, rivers, oceans, estuaries).
Unit: 3	**Biodiversity:** Genetic, species and ecosystem diversity, bio-geographical classification of India.Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.
Unit: 4	**Environmental Pollution:** Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste management. Environment Protection Act: Air, water, forest and wild life acts, issues involved in enforcement of environmental legislation.
Unit: 5	**Social Aspects and the Environment:** Water conservation and environmental ethics: Climate change, global warming, acid rain, ozone layer depletion. **Disaster Management:** Types of disasters, impact of disasters on environment, infrastructure and development. Basic principles of disaster mitigation. disaster management cycle, and disaster management in India.

Examination and Evaluation Pattern: It include both internal evaluation (15 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (35 marks) which is mainly end semester examination.

Text Books:

1. A.K. De, Environmental Chemistry, New Age Publications, 2002.
2. E.P. Odum, Fundamentals of Ecology, W.B. Sunders Co., U.S.A.

Reference Books:

1. G.L. Karia and R.A. Christain, Waste Water Treatment, Concepts and Design Approach, Prentice Hall of India, 2005.
2. Benny Joseph, Environmental Studies, Tata McGraw – Hill, 2005.
3. V.K. Sharna, Disaster Management, National Centre for Disaster Management, IIPE, Delhi, 1999.

Course Code	Course Title	Lecture			Semester: V
BTCS511PCT	Computer Organization	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS312PCT Course

Course Objectives:

1. To understand the organization of the classical von Neumann machine and its major functional Modules.
2. To learn system organization and structure through instruction cycles.
3. To learn basic concepts of interrupts and how interrupts are used to implement I/O control and data transfers. Identify various types of buses in a computer system and illustrate how data transfers are performed.

Course Outcomes:

1. Apply and analyze computer organization, computer arithmetic, and CPU design & Understand I/O system and interconnection structures of computer
2. Design and analyze different interrupts, I/O techniques, PLDs and memory organization
3. Implement learning skills and be able to develop different hardware for computer organization

Detailed Contents:

Unit: 1	Introduction: Function and structure of computer Functional components of a computer, Interconnection of components, Performance of a computer. Computer Organization and Architecture Basic structure of General purpose Computer with instruction set, Basic Computer and registers, Hardware Organization.
Unit: 2	Registers Microoperations and Arithmetic Logic Structure: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Adder-Subtractor, Arithmetic Logic Shift Unit.
Unit: 3	CPU Organization: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control Organization of a control unit-Operations of a control unit, Hardwired control unit, Microprogrammed control unit.
Unit: 4	Input Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA controlled I/O, Direct Memory Access, Input-Output Processor
Unit: 5	Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI
2	Computer Organization and Architecture–William Stallings Sixth Edition, Pearson/PHI

Reference Books:

1	Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill
2	Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3	Fundamentals of Computer Organization and Design, -Sivaraama Dandamudi Springer Int. Edition.
4	Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier
5	Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication

Course Code	Course Title	Lecture			Semester: V
BTCS512PCT	Formal Language & Automata Theory	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS411PCT Course

Course Objectives:

1. Introduces the fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton and Turing machine.
2. Explain the basic models of computation including the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.
3. Acquire insights into the relationship among formal languages, formal grammars, and automata.

Course Outcomes:

1. Demonstrate the understanding of abstract models of computing, including deterministic (DFA), non-deterministic (NFA), and Turing (TM) machine models.
2. Demonstrate an understanding of regular expressions and grammars, including context-free and context-sensitive grammars.
3. Understand the relationships between language classes, including regular, context-free, context-sensitive, recursive, and recursively enumerable languages.

Detailed Contents:	
Unit: 1	Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata.
Unit: 2	Regular expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine.
Unit: 3	Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.
Unit: 4	Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.
Unit: 5	Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, Universal TM, Church's Thesis, Chomsky hierarchy of languages, Recursive and recursively enumerable languages, Halting problem, Undecidable problems about TMs. Post correspondence problem (PCP).

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education
2	Theory of Computer Science: Automata, Languages and Computation, K.L.P.Mishra, N.Chandrasekaran
Reference Books:	
1	Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley
2	Introduction to languages and the Theory of Computation ,John C Martin, TMH
3	Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.

Course Code	Course Title	Lecture			Semester: V
		L	T	P	
BTCS503PCT	Design & Analysis of Algorithms	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311PCT Course

Course Objectives:

1. Understand the concepts and skills of algorithm design, implemental some well-known algorithms and analyze the performance of algorithms
2. Define the complexity of algorithms, Reasoning about the correctness of the algorithm
3. Behaviours of algorithms and the notion of tractable and intractable problems.

Course Outcomes:

1. Analyze a given algorithm and express its time and space complexities in asymptotic notations.
2. Solve recurrence equations using Iteration Method, Recurrence Tree Method and Master's Theorem.
3. Design algorithms using Divide and Conquer Strategy.
4. Compare Dynamic Programming and Divide and Conquer Strategies.
5. Solve Optimization problems using Greedy strategy.
6. Design efficient algorithms using Back Tracking and Branch Bound Techniques for solving problems.
7. Classify computational problems into P, NP, NP-Hard and NP-Complete.
8. To understanding about writing algorithms and step by step approach in solving problems with the help of data structures.

Detailed Contents:	
Unit: 1	**Introduction:** Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- O notation, Omega notation, Theta notation **Divide and Conquer:** Structure of divide-and-conquer algorithms; Binary search; Merge Sort; Quick sort.
Unit: 2	**Greedy Method:** General method- Knapsack problem – job sequencing with deadlines– minimum-cost spanning trees: Prim's and Kruskal's algorithms – Single source shortest paths: Dijkstra's algorithm.
Unit: 3	**Dynamic Programming:** General method – Multistage Graphs – All pairs shortest paths, Single source shortest paths – optimal binary search trees – 0/1 Knapsack problem traveling sales person problem
Unit: 4	**Back Tracking:** General method – n-queen problem – sum of subsets problem – graph colouring – Hamiltonian cycles – Knapsack problem.
Unit: 5	**Branch and Bound:** Least Cost (LC) search, bounding – LC branch and bound – FIFO branch and bound – Travelling sales person problem, Computability classes – P, NP, NP-complete and NP-hard.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2	Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Pearson Education, 2007.
Reference Books:	
1	RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", Mc Graw Hill, 2005.
2	E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", Berman, Paul," Algorithms", Cengage Learning.
3	Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

Course Code	Course Title	Lecture			
BTCS511HST	Organisational Behaviour	L	T	P	Semester: V
Version:	Date of Approval: 13th BoS 16-08-2019	2	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	50
Periods/ Week	:	2	Internal Evaluation	:	15
Credits	:	2	End Semester	:	35
Instruction Mode	:	Lecture	Exam Duration	:	2 Hrs.

Prerequisite(s): No specific requisites

Course Objectives

1. To help the students to develop cognizance of the importance of human behaviour.
2. To enable students to describe how people behave under different conditions
3. To provide the students to analyse specific strategic human resources demands for future action.
4. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

Course Outcomes

1. Demonstrate the applicability of the concept of organizational behavior
2. Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
3. Analyze the complexities associated with management of the group behavior in the organization.
4. Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization..

Detailed Contents:	
Unit: 1	**Introduction:** Meaning, Fundamental concepts, Definition, Approaches to OB, Characteristics and limitations of OB, Challenges and Opportunities of OB, Models of OB.
Unit: 2	**Personality:** Definition, Features, Big five model, MBTI, Johari Window, Managerial Implications of Personality. Perceptions and Attributions: Definition, Features, factors affecting perception, Process. Attribution, perceptual and attribution errors, Managerial Implications of Perception.
Unit: 3	Learning: Definition, Features, Classical and operant conditioning, social learning theory, Behavioral modification. Attitude: Definition, Features, ABC model of Attitude, Managerial Implications of Attitude.
Unit: 4	**Motivation:** Concept, Definition, Features, Types of Motivation, Process, Managerial Implications of Motivation. Leadership: Concept, Definition, Leadership Styles, Transactional and Transformational Leadership, Leadership development.
Unit: 5	**Groups and Teams:** Definition, Features, Group development stages, Group vs. Teams, Managing and developing effective teams. Conflict Management: Definition, Features, Types of Conflict, Conflict Resolution Strategies, Relationship between Conflict and Performance. Organizational Culture: Elements and dimensions of organizational culture, Importance of organizational culture in shaping the behavior of people.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Robbins, S. P., & Judge, T. (2013). Organizational behavior (15th ed.). Boston: Pearson.
2	Newstrom J. W., & Davis, K. (2011). Human behavior at work (12th ed.). Tata McGraw Hill
3	Nelson, D , Quick, J.C., & Khandelwal, P., (2011). ORGB . Cengage Learning.
4	Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.
Reference Books:	
1	Pareek. U. (2010). Understanding Organizational Behavior (2nd ed.). Oxford University Press
2	Schermerhorn, J. R., Osborn, R.N., Hunt, M.U.J (2016). Organizational Behavior (12th ed.). Wiley

Course Code	Course Title	Lecture			Semester: V
BTCS512HST	History of Sciences & Technology in India	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	2	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	50
Periods/ Week	:	2	Internal Evaluation	:	15
Credits	:	2	End Semester	:	35
Instruction Mode	:	Lecture	Exam Duration	:	2 Hrs.

Prerequisite(s): It is expected that the students have basic knowledge of science

Course Objectives:

1. Know the origin and development of astronomy in ancient India;
2. Understand the origin and growth of mathematics in ancient India.
3. Identify the origin and development of copper, gold, Iron and other metal in ancient India;

Course Outcomes:

1. Recognize the development of Science Beginning and their achievement
2. Assess the growth of engineering in ancient India.
3. Find the significance of metallurgy in ancient India;

Detailed Contents:

Unit: 1	Science and Technology- The Beginning Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. Development of Geography: Geography in Ancient Indian Literature.
Unit: 2	Developments in Science and Technology in Medieval India Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas and karkhanas set up. Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine. Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc.
Unit: 3	Developments in Science and Technology in Colonial India Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company's Service.
Unit: 4	Indian Response to new Scientific Knowledge, Science and Technology in Modern India: Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites
Unit: 5	Prominent scientist of India since beginning and their achievement Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga & Patanjali. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha and Dr. Vikram Sarabhai.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	George G Joseph, Crest of the Peacock, Non-European roots of mathematics, Third edition, Princeton University Press, Princeton, NJ, 2011.
2	Agrawal, D.P., Ancient Metal Technology and Archaeology of South Asia (A Pan-Asian Perspective), Aryan Books International, New Delhi, 2000

Reference Books:

1	Cunningham , Alexander , The Ancient Geography o f India. Indological Book House, Varanasi, 1963.
2	Dey, N. L., The Geographical Dictionary o f Ancient and Medieval India. Luzac and Co., London, 1927.

Course Code	Course Title	Lecture			Semester: V
BTCS560PCP	Design & Analysis of Algorithms LAB	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students know any programming language and have done BTCS311PCT/BTCS503PCT Course

Course Objectives:

The course should enable the students to learn how to analyze a problem and design the solution for the problem:

1. To write programs to solve problems using divide and conquer strategy.
2. To write programs to solve problems using backtracking strategy.
3. To write programs to solve problems using greedy and dynamic programming techniques.

Course Outcomes:

After successful completion of course student shall be able to:

1. Implement various data structures (viz. Stacks, Queues, Linked Lists, Trees, Graphs) and algorithms like Greedy, Dynamic, Divide & Conquer etc.
2. Analyze step by step and develop algorithms to solve real world problems.
3. Use and implement appropriate algorithms for the required problems using a programming language

Detailed Contents:

1. Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2. Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3. Implement 0/1 Knapsack problem using Dynamic Programming.
4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
5. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
6. Find a subset of a given set S = {s_1, s_2,....., s_n} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1, 8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
7. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
8. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
9. Implement N Queen's problem using Back Tracking.
10. Implement the travelling salesperson problem (TSP) using dynamic programming.

Note: Students can implement more algorithms based on prescribed syllabus.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

	Text Books:
1	Data structures, Algorithms and Applications in java, 2nd Edition, S. Sahani, Universities Press.
2	Data structures and Algorithms in java, 3rd edition, A. Drozdek, Cengage Learning.
	Reference Books:
1	Data structures with Java, J. R. Hubbard, 2nd edition, Schaum's Outlines, TMH.
2	Data Structures using Java, D. S. Malik and P.S. Nair, Cengage Learning

Course Code	Course Title	Lecture			Semester: V
		L	T	P	
BTCS511NCT	Constitution of India	2	0	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	50
Periods/ Week	:	4	Internal Evaluation	:	15
Credits	:	-	End Semester	:	35
Instruction Mode	:	Lecture	Exam Duration	:	2 Hrs.

Prerequisite(s): No pre-requisite

Course Objectives:

1. Understand the salient features of the Indian Constitution
2. Learn different ways of acquiring Indian Citizenship & 4. List the Fundamental Rights and Fundamental Duties of Indian citizens
3. Describe the Directive Principles of State Policy and their significance

Course Outcomes:

1. Practice the moral values that ought to guide the Engineering profession.
2 Know the definitions of risk and safety also discover different factors that affect the perception of risk
3. Appreciate the Ethical issues and Know the code of ethics adopted in various professional body's and industries
4. Justify the need for protection of human rights and to know about concept of women empowerment

Detailed Contents:	
Unit: 1	Introduction: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy
Unit: 2	Union Government and its Administration: Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha
Unit: 3	State Government and its Administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions
Unit: 4	Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy
Unit: 5	Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Examination and Evaluation Pattern: It include both internal evaluation (15 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (35 marks) which is mainly end semester examination.

Text Books:	
1	'Indian Polity' by Laxmikanth
2	'Indian Administration' by Subhash Kashyap
Reference Books:	
1	'Indian Constitution' by D.D. Basu
2	'Indian Administration' by Avasti and Avasti

Course Code	Course Title	Lecture			Semester: VI
BTCS611PCT	Complier Design	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS512PCT Course

Course Objectives:

1. To understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis
3. Design top-down and bottom-up parsers
4. Identify synthesized and inherited attributes
5. Develop syntax directed translation schemes
6. Develop algorithms to generate code for a target machine

Course Outcomes:

1. For a given grammar specification develop the lexical analyser
2. For a given parser specification design top-down and bottom-up parsers
3. Develop syntax directed translation schemes
4. Develop algorithms to generate code for a target machine

Detailed Contents:

Unit: 1	**Introduction:** Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).
Unit: 2	**Syntax Analysis (Parser):** Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(0), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison).
Unit: 3	**Semantic Analysis:** Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree. Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.
Unit: 4	**Intermediate Code Generation:** Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.
Unit: 5	**Architecture dependent code improvement:** instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation **Advanced topics:** Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Principles of compiler design -A.V. Aho .J.D.Ullman; Pearson Education.
2	Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

Reference Books:

1	lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2	Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech. 3.
3	Engineering a Compiler-Cooper & Linda, Elsevier
4	Compiler Construction, Louden, Thomson.

Course Code	Course Title	Lecture			Semester: VI
BTCS612PCT	Computer Networks	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS403PCT Course

Course Objectives:

1. Understand the fundamental concepts of data communications and computer Networks s.
2. Identify the basic components/instrument/equipment and their respective roles in data communication system
3. To incorporate Networks skills in various capacities like Networks administrators, Networks designers and Networks consultants who are able to design, implement and maintain communication systems, computer Networks s and related technologies.

Course Outcomes:

1. Apply the different Networking sub-systems and their functions in a telecommunication system.
2. Implement and configure the different types of Networks topologies and protocols.
3. Demonstrate Understand the different protocols layers of the OSI model & TCP/IP

Detailed Contents:

Unit: 1	**Data Communication**: Components of a Data Communication System, Simplex, Half-Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms.
Unit: 2	**Computer Networks**: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet. **Network Models**: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques.
Unit: 3	**Functions of OSI and TCP/IP Layers**: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs.
Unit: 4	IPv4 Structure and Address Space; Classful and Classless Addressing; Datagram, Fragmentation and Checksum; IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.
Unit: 5	**World Wide Web (WWW):** Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP. **Network Security**: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Forouzen, "Data Communication and Networks ing", TMH
2. A.S. Tanenbaum, "Computer Networks s", 3rd Edition, Prentice Hall India, 1997.

Reference Books:

1. S. Keshav, "An Engineering Approach on Computer Networks ing", Addison Wesley, 1997
2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989

Course Code	Course Title	Lecture			Semester: VI
BTCS660PCP	Complier Design LAB	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST and BTCS611PCT Course

Course Objectives:

1. Identify tokens by lexical analysis
2. Design LL parsers
3. Design LR parsers
3. Identify synthesized and inherited attributes
4. Develop syntax directed translation schemes
5. Develop algorithms to generate code for a target machine

Course Outcomes:

1. For a given grammar specification develop the program for lexical analyser
2. For a given parser specification develop the program for top-down and bottom-up parsers
3. Develop program for syntax directed translation scheme
4. Develop algorithms to generate code for a target machine

Detailed Contents:

1. Simulation of a Finite state Automata to recognize the tokens of various control statements.
2. Simulation of a Finite state machine to distinguish among Integers, Real Numbers & Numbers with Exponents.
3. Program in LEX tool to recognize the tokens and to return the token found for a C like Language
4. Program to eliminate Left recursion and Left factoring
5. Program to find First and Follow sets
6. Program to design LL parser
7. Parsing of arithmetic and algebraic expressions and equations.
8. Use of YACC tool to parse the statements of C like Language
9. Program to generate Three Address Code
10. Program to design SLR parser for simple grammars

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Principles of compiler design -A.V. Aho .J.D.Ullman; Pearson Education.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

Reference Books:

1. lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech. 3.
3. Engineering a Compiler-Cooper & Linda, Elsevier
4. Compiler Construction, Louden, Thomson.

Course Code	Course Title	Lecture			Semester: VI
		L	T	P	
BTCS661PCP	Computer Networks LAB	0	0	4	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST and BTCS403PCT Course

Course Objectives:

1. To Understand the functionalities of various layers of OSI model
2. To understand the operating System functionalities

Course Outcomes:

1. Apply the encryption and decryption concepts in Linux environment
2. Ability to apply appropriate algorithm for the finding of shortest route.
3. Ability to configure the routing table

Detailed Contents:

1. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP .
3. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Take a 64 bit playing text and encrypt the same using DES algorithm.
7. Write a program to break the above DES coding
8. Using RSA algorithm encrypts a text data and Decrypt the same

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. Forouzen, "Data Communication and Networks ing", TMH
2. A.S. Tanenbaum, "Computer Networks s", 3rd Edition, Prentice Hall India, 1997.

Reference Books:

1. S. Keshav, "An Engineering Approach on Computer Networks ing", Addison Wesley, 1997
2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989

Course Code	Course Title	Lecture			Semester: VI
BTCS662PCP	Project-I	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	6	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	3	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST, BTCS413PCT Course

Course Objectives:

1. To understand Software requirement specification and designing methodology
2. Familiarization of the syntax, semantics, data-types and library functions of any programming languages
3. To apply ER Diagram, DFD, UML for designing the software application

Course Outcomes:

1. Applying SRS, techniques
2. Apply Design methods for given SRS
3. Write the codes as per SRS and designed Framework

Course Code	Course Title	Lecture			Semester: VII
BTCS760PCP	Project-II	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	12	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	200
Periods/ Week	:	4	Internal Evaluation	:	100
Credits	:	6	End Semester	:	100
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS662PCP course

Course Objectives:
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Course Outcomes:

Course Code	Course Title	Lecture			Semester: VIII
BTCS860PCP	Project-III	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	0	0	12	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	200
Periods/ Week	:	4	Internal Evaluation	:	100
Credits	:	6	End Semester	:	100
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS662PCP and BTCS760PCP Course

Course Objectives:
Course Outcomes:

LIST OF PROFESSIONAL ELECTIVES

Course Code	Course Title	Lecture			Semester: V
		L	T	P	
BTCS511PET	Principles of Programming Languages	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS211EST course

Course Objectives:

1. The aim is to study and appreciate different types of languages and the underlying mathematical theories. This may help to design and also to appreciate new language features.

Course Outcomes:

1. Ability to express syntax and semantics in formal notation.
2. Ability to apply suitable programming paradigm for the application.
3. Gain knowledge and comparison of the features programming languages.

Detailed Contents:

Unit: 1	**Introduction:** Overview of different programming paradigms e.g. imperative, object oriented, functional, logic and concurrent programming. **Syntax and semantics of programming languages:** A quick overview of syntax specification and semiformal semantic specification using attribute grammar.
Unit: 2	**Imperative and OO Languages:** Names, their scope, life and binding. Control-flow, control abstraction; in subprogram and exception handling. Primitive and constructed data types, data abstraction, inheritance, type checking and polymorphism.
Unit: 3	**Functional Languages:** Typed-calculus, higher order functions and types, evaluation strategies, type checking, implementation, case study. **Logic Programming Languages:** Computing with relation, first-order logic, SLD-resolution, unification, sequencing of control, negation, implementation, case study.
Unit: 4	**Concurrency:** Communication and synchronization, shared memory and message passing, safety and liveness properties, multithreaded program.
Unit: 5	**Formal Semantics:** Operational, denotational and axiomatic semantics of toy languages, languages with higher order constructs and types, recursive type, subtype, semantics of nondeterminism and concurrency.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Glynn Winskel, A Formal Semantics of Programming Languages: An Introduction, MIT Press.
2	Benjamin C. Pierce, Types and Programming Languages, MIT Press.
3	John C. Mitchell, Foundations for Programming Languages, MIT Press

Reference Books:

1	Daniel P. Friedman, Mitchell Wand and Christopher T. Haynes, Essentials of Programming Languages, Prentice Hall of India.
2	Ravi Sethi, Programming Languages: Concepts and Constructs, Addison-Wesley.
3	H. P. Barendregt, The Lambda Calculus: Its Syntax and Semantics, North-Holland.

Course Code	Course Title	Lecture			Semester: V
		L	T	P	
BTCS512PET	Parallel and Distributed Algorithms	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS503PCT course

Course Objectives:

1. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
2. To study the main classes of parallel algorithms.
3. To study the complexity and correctness models for parallel algorithms.

Course Outcomes:

Upon successful completion of this course, students will be able to:

2. Learn basic principles of parallel and distributed computing and with parallel and distributed algorithms and their time complexity.
3. Apply the Message Passing Techniques
4. Understand and explore the concepts of pipelining.
5. Apply the distributed shared memory techniques.

Detailed Contents:	
Unit: 1	Basic Technique, Need for parallel computers, Models of computation, Analyzing parallel algorithms, Expressing parallel algorithms, Parallel, Parallel & Cluster Computing
Unit: 2	Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples
Unit: 3	Pipelining- Techniques computing platform, pipeline programs examples
Unit: 4	Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelist sharing data parallel programming languages and constructs, open MP
Unit: 5	Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Nicola Santoro, "Design and Analysis of Distributed Algorithms", John Wiley.
2	Barry Wilkinson, Michael Allen, "Parallel Programming", Pearson education.
Reference Books:	
1	Joseph Jaja, An Introduction to Parallel Algorithms, Addison Wesley.
2	Selim G. Akl, "The Design and Analysis of Parallel Algorithms", PHI

Course Code	Course Title	Lecture			
		L	T	P	Semester: IV
BTCS513PET	Signals & Systems				
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311EST and BTCS312PCT course

Course Objectives:

1 To familiarize the students with basic concept of control systems.
2 To study the concepts and techniques of stability for linear and non-linear control systems.
3 To have a thorough knowledge of Z transform.

Course Outcomes:

1. To understand the basic concept of control systems.
2. To test the stability for linear and non-linear systems.
3. Design of linear control systems.
4. Application of the most powerful technique of state-space.

Detailed Contents:	
Unit: 1	Morphology of signals and their classifications. Even and odd functions, orthogonal function, definition of Step, impulse, ramp functions. Other non-sinusoidal signals and wave forms as the sum of standard functions. Fourier series representation of signals.
Unit: 2	Fourier Integral and Fourier transform and its properties. Parsevel's theorem. System representation using differential equations, transfer function, impulse response. Poles and zeros of a system
Unit: 3	Analysis of Linear Time Invariant (LTI) continuous-time system using Laplace Transform. Frequency response of LTI systems, zero input response, forced input response. Stability of LTI system, pole criteria for stability, Routh's stability test.
Unit: 4	Introduction to Z-transform, Inverse Z- transform and their properties, region of convergence. Poles and zeros. Difference equation, transfer function, pulse response. Applications of Z transform for the analysis of discrete-time LTI systems.
Unit: 5	Introduction to probability. Bay's theorem, concept of random variable, probability density and distribution function of a random variable. Introduction to random process. Power spectral density.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1 Simon Hykin, Barry Van Veen "Signals and System", John Wiley & Sons.
2 Robert A Gabel , "Signal and Linear Systems", John Wiley & Sons.

Reference Books:

1 Henary Stark and John W Woods, "Probability and Random Processes", Pearson Education, New Delhi.
2 Alan V. Oppenheim, "Signals and Systems", Prentice Hall, 2010

Course Code	Course Title	Lecture			Semester: VII
BTCS611PET	Data Mining and Data Ware Housing	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS402PCT course

Course Objectives:

1. Introduce data mining principles and techniques with data mining as a cutting edge business intelligence tool.
2. Develop critical thinking, problem solving and decision making skills wrt Data warehouse and data mining.
3. Describe various schema model and the Star Schema to design a Data Warehouse.

Course Outcomes:

1. Design a data warehouse or data mart to present information needed by the manager and can be utilized for managing clients.
2. Design and implement a quality data warehouse or data mart effectively and administer the data resources in such a way that it will truly meet management's requirements.
3. Evaluate standards and new technologies to determine their potential impact on your information resource for a large complex data warehouse/data mart.

Detailed Contents:

Unit: 1	**Introduction:** Fundamentals of Data Mining, Kinds of Patterns can be mined, Technologies Used, Applications and Issues in Data Mining.**Types of Data:** Attribute types, Basic Statistical descriptions of Data, Measuring data Similarity and Dissimilarity.**Data Preprocessing:** Need of Preprocessing, DataCleaning, Data Integration, Data Reduction, Data Transformation.
Unit: 2	**Data Warehouse and OLAP:** Data Warehouse, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-oriented induction
Unit: 3	**Mining Frequent Patterns, Associations and Correlations:** Market Basket Analysis, Association rule mining, Frequent Item set mining methods, Pattern Evaluation methods, Constraint based frequent pattern mining,Mining Multilevel and Multidimensional patterns
Unit: 4	**Classification :** General approach to classification, Classification by Decision Tree Induction , Bayes Classification methods, Bayesian Belief Networks, Classification by Backpropogation, Lazy Learners, Other Classification methods , Classification using Frequent patterns, Model Evaluation and selection
Unit: 5	**Cluster Analysis:** Basic Clustering methods, Partitioning methods, Density –Based Methods, Grid- based methods, and Evaluation of Clustering, Outlier Analysis and Detection methods.**Data Mining Trends and Research Frontiers:** Mining Complex Data Types, Data Mining Applications, Data Mining Trends

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Han J & Kamber M, "Data Mining: Concepts and Techniques", Harcourt India, Elsevier India, Second Edition.
2. Pang-NingTan. MichaelSteinback,VipinKumar, "Introduction to Data Mining", Pearson Education, 2008.

Reference Books:

1. Margaret H Dunham,S.Sridhar, "Data mining: Introductory and Advanced Topics", Pearson Education, 2008.
2. Humphires,hawkins,Dy, "Data Warehousing: Architecture and Implementation", Pearson Education, 2009.
3. Anahory, Murray, "Data Warehousing in the Real World", PearsonEçiucation, 2008.
4. Kargupta,Joshi,etc., "Data Mining: Next Generation Challenges and Future Directions" Prentice Hall of IndiaPvtLtd, 2007.

Course Code	Course Title	Lecture			Semester: VI
BTCS612PET	Python Programming	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	2	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	6	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done any programming language course

Course Objectives:

5. Learn the fundamentals of writing Python programming.
6. Learn core Python scripting elements such as variables and flow control structures.
7. Discover how to work with lists and sequence data.
8. Use Python to read and write files.
9. Work with the Python standard library.
10. Explore Python's object-oriented features.

Course Outcomes:

The Students will be able to :

4. Problem solving and programming capability.
5. Understanding of scripting and the contributions of scripting languages.
6. Understanding of Python especially the object-oriented concepts,
7. Understanding of the built-in objects of Python,
8. Be exposed to advanced applications such as TCP/IP network programming, multithreaded programming, Web applications, discrete-event simulations, etc.

Detailed Contents:

Unit: 1	**Introduction:** History, Features, Setting up path, Working with Python , Basic Syntax, Variable and Data Types, Operator, Input-Output, Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions, If, If- else, Nested if-else, Looping, For, While, Nested loops, Control Statements, Break, Continue, Pass
Unit: 2	**String Manipulation and Lists:** **Strings:** Accessing Strings, Basic Operations, String slices, Function and Methods **Lists:** Introduction, Accessing list, Operations, Working with lists, Function and Methods
Unit: 3	**Functions and modules:** Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables, Importing module, Math module, Random module, Packages, Composition **Exception Handling:** Exception, Exception Handling, Except clause, Try ? finally clause, User Defined Exceptions
Unit: 4	**OOPs concept:** Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding **Regular expressions:** Match function, Search function, Matching VS Searching, Modifiers, Patterns **Database:** Introduction, Connections, Executing queries, Transactions, Handling error
Unit: 5	**Networking:** Socket, Socket Module, Methods, Client and server, Internet modules **Multithreading:** Thread, Starting a thread, Threading module, Synchronizing threads, Multithreaded Priority Queue **GUI Programming:** Introduction, Tkinter programming, Tkinter widgets, Sending email

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Sheetal Taneja and Naveen Kumar, "Python Programming - A Modular Approach", Pearson education.
2. Cay S. Horstmann and Rance D. Necaise, "Python for Everyone", Wiley.

Reference Books:

1. Allen Downe, "Learning With Python", Wiley.
2. Jake VanderPlas, "Python Data Science Handbook", O'Reilly' Publisher

Course Code	Course Title	Lecture			Semester: VI
BTCS613PET	Advanced Computer Architecture	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS511PCT course

Course Objectives:

1. To study the computer design and performance metrics
2. To study pipelining, RISC and CISC
3. To study about Paralellism.

Course Outcomes:

1. To have a knowledge of Instruction and Thread level Paralellism
2. To have a knowledge of memory hierarchy.

Detailed Contents:	
Unit: 1	Fundamentals of Computer Design:Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, Classifying instruction set- MEmory addressing- type and size of operands, Operations in the instruction set.
Unit: 2	Pipelines: Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties. Memory Hierarchy Design: Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.
Unit: 3	Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation. ILP Software Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.
Unit: 4	Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism-Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.
Unit: 5	Inter Connection and Networks: Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	John L. Hennessy, David A. Patterson – Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.
2	John P. Shen and Miikko H. Lipasti – Modern Processor Design : Fundamentals of Super Scalar Processors
Reference Books:	
1	Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs., MC Graw Hill.
2	Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed.

Course Code	Course Title	Lecture			Semester: VI
BTCS614PET	Distributed Systems	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS402PCT, BTCS403PCT, BTCS612PCT courses

Course Objectives:

1. Familiarize the students with the basics of distributed computing systems.
2. To introduce the concepts of distributed file systems, shared memory and message passing systems, synchronization and resource management.
3. Study Inter–process Communication, API for the Internet Protocols, External Data Representation and Marshalling – Client –Server Communication – Group Communication – Case Study – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications – Java RMI – Case Study

Course Outcomes:

1. Verify and analyze the time complexity of the algorithms related to distributed computing.
2. Design and develop various algorithms for different environment like Amoeba, Hadoop, HDFS architecture, setting up the hadoop environment.
3. Understand Map-Reduce Architecture and Map reduce programming

Detailed Contents:

Unit: 1	**Basic Concepts** Characterization of Distributed Systems – Examples – Resource Sharing and the Web Challenges System Models – Architectural and Fundamental Models – Networks ing and InterNetworks ing Types of Networks s – Networks Principles – Internet Protocols – Case Studies.
Unit: 2	**PROCESSES AND DISTRIBUTED OBJECTS** Inter–process Communication – The API for the Internet Protocols – External Data Representation and Marshalling – Client –Server Communication – Group Communication – Case Study – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications – Java RMI – Case Study.
Unit: 3	**OPERATING SYSTEM ISSUES** The OS Layer – Protection – Processes and Threads – Communication and Invocation – OS Architecture – Security – Overview – Cryptographic Algorithms – Digital Signatures – Cryptography Pragmatics – Case Studies – Distributed File Systems – File Service Architecture – Sun Networks File System – The Andrew File System.
Unit: 4	**OPERATING SYSTEM ISSUES** Name Services – Domain Name System – Directory and Discovery Services – Global Name Service – X.500 Directory Service – Clocks – Events and Process States – Synchronizing Physical Clocks – Logical Time And Logical Clocks – Global States – Distributed Debugging – Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.
Unit: 5	**DISTRIBUTED TRANSACTION PROCESSING** Transactions – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering – Comparison – Flat and Nested Distributed Transactions – Atomic Commit Protocols – Concurrency Control in Distributed Transactions – Distributed Deadlocks – Transaction Recovery – Overview of Replication And Distributed Multimedia Systems.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", 3rd Edition, Pearson Education, 2002.
2	Andrew S. Tanenbaum, Maartenvan Steen, Distibuted Systems, "Principles and Pardigms", Pearson Education, 2002
3	John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

Reference Books:

1	Sape Mullender, "Distributed Systems", 2nd Edition, Addison Wesley, 1993.
2	Albert Fleishman, Distributes Systems, "Software Design and Implementation", Springer, Verlag, 1994.
3	M. L. Liu, "Distributed Computing Principles and Applications", Pearson Education, 2004

Course Code	Course Title	Lecture			Semester: VIII
BTCS615PET	Computer Graphics	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS311PCT and BTCS311BST courses

Course Objectives:

1. To provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
2. To understand computer graphics techniques (2-D/3-D), focusing on 3D modeling, image synthesis, and rendering.
3. Introduce geometric transformations, geometric algorithms, software systems, 3D object models (surface, volume and implicit), visible surface algorithms, image synthesis, shading and mapping, ray tracing, radiosity, global illumination, photon mapping, and anti-aliasing.

Course Outcomes:

1. Demonstrate geometrical transformations (2-D/3-D) with the relevant mathematics of computer graphics, e.g., 3D rotations using both vector algebra, geometrical transformations and projections using homogeneous co-ordinations system
2. Apply principles and techniques of computer graphics, e.g., the graphics pipeline, and Brenham algorithm for speedy line and circle generation.
3. Apply computer graphics concepts in the development of computer games, information visualization, and business applications.

Detailed Contents:

Unit: 1	Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices. **Output primitives**: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms
Unit: 2	**2-D geometrical transforms**: Translation, scaling, rotation, other transformations, matrix representations and homogeneous coordinates, transformations between coordinate systems. **2-D viewing**: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.
Unit: 3	**3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.
Unit: 4	**3-D Geometric transformations**: Translation, rotation, scaling, reflection and shear transformations, composite transformations. **3-D viewing:** Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.
Unit: 5	**Visible surface detection methods**: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods **Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, Pearson Education.
2. Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

Reference Books:

1. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer
2. Computer Graphics, Steven Harrington, TMH

Course Code	Course Title	Lecture			Semester: VI
		L	T	P	
BTCS616PET	Advanced Operating Systems	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS403PCT courses

Course Objectives:

1. Define, explain, and apply introductory operating systems concepts: process management, inter-process communication, memory management, I/O systems, file systems, and the like
2. Use the UNIX operating system interface to implement a user-level shell in the C language
3. Design and implement a correct concurrent program requiring synchronization

Course Outcomes:

1. Gain experience in implementing and debugging operating system components, including the kernel module, system call, synchronization primitives, and the file system

Detailed Contents:	
Unit: 1	**Introduction**: Functions of operating systems, Design approaches: layered, kernel based and virtual machine approach, types of advanced operating systems (NOS, DOS, Multiprocessor OS, Mobile OS, RTOS, Cloud OS) **Unix Kernel and File Management**: System Structure, User Perspective, Architecture of Unix Operating System, Buffer cache: Header, Buffer Pool, Retrieving, Reading and Writing Buffer. File Representation: inodes: Structure of file Directories, Path conversion to inode, superblock, inode assignment, allocation of disk blocks
Unit: 2	**Unix Process and Memory management**: Detailed design of Process Structure: Kernel Data structures for process, Structure of Uarea and Process table, Process states and Transitions. Context of a Process: Static and Dynamic area of context, Saving the Context Layout of System Memory, Regions, Mapping regions with Process, page table and mapping virtual address to physical address.
Unit: 3	**Distributed Operating system concepts**: Goals, Distributed Computing Models, Hardware Concepts, Software Concepts, Architecture of DOS. Design Issues: Transparency, Flexibility, Scalability, Reliability, Performance, fault tolerance
Unit: 4	**Multiprocessor Operating System**: Introduction, Basic multiprocessor system architectures, design issues, Threads, Process synchronization: the test and set instruction, the swap instruction, implementation of the process wait. Processor scheduling: Issues, Co-scheduling, Smart scheduling, Affinity Based scheduling
Unit: 5	**Real Time Operating Systems and Mobile OS**: Characteristics of Real Time operating Systems, Classification of Real Time Operating Systems, Scheduling in RTOS: Clock driven: cyclic, Event driven: EDF and rate monotonic scheduling. Mobile OS: Architecture, Android OS, iOS, Virtual OS, Cloud OS and their design issues
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Charles Crowley, "Operating Systems: A Design-Oriented Aproach", Tata McGraw Hill Education".
2	Stuart E. Madnick & John J. Donovan. Operating Systems. McGraw Hill
Reference Books:	
1	Harvey M Dietel, " An Introduction to Operating System", Pearson Education
2	D M Dhamdhere, "Operating Systems :A Concept basedAproach", McGraw Hill

Course Code	Course Title	Lecture			Semester: VI
BTCS617PET	Embedded Systems	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS312PCT courses

Course Objectives:

1. Study Embedded computing – characteristics of embedded computing applications – embedded system design challenges
2. Explain the process of Real time Embedded system – Selection of processor; Memory; database security, mechanism, policy and standards
3. Introduce RTOS- Inter Process communication, Interrupt driven Input and Output Non- maskable interrupt, Software interrupt; Thread – Single, Multithread concept; Multitasking Semaphores.

Course Outcomes:

1. Understand characteristics of embedded computing applications, embedded system design challenges
2. Demonstrate the process of Selection of processor; Memory; database security, mechanism, policy and standards
3. Understand the mechanism of Inter Process communication, Interrupt driven Input and Output Non- maskable interrupt, Software interrupt.

Detailed Contents:

Unit: 1	**Embedded System Organization** Embedded computing – characteristics of embedded computing applications – embedded system design challenges; Build process of Real time Embedded system – Selection of processor; Memory; I/O devices-Rs-485, MODEM, Bus Communication system using I^2C, CAN, USB buses, 8 bit –ISA, EISA bus.
Unit: 2	**Real-Time Operating System** Introduction to RTOS; RTOS- Inter Process communication, Interrupt driven Input and Output Non- maskable interrupt, Software interrupt; Thread – Single, Multithread concept; Multitasking Semaphores.
Unit: 3	**Interface with Communication Protocol** Design methodologies and tools – design flows – designing hardware and software Interface. system integration; SPI, High speed data acquisition and interface-SPI read/write protocol, RTC interfacing and programming.
Unit: 4	**Design of Software for Embedded Control** Software abstraction using Mealy-Moore FSM controller, Layered software development, Basic concepts of developing device driver – SCI – Software - interfacing & porting using standard C & C++ ; Functional and performance Debugging with benchmarking Real-time system software – basics of contemporary RTOS – VXWorks, UC/OS-II
Unit: 5	**Interfacing with Embedded Controller** Programmable interface with A/D & D/A interface; Digital voltmeter, control- Robot system; - PWM motor speed controller, serial communication interface. Standard single purpose processor's peripherals: timers, counters, watchdog timers, UART, LCD controllers, keypad controllers. **Applications:** Digital camera-washing machine-cell phones-home security systems-finger print identifiers-cruise control-printers Automated teller machine

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Steven F. Barrett, Daniel J. Pack, "Embedded Systems – Design and Applications with the 68HC 12 and HCS12", Pearson Education, 2008.
2. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill,2006.

Reference Books:

1. Daniel W. Lewis, "Fundamentals of Embedded Software", Prentice Hall India, 2004.
2. Jack R Smith "Programming the PIC microcontroller with MBasic" Elsevier, 2007.

Course Code	Course Title	Lecture			Semester: VII
		L	T	P	
BTCS711PET	Artificial Intelligence	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS411PCT course

Course Objectives:

1. Study and realize the intelligent human behaviors on a computer. The main topics in Artificial intelligence include: problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming, and machine learning.
2. Learn and possess a firm grounding in the existing techniques and component areas of Artificial Intelligence
3. Apply this knowledge to the development of Artificial Intelligent Systems and to the exploration of research problems.

Course Outcomes:

1. Understand the principles of problem solving and be able to apply them successfully.
2. Be familiar with techniques for computer-based representation and manipulation of complex information, knowledge, and uncertainty.
3. Gain awareness of several advanced AI applications and topics such as intelligent agents, planning and scheduling, machine learning, etc.

Detailed Contents:

Unit: 1	**Introduction**: Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.
Unit: 2	**Introduction to Search** : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.
Unit: 3	**Knowledge Representation** & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.
Unit: 4	**Machine Learning** : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning.
Unit: 5	**Pattern Recognition** : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill.

Reference Books:

1. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education.
2. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India.

Course Code	Course Title	Lecture			Semester: VII
BTCS712PET	Block Chain Technology	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS612PCT and BTCS411PCT courses

Course Objectives:

1. conceptual understanding of the function of Blockchains as a method of securing distributed ledgers
2. Understanding Cryptocurrency
3. Learn Ethereum framework.

Course Outcomes:

The Students will be able to :

4. Familiarise the functional/operational aspects of cryptocurrency ecosystem.
5. Understand emerging abstract models for Blockchain Technology.
6. Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency

Detailed Contents:	
Unit: 1	**Introduction to Blockchain:** Basics of Blockchain, Distributed Ledger Technology, Types of network, Components of Blockchain or DLT, Ledger: Blocks, Blockchain, PKI and Cryptography: Private Keys, Public Keys, Hashing Digital Signature, Digital Token, Cryptocurrency.
Unit: 2	**Consensus Problem** - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS)
Unit: 3	**Blockchain Working:** Block, Hash, Structure of Blockchain, Distributed, Lifecycle of Blockchain, Smart Contract, Consensus Algorithm, Fault Tolerance, Actors of Blockchain, Blockchain developer, Blockchain operator, Blockchain regulator, Blockchain user, Membership service provider, Building A Small Blockchain Application
Unit: 4	**Introduction to Bitcoin:** Bitcoin, Wallet, Blocks, Merkley Tree, hardness of mining, transaction verifiability, anonymity, forks, double spending, mathematical analysis of properties of Bitcoin.
Unit: 5	**Ethereum** - Ethereum network, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity - Smart Contracts, some attacks on smart contracts, Design and issue Cryptocurrency.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.
2. Arshdeep Bahga and Vijay Madisetti, "Blockchain Application: A Hnads-on Approach".

Reference Books:

1. Xiwei (Sherry) Xu, Ingo Weber and Mark Staples "Architecture for Blockchain Applications", Springer.
2. Andreas Antonopoulos, "Mastering Bitcoin", O'Reilly' Publisher.

Course Code	Course Title	Lecture			Semester: VII
		L	T	P	
BTCS713PET	Real Time System	3	1	0	
Version:	Date of Approval: 13th BoS 16-08-2019				

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS617PET courses

Course Objectives:

1. Develop an understanding of various Real Time systems Application
2. Obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems.
3. Get in-depth hands-on experience in designing and developing a real operational system.

Course Outcomes:

1. Understand concepts of Real-Time systems and modelling.
2. Recognise the characteristics of a real-time system.
3. Understand and develop document on an architectural design of a real-time system

Detailed Contents:	
Unit: 1	**Introduction**: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.
Unit: 2	**Real Time Scheduling**: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.
Unit: 3	**Resources Sharing**: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.
Unit: 4	**Real Time Communication**: Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.
Unit: 5	**Real Time Operating Systems and Databases:** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Real Time Systems by Jane W. S. Liu, Pearson Education Publication
2	
Reference Books:	
1	Mall Rajib, "Real Time Systems", Pearson Education
2	Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

Course Code	Course Title	Lecture			Semester: VII
BTCS714PET	Ad-Hoc and Sensor Network	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS612PCT course

Course Objectives:

1. Introduce Ad hoc wireless Internet, MAC protocols for Ad hoc Wireless Networks s Issues in Designing a MAC Protocol for Ad hoc Wireless Networks s
2. Understand the Basics of Wireless, Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications Data Retrieval in Sensor Networks s:
3. Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

Course Outcomes:

1. Understand adhoc wireless Internet, MAC protocols for Ad hoc Wireless Networks s Issues
2. Analyze Routing Protocol for Ad hoc Wireless Networks s, Classifications of Routing Protocols, Transport Layer for Ad Hoc Wireless Networks s
3. Demonstrate Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

Detailed Contents:

Unit: 1	**Ad Hoc Wireless Networks s:** Introduction, Issues in Ad hoc wireless Networks s, Ad hoc wireless Internet **MAC protocols for Ad hoc Wireless Networks s** Issues in Designing a MAC Protocol for Ad hoc Wireless Networks s, Design Goals for a MAC Protocol for Ad hoc Wireless Networks s, Classifications of the MAC Protocols, Other MAC Protocols.
Unit: 2	**Routing Protocols for Ad Hoc Wireless Networks s** Issues in Designing a Routing Protocol for Ad hoc Wireless Networks s, Classifications of Routing Protocols **Transport Layer for Ad Hoc Wireless Networks s** Issues in Designing a Transport layer protocol for Ad hoc Wireless Networks s, Design goal s of a Transport layer protocol for Ad hoc Wireless Networks s, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks.
Unit: 3	**Security protocols for Ad hoc Wireless Networks s** Security in Ad hoc Wireless Networks s, Networks Security Requirements, Issues and Challenges in Security Provisioning, Networks Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks.
Unit: 4	**Basics of Wireless, Sensors and Applications:** The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications **Data Retrieval in Sensor Networks s:** Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.
Unit: 5	**Sensor Networks Hardware:** Components of Sensor Mote, **Operating System in Sensors–** TinyOS, LA-TinyOS, SOS, RETOS **Imperative Language:** nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns-2 and its sensor Networks extension, TOSSIM.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Carlos de Morais Cordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks s : Theory and Applications", Second Edition, World Scientific Publishers, 2011.

Reference Books:

1	Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks s', A John Wiley & Sons Inc. Publication, 2007.
2	Prasant Mohapatra and Sriramamurtyhy, "Ad Hoc Networks s: Technologies and Protocols", Springer International Edition, 2009.

Course Code	Course Title	Lecture			Semester: VII
BTCS715PET	Internet-of-Things	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS711ET and BTCS714PET courses

Course Objectives:

1. To understand the concepts of Internet of Things and can able to build IoT applications
2. To understand the architecture and applications of IoT.
3. To study python for the implementation of IoT.

Course Outcomes:

1. Have knowledge of Internet of things, its architecture.
2. Have knowledge of Python and IoT tools.
3. Have knowledge of various interoperability challenges in IoT.

Detailed Contents:

Unit: 1	**Introduction to IoT:** Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs **IoT & M2M:** Machine to Machine, Difference between IoT and M2M, Software define Network
Unit: 2	**Network & Communication aspects:** Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination
Unit: 3	**Challenges in IoT:** Design challenges, Development challenges, Security challenges, Other challenges
Unit: 4	**Domain specific applications of IoT:** Home automation, Industry applications, Surveillance applications, Other IoT applications
Unit: 5	**Developing IoTs:** Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

Reference Books:

1. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013

Course Code	Course Title	Lecture			
		L	T	P	Semester: VII
BTCS716PET	Machine Learning	3	1	0	
Version:	Date of Approval: 13th BoS 16-08-2019				

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS611ET and BTCS711PET courses

Course Objectives:

1. To understand the basic building blocks and general principles that allow one to design machine learning algorithms
2. To become familiar with specific, widely used machine learning algorithms
3. To learn methodology and tools to apply machine learning algorithms to real data and evaluate their performance.

Course Outcomes:

1. Develop an appreciation for what is involved in learning from data.
2. How to apply a variety of learning algorithms to data.
3. How to perform evaluation of learning algorithms and model selection.

Detailed Contents:

Unit: 1	**Introduction:** Defining learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation, supervised learning, unsupervised learning, Reinforcement learning, learning algorithms.
Unit: 2	**Decision Tree Learning:** Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity, Overfitting, noisy data, and pruning.
Unit: 3	**Ensemble Learning:** Bagging, boosting, and Ada-Boost. Experimental Evaluation of Learning Algorithms, Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.
Unit: 4	**Rule Learning:** Translating decision trees into rules. Artificial Neural Networks: Neurons and biological motivation. Linear threshold units. **Perceptrons:** representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate. Overfitting, learning network structure, recurrent networks.
Unit: 5	**Support Vector Machines:** Maximum margin linear separators. Kernels for learning non-linear functions. **Bayesian Learning:** theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logisitic regression. Bayes nets and Markov nets for representing dependencies. **Instance-Based Learning:** Constructing explicit generalizations versus comparing to past specific examples. k-Nearest neighbour algorithm, Case-based learning.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Machine Learning – Tom M. Mitchell, - MGH
2	Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

Reference Books:

1	Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2	Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

Course Code	Course Title	Lecture			Semester: VIII
BTCS811PET	Image Processing	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS615PET course

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.

Course Outcomes:

1. Understand Basics of Image formation and transformation using sampling and quantization.
2. Understand different types signal processing techniques used for image sharpening and smoothing.
3. Perform and apply compression and coding techniques used for image data.

Detailed Contents:	
Unit: 1	**Introduction to Image Processing:** Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception.Digital Image-sampling and quantization serial & parallel Image processing.
Unit: 2	**Signal Processing:** 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
Unit: 3	**Image Restoration:** 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.
Unit: 4	**Segmentation Techniques:** 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.
Unit: 5	**Shape Analysis:** 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.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

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

Reference Books:

1. Rosenfeld and Kak, "Digital Picture Processing" vol.I&vol.II, Academic,1982
2. Ballard and Brown, "Computer Vision", Prentice Hall, 1982

Course Code	Course Title	Lecture			
BTCS812PET	Data Analytics	L	T	P	Semester: VIII
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS201BST and BTCS611PET courses

Course Objectives:

1.The main goal of this course is to help students learn, understand, and practice data analytics approaches,
2.Conceptualization and summarization of data
3. Data computing technologies

Course Outcomes:

1. Explain the importance of data and data analysis
2. Interpret the probabilistic models for data
3. Illustrate hypothesis, uncertainty principle
4. Demonstrate the regression analysis

Detailed Contents:	
Unit: 1	**Introduction to Data Analytics and Decision Making**: Introduction, Overview of the Book, The Methods, The Software, Modeling and Models, Graphical Models, Algebraic Models, Spreadsheet Models, Seven-Step Modeling Process. **Describing the Distribution of a Single Variable**: Introduction,Basic Concepts, Populations and Samples, Data Sets,Variables,and Observations, Types of Data, Descriptive Measures for Categorical Variables, Descriptive Measures for Numerical Variables, Numerical Summary Measures, Numerical Summary Measures with StatTools, Charts for Numerical Variables, Time Series Data, Outliers and Missing Values,Outliers,Missing Values, Excel Tables for Filtering,Sorting,and Summarizing.**Finding Relationships among Variables**: Introduction, Relationships among Categorical Variables, Relationships among Categorical Variables and a Numerical Variable.
Unit: 2	**Probability and Probability Distributions**:Introduction,Probability Essentials, Rule of Complements, Addition Rule, Conditional Probability and the Multiplication Rule, Probabilistic Independence, Equally Likely Events, Subjective Versus Objective Probabilities, Probability Distribution of a Single Random Variable, Summary Measures of a Probability Distribution, Conditional Mean and Variance, Introduction to Simulation Normal Random Distribution.
Unit: 3	**Decision Making under Uncertainty**: Introduction,Elements of Decision Analysis, Payoff Tables, Possible Decision Criteria, Expected Monetary Value(EMY),Sensitivity Analysis, Decision Trees, Risk Profiles, The Precision Tree Add-In,Bayes' Rule, Multistage Decision Problems and the Value of Information, The Value of Information, Risk Aversion and Expected Utility,utility Functions, Exponential Utility, Certainty Equivalents, Is Expected Utility maximization Used?
Unit: 4	**inHypothesis Testing using R programming**:Introduction,Concepts in Hypothesis Testing, Null and Alternative Hypothesis, One-Tailed Versus Two-Tailed Tests, Types of Errors, Significance Level and Rejection Region, Significance from p-values, Type II Errors and Power, Hypothesis Tests and Confidence Intervals, Practical versus Statistical Significance, Hypothesis Tests for a Population Mean,
Unit: 5	**Regression Analysis**: Estimating Relationships: Introduction, Scatterplots : Graphing Relationships, Linear versus Nonlinear Relationships,Outliers,Unequal Variance, No Relationship,Correlations:Indications of Linear Relationships, Simple Linear Regression, Least Squares Estimation, Standard Error of Estimate, The Percentage of Variation Explained:R-Square,Multiple Regression, Interpretation of Regression Coefficients, Interpretation of Standard Error of Estimate and R-Square, Modeling Possibilities, Dummy Variables, Interaction Variables, Nonlinear Transformations, Validation of the Fit., Statistical Inference:Introduction, Assumptions,Nonconstant Error Variance,Nonnormality of Residuals,Autocorrelated Residuals ,Prediction.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2	Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012
Reference Books:	
1	Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons,2014
2	Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012

Course Code	Course Title	Lecture			Semester: VIII
		L	T	P	
BTCS813PET	Neural Networks and Deep Learning	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS711PET/BTCS716PET courses

Course Objectives:

1. Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

Course Outcomes:

1. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
2. Implement deep learning algorithms and solve real-world problems.

Detailed Contents:	
Unit: 1	Introduction: Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.
Unit: 2	Feedforward neural network: Artificial Neural Network, activation function, multi-layer neural network. Training Neural Network: Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.
Unit: 3	Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy. Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.
Unit: 4	Probabilistic Neural Network: Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Autoencoders.
Unit: 5	Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing. Deep Learning Tools: Caffe, Theano, Torch.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

Reference Books:

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013

Course Code	Course Title	Lecture			Semester: VIII
		L	T	P	
BTCS814PET	Cloud Computing	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	1	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS612PCT/BTCS614PET courses

Course Objectives:

1. Study cloud computing fundamentals, issues and challenges of cloud computing, Evolution of Cloud Computing , Applications cloud computing, Business models around Cloud, Cloud Computing simulation toolkit such as Eucalyptus - Nimbus - Open Nebula, CloudSim.
2. Study the characteriscs of cloud computing services and models, role of Virtualization, Grids and cluster
3. Explain Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Course Outcomes:

1. Apply any one Cloud Computing simulation toolkit such as Eucalyptus - Nimbus - Open Nebula, CloudSim for coud services
2. Understand cloud computing services and models and role of Virtualization, Grids and cluster
3. Understand Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance and Risk Management

Detailed Contents:

Unit: 1	**Cloud Computing Fundamentals:** Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , Applications cloud computing, Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.
Unit: 2	**Cloud Services and File System** Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service- Monitoring as a Service – Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to MapReduce, GFS, HDFS, Hadoop Framework
Unit: 3	**Collaborating With Cloud** Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing ,Databases Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks s – Collaborating via Blogs and Wikis.
Unit: 4	**Virtualization** Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation. **Hardware and Infrastructure** Clients, Security, Networks , Services. Accessing the Cloud – Platforms, Web Applications, Web APIs, Web Browsers. Cloud Storage – Overview, Cloud Storage Providers, Standards – Application, Client, Infrastructure, Service.
Unit: 5	**Security in the Cloud** Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009. Kumar Saurabh, "Cloud Computing – insights into New -Era Infrastructure", Wiley India,2011.
2. Cloud Computing "A Practical Approach" Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill.

Reference Books:

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.

Course Code	Course Title	Lecture			Semester: VIII
BTCS815PET	Human Computer Interaction	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS615PET/BTCS811PET courses

Course Objectives:

1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for individuals and persons with disabilities
3. Learn the guidelines for user interface

Course Outcomes:

1. Design effective dialog for HCI.
2. Design effective HCI for individuals and persons with disabilities.
3. Assess the importance of user feedback.

Detailed Contents:	
Unit: 1	FOUNDATIONS OF HCI The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.
Unit: 2	DESIGN & SOFTWARE PROCESS Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.
Unit: 3	MODELS AND THEORIES Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.
Unit: 4	MOBILE HCI Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
Unit: 5	WEB INTERFACE DESIGN Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004
2	
Reference Books:	
1	Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009.
2	Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009

Course Code	Course Title	Lecture			Semester: VIII
BTCS816PET	Web and Internet Technology	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS412PCT course

Course Objectives:

1. To provide you the conceptual and technological developments in the field of Internet and web designing with the emphasis on comprehensive knowledge of Internet and its applications.
2. To put emphasis on basic concepts of web design.

Course Outcomes:

1. Demonstrate the ability to create web pages using HTML, DHTML, Java Scripts, and XML.
2. Review the current topics in Web & Internet technologies.

Detailed Contents:

Unit: 1	**Introduction to Internet:** Internet, Internet history of the World Wide Web and ARPANET, Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet. **Internet Network:** Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security.
Unit: 2	**Network Components:**Client, Server, Communication Media, Types of network: Peer-Peer, Clients-Server **Addressing in Internet:** DNS, Domain Name and their organization, understanding the Internet Protocol Address. Network topologies: Bus, star and ring, Ethernet, FDDI, ATM and Intranet. **Services & Current Trends on Internet:** Services- E-mail, WWW, Telnet, HTTP, FTP, IRC and Search Engine, Current Trends- Languages, Internet Phone, Internet Video, collaborative computing, e-commerce.
Unit: 3	**Web Publishing and Browsing:** Overview, Web hosting, HTML. Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles. **HTML Programming Basics:** HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia. **Style Sheets:** Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS.
Unit: 4	**Interactivity Tools:** ASP, VB Script, JAVA Script, JAVA and Front Page, Flash **Javascript:** Client side scripting, What is Javascript, How to develop Javascript, Simple Javascript, Variables, Functions, Control Statements, Arrays.
Unit: 5	**PHP:** Starting to script on server side, Arrays, function and forms, advance PHP Databases : Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", 2006, Pearson Education.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, 2007, Pearson Education.

Reference Books:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, 2006, Pearson Education.
2. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, 2001, Pearson Education.

Course Code	Course Title	Lecture			Semester: VIII
BTCS817PET	Cryptography and Network Security	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS612PCT and BTCS311BST courses

Course Objectives:

1. Discuss the fundamentals of computer Networks security concepts and security challenges
2. Understand the classical and modern cryptographic techniques, modular arithmatic, key concepts, Fiestal cipher structure, symmetric and asymmetric key cryptography, factors affecting computer Networks security deployment.
3. Describe emerging technology in the net-centric security areas and assess their current capabilities, limitations and potential applications.

Course Outcomes:

1. Examine and analyze the difference between stenography and cryptographic techniques, various public and private key algorithms like RSA, Digital signature, protocols like transport-layer concepts: Transport-Layer services -Reliable vs. un-reliable data transfer -TCP protocol
2. Examine and analyze Networks security issues like confidentiality, integrity, availability, authentication and authorization, DoS
3. Examine and analyze different Networks security protocol, Virus, Worms, Trozen Hoarse, Intrusion detection system , Firewall, Private virtual Networks

Detailed Contents:

Unit: 1	Introduction to the Concepts of Security: The need for security, Security Approaches, Principles of Security, Types of Attacks. Cryptographic Techniques: Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.
Unit: 2	Modular arithmetic, prime numbers, relative prime numbers, Euler's function, GCD. Computer-based Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes, An overview of Symmetric Key Cryptography, DES, International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis.
Unit: 3	Computer-based Asymmetric Key Cryptography: Brief History of Asymmetric Key Cryptography, An overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography, Digital Signatures.
Unit: 4	Public Key Infrastructure: Digital Certificates, Private Key Management, The PKI Model, Public Key Cryptography Standards, PKI and Security. Internet Security Protocols: Basic Concepts, Secure Socket Layer, SHTTP, Time Stamping Protocol, Secure Electronic Transaction, SSL versus SET, 3-D Secure Protocol, Electronic Money, E-mail Security.
Unit: 5	Understanding Session Hijacking, Spoofing vs Hijacking, Steps in Session Hijacking, Types of Session Hijacking, and TCP Concepts Sequence numbers. ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing. Wireless 802.11 Networks security standards, Sniffing Traffic, Wireless DOS attacks, DDoS, WLAN Scanners, WLAN Sniffers, Securing Wireless Networks.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Cryptography and Networks Security by Behrouz A. Forouzan, 2nd Edition TMH.
2. Cryptography and Networks Security, W. Stallings, Prentice Hall, 5th Edition, 20102.

Reference Books:

1. Networks Security Essentials, William Stallings, Prentice Hall, 5th Edition, 2013.
2. Firewalls and Internet Security, William R. Cheswick and Steven M. Bellovin, Addison-Wesley Professional, 2ndEdition, 2003.

Course Code	Course Title	Lecture			Semester: VII
		L	T	P	
BTCS818PET	Soft Computing	3	1	0	
Version:	Date of Approval: 13th BoS 16-08-2019				

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS411PCT course

Course Objectives:

1. Familiarize with soft computing techniques and basic concepts.
2. Provide the basic concepts of different methods and tools for processing of uncertainty in intelligent systems, such as, fuzzy models, neural Networks s, probabilistic models, and foundations of its using in real systems.
3. Introduce and use the idea of Neural Networks s, fuzzy logic and use of heuristics based on human experience.

Course Outcomes:

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Recognize the feasibility of applying a soft computing methodology for a particular problem
3. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems, genetic algorithms to combinatorial optimization problems and neural Networks s to pattern classification and regression problems

Detailed Contents:

Unit: 1	Introduction to Soft Computing, Concept of computing systems, "Soft" compiting versus "Hard" Computing, Characteristics of Soft computing, Some applications of Soft computing techniques
Unit: 2	Fuzzy logic: Introduction to Fuzzy logic.,Fuzzy sets and membership functions., Operations on Fuzzy sets., Fuzzy relations, rules, propositions, implications and inferences., Defuzzification techniques. Fuzzy logic controller design., Some applications of Fuzzy logic.
Unit: 3	Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to proablistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc., Solving single-objective optimization problems using GAs.
Unit: 4	Multi-objective Optimization Problem Solving: Concept of multi-objective optimization problems (MOOPs) and issues of solving them., Multi-Objective Evolutionary Algorithm (MOEA).,Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.
Unit: 5	Artificila Neural Networks: Biological neurons and its working., Simulation of biolgical neurons to problem soloving., Different ANNs architectures., Trainging techniques for ANNs., Applications of ANNs to solve some real life problems.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Fuzzy Logic: A Pratical approach, F. Martin, , Mc neill, and Ellen Thro, AP Professional, 2000.
2. Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, MIT Press, 1998.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000.

Reference Books:

1. Fuzzy Logic with Engineering Applications (3rd Edn.), Timothy J. Ross, Willey, 2010.
2. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.

Course Code	Course Title	Lecture			Semester: VII
		L	T	P	
BTCS819PET	Speech and Natural Language Processing	3	1	0	
Version:	**Date of Approval: 13th BoS 16-08-2019**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): It is expected that the students have done BTCS611PCT/BTCS512PCT courses

Course Objectives:

1. To learn about basic NLP problems, tasks and methods
2. To master basic programming tools for NLP

Course Outcomes:

1. Programming skills: implementing a simple NLP systems
2. Analytical skills: define a NLP problem and find a suitable solution to it
3. Presenting skills: demonstrating your own program solution.

Detailed Contents:

Unit: 1	OVERVIEW AND MORPHOLOGY Introduction – Models -and Algorithms - -Regular Expressions Basic Regular Expression Patterns – Finite State Automata. Morphology - Inflectional Morphology - Derivational Morphology. Finite-State Morphological Parsing --Porter Stemmer
Unit: 2	WORD LEVEL AND SYNTACTIC ANALYSIS N-grams Models of Syntax - Counting Words - Unsmoothed N-grams Smoothing- Backoff DeletedInterpolation – Entropy - English Word Classes - Tagsets for English Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging
Unit: 3	CONTEXT FREE GRAMMARS Context Free Grammars for English Syntax- ContextFree Rules and Trees. Sentence- Level Constructions– Agreement – Sub Categorization. Parsing – Top-down – Earley Parsing - feature Structures – ProbabilisticContext-Free Grammars
Unit: 4	SEMANTIC ANALYSIS Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus. Representing Linguistically Relevant Concepts -SyntaxDriven Semantic Analysis - Semantic Attachments -SyntaxDriven Analyzer. Robust Analysis - Lexemes and Their Senses - Internal Struct ure - Word SenseDisambiguation -Information Retrieval
Unit: 5	LANGUAGE GENERATION AND DISCOURSE ANALYSIS Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence. Dialog and Conversational Agents - Dialog Acts – Interpret ation -Conversational Agents. Language Generation – Architecture - Surface Realizations - Discourse Planning Machine Translation -Transfer Metaphor–Interlingua – Statistical Approaches

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008
2	

Reference Books:

1	C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA:,1999
2	C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA:,1999

Course Code	Course Title	Lecture			Semester: VI
		L	T	P	
UGCS611GET	Soft Skill and Interpersonal Communication	3	1	0	
Version:	**Date of Approval:**				

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No specific pre-requisites

Course Objectives:

1. To help the students in building interpersonal skills.
2. To develop skill to communicate clearly.
3. To enhance team building and time management skills.
4. To learn active listening and responding skills.

Course Outcomes:

1. Make use of techniques for self-awareness and self-development.
2. Apply the conceptual understanding of communication into everyday practice.
3. Understand the importance of teamwork and group discussions skills.
4. Develop time management and stress management

Detailed Contents:	
Unit: 1	**Fundamentals of Communication:** The Importance of Communication; The Basic Forms of Communication; The Process of Communication; Barriers to Communication; Dealing with Communication Barriers. **Nonverbal Communication:** Characteristics of Nonverbal Communication; Components of Nonverbal Communication.
Unit: 2	**Listening:** Importance of Listening; Barriers to Effective Listening; Approaches to Listening; How to be a Better Listener; What Speakers can do to Ensure Better Listening. **Interpersonal Skills:** Building Positive Relationships; Giving Praise; Dealing with Criticism; Managing Conflict.
Unit: 3	**Negotiations:** Approaches to Negotiation; The Major Elements of Negotiation Preparation; The Situation. **Interviewing:** Interview and Types of Business Interviews; Planning an Interview; Conducting an Interview; The Ethics of Interviewing
Unit: 4	**Interpersonal Skills:** Building Positive Relationships; Giving Praise; Dealing with Criticism; Managing Conflict. **Negotiations:** Approaches to Negotiation; The Major Elements of Negotiation Preparation; The Situation.
Unit: 5	**Interviewing:** Interview and Types of Business Interviews; Planning an Interview; Conducting an Interview; The Ethics of Interviewing. Ethics in engineering practice and research, Introduction to ethical reasoning & Engineering.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Sanjay Kumar and Pushpa Lata, "Communication Skills", Oxford University Press.
2	Krishna Mohan, Meera Banerji, "Developing Communication Skill", McMillan India Ltd.
Reference Books:	
1	Simon Sweeney, "English for Business Communication", Cambridge University Press.
2	Caroline & Whitbeck, "Ethics in Engineering Practice and Research", Cambridge University Press.

Course Code	Course Title	Lecture			Semester: VI
UGCS612GET	Human Resource Development and Organizational Behaviour	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	3	Internal Evaluation	:	30
Credits	:	3	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No specific pre-requisites

Course Objectives:

1. The course shall be conducted in an interactive manner since students learn best by active participation.
2. Lecture and discussion method will be followed to familiarize students with the theories, concepts, techniques, etc.
3. The instructor would also employ tools like case discussions, exercises, games, psychometric testing, etc. to aid students' understanding of theoretical concepts.
4. Collaborative learning would be emphasized in the form of group exercises, group projects, role-plays, etc.

Course Outcomes:

1. Group Project and Presentations: An important component is group project and presentations. Students will be able to select a development organization of their choice, undertake a study, and analyse OB concepts.
2. Techniques (like motivation, communication, team working, leadership, organizational culture etc.) as well as HR practices and policies (like recruitment, selection, training, development, performance measurement, compensation practices etc.) relevant to the presentations on the group project undertaken which prepare them for interviews.

Detailed Contents:

Unit: 1	Introduction to the course What is Organizational Behaviour (OB) and Human Resource Management (HRM) Difference between corporates and development organizations OB and HRM and Sustainable development OB and HRM: contribution and linkages with sustainability Importance of OB and HRM for sustainable development practitioners
Unit: 2	Knowing and Managing Yourself Individual Behaviour: MARS model of individual behaviour Values: Values across cultures (Hofstede's framework); Personality: Big five model; MBTI; Use of personality tests; Personality attributes influencing OB Emotions: Understanding emotions; Emotional labour; Emotional Intelligence Attitudes: Attitudes v/s values; Job Satisfaction; Organizational Commitment Perception: Factors influencing perception; 3 3 Perceptual errors; Self-fulfilling prophecy; Know yourself: Johari window
Unit: 3	Motivation in the workplace What is motivation; Early theories of motivation; Contemporary theories of motivation; Designing motivating jobs: JCM model; motivation of social workers. Work Teams v/s groups; Why teams; A model of Team effectiveness: Context, Composition, Work design, Process; Virtual teams; Turning individuals into team players
Unit: 4	Communication What is communication; Organizational communication: Formal networks and Grapevine; Electronic communications; Barriers to effective communication; non- verbal communication; Improving Interpersonal communication: Empathy and Active listening
Unit: 5	Job Analysis Job description; Job Specification; Job Evaluation 2 1 8 Recruitment, Selection, Orientation Sources of recruitment: Internal and external; Steps in selection process; Socialization and Induction; NGO recruitment

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	McShane, S.L. and Von Glinow, M.A., Organizational Behaviour, New Delhi, Tata McGrawHill Publishing company ltd.
2	P. Jyothi, P. and Venkatesh, D.N., Human Resource Management, New Delhi, Oxford University Press

Reference Books:

1	Denhardt, R.B., Denhardt, J.V., and Aristigueta, M.P. (2009), Managing Human Behaviour in Public and Non-Profit Organizations, Second edition. California, Sage Publications.
2	Pynes, J.E. (2004). Human Resources Management for Public and Nonprofit Organizations, Second Edition. San Francisco, CA: Jossey- Bass Publishers.

Course Code	Course Title	Lecture			Semester: VI
BTCS613GET	Cyber Law and Cyber Security	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	3	Internal Evaluation	:	30
Credits	:	3	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No specific pre-requisites

Course Objectives:

1. The paper aims to create the basic clarity and understanding of cyberlaws and cyber security laws to the professionals learning the ethical hacking programme.
2. The paper would address and emphasise on the activities leading to infringement of individual or organisational privacy.

Course Outcomes:

Awareness of cyber laws, ethics , responsible for handling the cyber security issues pertaining to varied domains and dealing in forensics diligently.

Detailed Contents:	
Unit: 1	**Introduction:** Cyber law, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, Issues of jurisdiction in cyberspace, Types of jurisdiction, The Test evolved - Minimum Contacts Theory - Sliding Scale Theory - Effects Test and International targeting, Jurisdiction under IT Act, 2000.
Unit: 2	**Cyber Crimes& Legal Framework** Cyber Crimes against Individuals, Institution and State , Hacking , Digital Forgery ,Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud , Cyber Terrorism .,Cyber Defamation ,Right to Privacy and Data Protection on Internet - Concept of privacy. Threat to privacy on internet - Self-regulation approach to privacy - Ingredients to decide confidentiality of information - Breach of sensitive personal information and confidentiality under IT Act and penalties for the same. - Right of Interception under IT Act. , Different offences under IT Act, 2000.
Unit: 3	**Overview of Cyber Security, Internet Governance** – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.
Unit: 4	**Cyber Security Vulnerabilities and Cyber Security Safeguards:** vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.
Unit: 5	**Securing Web Application, Services and Servers:** Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Intrusion Detection and Prevention, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Karnika Seth, Computers, Internet and New Technology Laws, Lexis NexisButterworthsWadhwa Nagpur.
2	Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
Reference Books:	
1	JonthanRosenoer, *Cyber Law*, Springer, New York, (1997).
2	SudhirNaib, The Information Technology Act, 2005: A Handbook, OUP, New York, (2011)
3	S. R. Bhansali, *Information Technology Act, 2000*, University Book House Pvt. Ltd., Jaipur (2003).

Course Code	Course Title	Lecture			Semester: VII
UGCS711GET	Intellectual Property Rights	L	T	P	
Version:	Date of Approval: 13th BoS 16-08-2019	3	0	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	3	Internal Evaluation	:	30
Credits	:	3	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No specific pre-requisites/ awareness of Cyber Law and Cyber Security is desireable

Course Objectives:

1. The course is designed to introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. The course introduces all aspects of the IPR Acts. It also includes case studies to demonstrate the application of the legal concepts in Science, Engineering, Technology and Creative Design.

Course Outcomes:

1. Students will learn the basic concepts of Intellectual property, laws to the students for first time and familiarize them with the kind of rights, remedies.
2. Students get familiarize about licensing regime associated with each kind of intellectual property so that students can have a basic understanding of Intellectual Property laws.

Detailed Contents:	
Unit: 1	OVERVIEW OF INTELLECTUAL PROPERTY introduction and the need for intellectual property right (IPR) IPR in India – Genesis and Development IPR in abroad Some important examples of IPR 5 PATENTS: Meaning,Criteria for obtaining patents Novelty Inventive step. Utility Non patentable inventions. Procedure for registration , Term of patent , Rights of patentee. Basic concept of Compulsory license and Government use of patent Infringement of patents and remedies in case of infringement
Unit: 2	COPYRIGHT: What is copyright, Copyright Act; What is covered by copyright? How long does copyright last? Why protect copyright? RELATED RIGHTS What are related rights? Distinction between related rights and copyright? Rights covered by copyright? TRADEMARKS: What is a trademark? Rights of trademark? What kind of signs can be used as trademarks? types of trademark function does a trademark perform How is a trademark protected? How is a trademark registered? How long is a registered trademark protected for ? How extensive is trademark protection? What are well-known marks and how are they protected? Domain name and how does it relate to trademarks?
Unit: 3	GEOGRAPHICAL INDICATIONS: What is a geographical indication? How is a geographical indication protected? Why protect geographical indications? INDUSTRIAL DESIGNS:What is an industrial design? How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?
Unit: 4	ENFORCEMENT OF INTELLECTUAL PROPERTY RIGHTS Infringement of intellectual property rights Enforcement Measures EMERGING ISSUES
Unit: 5	INTELLECTUAL PROPERTY Overview of Biotechnology and Intellectual Property, Biotechnology Research and Intellectual Property Rights Management Licensing and Enforcing Intellectual Property
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	T. M Murray and M.J. Mehlman,Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons 2000
2	Lionel Bently & Brad Sherman, Intellectual Property Law, Oxford. P. Narayanan, Intellectual Property Law, Eastern Law House
Reference Books:	
1	Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2	Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.