Department of
COMPUTER SCIENCE & ENGINEERING

4 Years B.Tech Degree Programme

REGULATION & SYLLABUS 2018

Choice Based Credit System
Outcome Based Assessment

SEMESTER-I & II

AUTONOMOUS
Accredited by NBA
Accredited by NAAC with 'A' Grade (3.28 out of 4.00 CGPA)

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Affiliated to UGC New Delhi & Biju Patnaik University of Technology, Odisha
GUNUPUR – 765022, Odisha, India

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To render best platform for adequate training and opportunities to work as teams on projects with effective communication skills and leadership qualities and understand professional ethics, social awareness and organizational context in which their engineering skills are utilized.

PEO2: To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.

PEO3: To extend an ability to analyze the need of the society by providing innovative solutions, leading to their personal cum professional growth as an entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: To provide students an understanding of the expectations of industry and practical competence with a broad range of programming language and open source platforms through value added courses.

PSO 2: The ability to analyze and develop computer programs in the areas related to artificial intelligence, big data analytics and cyber security for efficient design of computer-based systems of varying complexity.

PROGRAMME OUTCOMES (POs)

PO-1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3. Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO- 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO- 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO- 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO- 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO- 9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

COURSE STRUCTURE

I SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	BS	BBSBS1010	Engineering Mathematics-I	3	1	0	4
2	BS	BBSBS1021	Engineering Physics	3	0	0	3
		BBSBS1022	Engineering Chemistry				
3	ES	BBSES1031	Basics of Mechanics	3	0	0	3
		BBSES1032	Basics of Thermodynamics				
4	ES	BBSES1041	Basics of Electronics	3	0	0	3
		BBSES1042	Basics of Electrical Engineering				
5	ES	BBSES1050	Programming for Problem Solving	3	0	0	3
6	HS	BBSHS1060	Communicative English-I	2	0	0	2
PRACTICAL / SESSIONAL							
7	BS	BBSBS1121	Engineering Physics Laboratory	0	0	2	1
		BBSBS1122	Engineering Chemistry Laboratory				
8	ES	BBSES1141	Basics of Electronics Laboratory	0	0	2	1
		BBSES1142	Basics of Electrical Engineering Laboratory				
9	ES	BBSES1150	Programming for Problem Solving Laboratory	0	0	2	1
10	HS	BBSHS1160	Communicative English-I Laboratory	0	0	2	1
11	ES	BBSES1171	Engineering Drawing	0	0	2	1
		BBSES1172	Engineering Workshop				
12	MC	BBSHS1180	NSS	-	-	-	0
TOTAL				**17**	**1**	**10**	**23**

ANNEXURE-I

R-18

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, GUNUPUR

(AUTONOMOUS)

DEPARTMENT OF BASIC SCIENCE &HUMANITIES

(ENGINEERING CHEMISTRY)

L	T	P	C	QP
3	0	-	3	

BBSBS1022

COMMON TO ALL BRANCHES (AEI/BT/CHEM/CIVIL/CSE/ECE/EE/EEE/IT/MECH)

UNIT-1 (12 Hours)

ATOMIC AND MOLECULAR STRUCTURE

Schrodinger's wave equation(no derivation), Significance of wave functions, Particle in a box, Application for conjugated molecule, Molecular Orbital theory and Energy level diagramfor Diatomic molecules,

Spectroscopic techniques and applications: Electronics spectroscopy, Vibrational and rotational spectroscopy of diatomic molecules.

UNIT-2(12 Hours)

WATER CHEMISTRY

Types of Hardness, Determination of Hardness by EDTA method, Treatment of water for Domestic use, Water softening processes Lime-soda process, Ion Exchange method, Boiler feed water, Scale and Sludge, Caustic embrittlement, Carbonate and phosphate conditioning, Colloidal conditioning, Calgon conditioning,

.

UNIT-3 (12 Hours)

CORROSION

Thermodynamic functions: Entropy, Freeenergy, Relation between E.M.F and free energy,The Nernst's equation and application,

Definition of corrosion, Types of corrosion: Dry corrosion and wet corrosion, Galvanic corrosion, Concentration cell corrosion, Factors influencing corrosion, Corrosion control: Cathodic protection (Sacrificial anodic protection and Impressed current cathodic protection), Inhibitors, Protective coatings: Galvanization and Tinning.

UNIT -4 (12 Hours)

POLYMER CHEMISTRY

Introduction, polymer, Classification of polymers, Plastics: Thermosetting and thermo plastic, PVC, PE,PS,PMMA, PTFE, Bakelite,Nylon-6,6,Nylon-6, Fiber reinforced plastic.

*ADD-ON COURSES: Conducting Polymer (Polyaniline, Polyacetylene), Bio-Degradable and Non-Bio Degradable polymer, Nano composite.

Text Books: 1.Engineering chemistry by Jain & Jain, DhanpatRai publishing company (p) Ltd.

Reference books:

1.A Text Book of Engineering Chemistry by S.S.Dara,S Chand Publishers.

2. A Text Book of Engineering Chemistry by SashiChawla,DhanpatRai Publishing house.

3. Text Book of Engineering Chemistry, 2nd edition, by R.Gopalan,D.Venkapaya&SulochanaNagarajan, Vikas Publishing House Pvt.Ltd.

4. B. Tech Chemistry- I and II by P. K. Kar, S. Dash, B. Mishra kalyani publishers.

5. Physical Chemistry By P.W Atkins

6. Engineering Chemistry(NPTEL Web Book) by B . L Tembe, Kamaluddin and M.S. Krishna

7. Fundamentals of Molecular spectroscopy By C . N Banwell

8. University chemistry by B.H. Mahan

ANNEXURE-I

R-18

L	T	P	C	QP
-		2	1	

ENGINEERING CHEMISTRY LAB

BBSBS1122

COMMON TO BRANCHES (AEI/BT/CHEM/CIVIL/CSE/ECE/EE/EEE/IT/MECH)

LAB EXPERIMENTS

1. Determination of amount of OH^- and CO_3^{2-} present in supplied water sample.
2. Determination of total hardness of water.
3. Standardization of $KMnO_4$ using sodium oxalate.
4. Determination of ferrous ion in Mohr's salt by standardized $KMnO_4$.
5. Determination of percentage of dissolved oxygen in given water sample.
6. Estimation of available chlorine in bleaching powder/ chloride content.
7. Determination of rate constant of acid catalyzed hydrolysis of ester.
8. Preparation of drug (aspirin).
9. Adsorption of acetic acid by charcoal.
10. Acid value of oil.
11. Determination of strength of HCl and CH_3COOH acid from the mixture of acids using NaOH by Conductrometry.
12. Determination moisture and ash content of coal.
13. Determination of partition coefficient of iodine in benzene and water.
14. Preparation and determination of pH of buffer solution.
15. Determinationof viscosity of supplied sample.

ANNEXURE-I

L	T	P	C	QP
2	-	-	2	

COMMUNICATIVE ENGLISH AND SOFT SKILLS

BBSHS1060

B. TECH. FIRST SEMESTER SYLLABUS

COMMON TO ALL BRANCHES (AEI/BT/CHEM/CIVIL/CSE/ECE/EE/EEE/IT/MECH)

COURSE OBJECTIVES:

1. To develop the communication skills and soft skills of the students
2. To enhance the ability of the students to develop employability and entrepreneurial skills
3. To enable students to develop intrapersonal and interpersonal communication skills
4. To enable students to participate in group discussions without stage dear
5. To make students understand corporate communication

COURSE OUTCOMES:

The students will be able to:

1. Understand the importance of effective communication for personal and professional development.
2. Inculcate a positive attitude towards people, organization, and life.
3. Understand conversation in English by native speakers of English and interact appropriately.
4. Appreciate the use of ICT for professional communication
5. Understand the nature and scope of corporate communication and map their needs.
6. Use correct vocabulary and grammar for effective communication in English.
7. Imbibe soft skills that will help them in becoming a good time manager, team player, leader, entrepreneur, etc.

COMMUNICATIVE ENGLISH AND SOFT SKILLS

UNIT -1 Importance of English for Communication in the 21st Century (9 hours)

1.1 Role of English in enhancing employability and entrepreneurial skills (1)

1.2 The Nature and Scope of Communication (1)

1. 3 Objectives of Communication: Information, advice, suggestion, order, motivation, persuasion, warning, negotiation, decision-making, etc. through English Language skills, i.e., LSRW skills (1 + 1)

1.4 The process of communication and factors that influence communication: Sender, receiver, channel, code, topic, message, context, feedback, noise, filters and barriers (steps such as Ideation, Encoding, Transmission, Decoding, etc. need to be dealt with); Audience and purpose (1 + 1+ 1)

1.5 Types of Communication: General and Professional Communication; Formal and Informal Communication; Verbal and Non-verbal communication; Intrapersonal and Interpersonal communication; Written communication and Spoken communication. (1 + 1)

UNIT -2. English Vocabulary, Grammar & Usage (8 hours)

2.1 Synonyms and Antonyms 1
2.2 Words often confused 1
2.3 Technical terms and one word substitutes 1
2.4 Idioms and Phrasal Verbs 1
2.5 Identify common errors in English. 1+1
2.6 Communicative use of the Passive Voice 1
2.7 Difference between American, British and Indian English (Vocabulary based) 1

UNIT- 3. Introduction to Corporate Communication **(10 hours)**

3.1 Seven C's communication 1

3.2. Ten C's of Non-communication. 1

3.3 Corporate Communication – Direction of Communication: Downward Communication, Upward Communication, Horizontal/Lateral Communication, Diagonal Communication 1 + 1

3.4 Communication challenges in today's work place: Advances in technology; culturally diverse workforce; Team-based organizational Settings; how to overcome these challenges 1 + 1

3.5 Information and Communication Technology (ICT) and the corporate world, Power point presentation using multimedia; Internet and Intranet; Fax; Teleconferencing; Videoconferencing; 1+1

3.6 Corporate/Business etiquette: Good listening skills, proper dressing and grooming; proper handshake, mobile etiquette, table manners 1 + 1

UNIT- 4 Soft skills Development. (9 hrs)

4. 1 Importance of soft skills in personal and professional life 1

4.2 Are we hardwired for success? 1

4.3 Importance of developing a positive attitude 1+1

4.4 Leadership skills. 1+1

4.5 Teamsmanship. 1

4.6. Lateral thinking 1

4.7 Emotional Intelligence. 1

Text Books

1. An Introduction to Professional English and Soft Skills by B. K. Das et al., Cambridge University Press.
2. Communicative English for Engineers and Professionals by Nitin Bhatnagar and Mamta Bhatnagar. Published by DK/Pearson.
3. Practical English Usage. Michael Swan, OUP,1995.

Reference Books:

1. Form and Finesse, Business Communication and Soft skills by Shruti Das, Published by Orient Black Swan.
2. Technical Communication , Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
3. Business Communication Today by Bovee, Courtland L., Thill, John V. Prentice Hall.
4. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh. Pearson.
5. Oxford Guide to English Grammar by John Easthood. Oxford University Press.
6. 365 Ways to Change Your World by Norman Vincent Peale by Orient Paperbacks.

COMMUNICATIVE ENGLISH AND SOFT SKILLS LAB

L	T	P	C	QP
-		2	1	

BBSHS1160

COMMON TO ALL BRANCHES (AEI/BT/CHEM/CIVIL/CSE/ECE/EE/EEE/IT/MECH)

COURSE OBJECTIVES:

1. To develop the vocabulary and usage skills of students by practice.
2. To develop the communication skills of the students, especially the Listening and Speaking skills.
3. To enable students to participate in group discussions through proper listening and speaking.
4. To enable students eliminate grammatical mistakes in speech and writing.

COURSE OUTCOMES:

The students will be able to:

1. Build up a good range of vocabulary and know proper usage.
2. Become active listeners with good comprehension, participation, and evaluation.
3. Develop conversational and public speaking competencies.
4. Use grammar for effective speaking in GD and other formats of speaking.
5. Eliminate stage fear and disfluencies.

COMMUNICATIVE ENGLISH AND SOFT SKILLS LAB

Phonetics & Listening Skills 16 hours = 8 classes [2 listening tests x 10 marks = 20 marks]

Vowels, diphthongs, consonants, consonant clusters; The International Phonetic Alphabet (IPA); phonemic transcription; Problem sounds; Syllable division and word stress; Sentence rhythm and weak forms; Contrastive stress in sentences to highlight different words; Intonation: falling, rising, and falling-rising tunes; Listening to Newspaper reading/Video, etc.

Listening with a focus on pronunciation (ear-training): segmental sounds, stress, weak forms, intonation & Listening for comprehension. Reading of English daily newspapers and self-development books be integrated listening and speaking activities.

Speaking skills 16 hours = 8 classes [4 speaking tests x 10 = 40 marks]

- Topics for 1 minute, 2 minutes, and 5 minutes speaking
- Pictures, Quotations, Attitude-testing Questions may be used.
- Summarizing/responding to handouts, articles, books, magazines and newspapers.
- Individual/Group presentations/discussion on given topics

Soft skills development 14 hours = 7 classes [4 assignments x 10 = 40 marks]

- Positive thinking (Teachers to engage game/activity-oriented classes)

Text/Reference Books:

1. Form and Finesse, Business Communication and Soft skills by Shruti Das, Published by Orient Black Swan.
2. Business and Corporate Soft skills developed by Rai Tech. University (PDF available)
3. *Spoken English* (with CD). Sasikumar V and P V Dhamija. New Delhi: Tata McGraw-Hill Education Pvt. Ltd. (2nd Ed.)

COMMUNICATIVE ENGLISH
&
TECHNICAL COMMUNICATION

L	T	P	C	QP
2		-	2	

BBSHS2060

B. TECH. SECOND SEMESTER SYLLABUS

COMMON TO ALL BRANCHES (AEI/BT/CHEM/CIVIL/CSE/ECE/EE/EEE/IT/MECH)

COURSE OBJECTIVES:

1. To develop the communication skills and soft skills of the students
2. To enhance the ability of the students to develop employability and entrepreneurial skills
3. To enable students to successfully participate in GDs and PIs
4. To make students communicate effectively using technologies and techniques
5. To inculcate a sense of professionalism in students

COURSE OUTCOMES:

The students will be able to:

1. Understand the importance of technology in communication
2. Develop career conscious leading to preparation for career.
3. Inculcate a positive attitude towards people, organization, and life.
4. Understand the nature and scope of corporate communication and try to be industry-ready.
6. Learn practical application of concepts and tools of communication
7. Prepare professional documents for career needs (e.g. Job application letter, résumé) and professional needs (e.g., Memo and E-mail writing)

COMMUNICATIVE ENGLISH
&
TECHNICAL COMMUNICATION

UNIT 1 Introduction to Technical Communication 7 hours

1.1 Essence of Technical Communication 1

1.2 Nature and Scope of Technical Communication: 1 +1 +1

Technical Communication -- Interactive and Adaptable; Technical Communication -- Reader Centered; Technical Communication and teamwork; Technical Communication Has Ethical, Legal, and Political Dimensions; Technical Communication – its International and Cross-Cultural nature; Technical communication and use of ICT.

1.3 Need of Technical communication for career development 1

1.4 Computer Assisted Language Learning (CALL) – Self learning through use of technology, Effectiveness of CALL for developing English Language Skills; Use of Internet 1 +1

UNIT 2 Career Communication 17 hours

2.1. Career making: Setting Goals, SWOT analysis 1

2.3 Preparing a Résumé: Elements of a Résumé; Types of Résumés: Chronological Résumé, Functional Résumé; Use of job portals 1 +1 +1

2.4 Effective Job Application Letter/Cover letter 1 +1

2.5 Group Discussion 1 +1

2.6 Job Interview 1 +1 +1+1 +1

2.7 Effective Oral Presentation 1+1

2.7 Handling a Meeting 1+1

UNIT 3 Technical Approach to Reading 8 Hours

3.1 Know your Reading speed; Advantages of speed reading 1

3.2 SQ4R Techniques of Reading 1+1

3.3. Techniques of Rapid reading: skimming, scanning 1+1

3.4 Understanding coherence and cohesion 1

3.5 Note taking, Mind maps 1+1

UNIT 4 Technical Writing 14 hours

4.1 Writing a technical paper 1+1

4.2 Writing business letters – significance, purpose, structure and elements, layout; types of business letters 1+1+1+1

4.3 Memos 1+1

4.4 Business Reports and Technical proposals 1+1+1+1

4.5 Using the Social media for better communication 1+1

Text Books:

1. Form and Finesse, Business Communication and Soft skills by Shruti Das, Published by Orient Black Swan.

2. Business Communication Today by Bovee, Courtland L., Thill, John V. Prentice Hall.

3. Technical Communication Today by Richard Johnson-Sheehan. Edition 5. Pearson.

4. *Communicative English for Engineers and Professionals* by Nitin Bhatnagar and Mamta Bhatnagar. Published by DK/Pearson.

Reference Books

1. Basic Communication Skills for Technology by Andre J. Rutherford, Pearson Education Asia, Patparganj, New Delhi.

2. Business Communication by Varinder Kumar and Bodh Raj. Kalyani Publishers.

3. A Textbook of English Phonetics for Indian Students by T. Balasubramanian

4. Technical Communication , Principle and Practice by Meenakshi Raman &Sangeeta Sharma, Oxford University Press

5. How to Read better and Faster by Norman Lewis. 4th Edition. Publisher: Crowell.

COMMUNICATIVE ENGLISH
&
TECHNICAL COMMUNICATION LAB

L	T	P	C	QP
-	-	2	1	

BBSHS2160

COMMON TO ALL BRANCHES (AEI/BT/CHEM/CIVIL/CSE/ECE/EE/EEE/IT/MECH)

COURSE OBJECTIVES:

1. To enable students to successfully participate in GDs and PIs.
4. To make students communicate effectively by classroom practice.
5. To inculcate a sense of professionalism in students

COURSE OUTCOMES:

The students will be able to:

1. Prepare professional documents for career needs (e.g. Job application letter, résumé) and professional needs (e.g., Memo and E-mail writing)
2. Effectively participate in GD and PI.
3. Emerge as an effective presenter/public speaker
4. Understand the practical needs at workplace (e.g., organize a meeting)

COMMUNICATIVE ENGLISH
&
TECHNICAL COMMUNICATION LAB

1. Writing an Effective Job Application Letter/Cover letter 4 hours
2. Writing a winning resume and posting in job portals 4 hours
3. Group Discussion 8 hours
4. Job Interview 8 hours
5. Oral presentation 6 hours
6. Organizing a Meeting 4 hours
7. Note making and Note taking 4 hours
8. Memo writing 2 hours
9. Profiling a company 4 hours
10. Summarizing books/research paper/news report 2 hours

Text/Reference Books:

The same books as prescribed in Theory.

ANNEXURE-I

L	T	P	C	QP
3	-	-	3	

TENTATIVE SYLLABUS FOR ENGINEERING PHYSICS R-18

BBSBS1021

COMMON TO ALL BRANCHES: (CSE, IT, EE, EEE, ECE, AEI, BT, CHEM, CIVIL, MECH)

This one semester Engineering Physics course comprises the following four units.
The main objective of the modules is to provide the students about the elementary features and the basic concepts of Physics and its applications to different physical systems.

UNIT: 01 (12 Hours)

Interaction of Wave and Matter

Simple Harmonic Oscillator, Damped harmonic oscillator and Forced harmonic oscillator, and coupled oscillator, Waves and its Characteristics, Superposition of Waves, Interference by division of wavefront (Bi-prism experiment) and division of amplitude (Newton's Ring experiment). Introduction to Diffraction, types of diffraction.

LASER, spontaneous & stimulated emission, Einstein's relation, Ruby Laser and He-Ne Laser, Semiconductor laser, application of Laser. Optical fiber, Acceptance angle, Numerical aperture, Skip distance, Step index and Graded index fibers, Attenuations in optical fibers, applications of optical fiber in communication systems.

UNIT: 02 (12 Hours)

Physics of Materials

Introductions to materials, Crystallography, Crystal structure, crystal direction and plane, Miller indices, Inter planar spacings, Reciprocal Lattice and its characteristics, Reciprocal Lattice of SC, FCC and BCC, Brillouin Zone, Bragg's law.

Energy bands in solids (conduction band, valence band and Fermi level), Classification of materials on the basis of band theory.

Magnetic properties of Materials & their applications.

Nano materials and applications (particulates, thin films, nano structures, etc.)

UNIT: 03 (10 Hour)

Electromagnetic theory and wave

Review of grad, divergence and curl , Gauss divergence theorem and Stoke's theorem (no derivations), fundamental laws of electrostatics, magneto-statics and electromagnetism, displacement current and conduction current, Maxwell's equations.

Electromagnetic wave and its characteristics, electromagnetic wave equation for free space and in charge free conducting medium , electromagnetic energy, Poynting vector and Poynting theorem.

UNIT: 04 (12 Hours)

Quantum Mechanics

Introduction to dual nature: Black body radiation, photoelectric effect, Compton effect (qualitative idea only), de-Broglie's hypothesis, Heisenberg's uncertainty principle and its application to non-existence of electron inside the nucleus and ground state energy of one dimensional harmonic oscillator, Basic postulates of Quantum Mechanics, Wave function and its characteristics, probability density , normalization, eigen values, eigen functions and expectation values, Schrödinger's equation (time dependent and time independent). Application of Schrödinger equation to one dimensional potential well, potential step and potential barrier (qualitative ideas).

Text Books:

1. Engineering Physics by D. K. Bhattacharya and Poonam Tanden, Oxford University Press.

2. Engineering Physics, H K Malik and A K Singh, Tata McGraw Hill, MGH.

Reference Books:

1. Materials Science & Engg., V. Raghvan, Prentice Hall of India.

2. Concepts of Modern Physics, A. Beiser, S. Mahajan, S.R. Choudhary, Tata McGraw Hill.

3. Lasers & Optical engineering, P Dass, Narosa Publishers, Springer Publisher.

4. Engineering Physics by B. B. Swain and P. K. Jena, Kitab Mahal,Cuttack

5. Quantum Mechanics by SatyaPrakash, Kitab Mohal, etc. Kedar Nath Ram Nath Publisher.

L	T	P	C	QP
-	-	2	1	

Engineering Physics Laboratory R-18

BBSBS1121

COMMON TO ALL BRANCHES: (CSE, IT, EE, EEE, ECE, AEI, BT, CHEM, CIVIL, MECH)

1. Study of frequency of an electric tuning fork by meld's experiment.
2. Study of the acceleration due to gravity by using Bar/Kater's pendulum.
3. Study of the law of transverse vibration by using sonometer.
4. Study of wavelength of light by Newton's Rings apparatus.
5. Study of wavelength of light by Fresenel's bi-prism/Michelson inter ferometer.
6. Study of grating element of a plane diffraction grating.
7. Study of double slit interface due to He-Ne laser.
8. Study of monochromaticity and divergence of the given laser beam
9. Study of reflection and total internal reflection by optical fibers
10. Study of Hall-coefficient of a semiconductor
11. Study of dielectric constant of given solid by Leacher wire method.
12. Study of the resistivity of a semiconductor with temperature by four- probe method.
13. Study of band gap energy of PN junction (Ge/Si) diode.
14. Study of plank's constant using photo-voltaic cell.
15. Study of B-H curve of ferromagnetic substance.
16. Study of magnetic susceptibility of solods.

ANNEXURE-I

R-18

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, GUNUPUR

(AUTONOMOUS)

DEPARTMENT OF BSH

ENGINEERING MATHEMATICS-I

BBSBS1010

COMMON TO ALL BRANCHES: (CSE, IT, EE, EEE, ECE, AEI, BT, CHEM, CIVIL, MECH)

L	T	P	C	QP
3	1	0	4	

UNIT-I (13 Hours)

MULTI-VARIABLE CALCULUS

Partial differentiation, Euler's theorem, Total derivative, Taylor's theorem for function of two variable (without proof), Maxima and Minima for function of two variables, Differentiation under integral sign (Leibnitz rule).

UNIT- II (12 Hours)

DIFFERENTIAL EQUATIONS-I

Ordinary differential Equations : First order and first degree differential equations and their method of solving, Application to Electrical circuits and heat conduction.

DIFFERENTIAL EQUATIONS-II

Linear differential equations of higher order and their different methods of solutions (operator methods). Second order linear differential equations and their solutions: Euler Cauchy equation, solution by undermined coefficient method and variation of parameters. Simple application to electrical circuits.

UNIT -III (10 Hours)

Fourier series, Fourier expansion of functions of arbitarary period, Even and odd functions, Half Range Expansion.

UNIT -IV (15 Hours)

LINEAR ALGEBRA:

Matrices, Types of matrices, Rank of matrix, Eigen values and Eigen vectors, Cayley – Hamilton theorem (without proof), system of linear equations, Orthogonal matrices, Complex matrices, Hermitian and skew-Hermitian matrices, Unitary matrices, similarity of matrices. Quadratic forms and Canonical forms.

Prescribed Books:

1. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Willey
2. Differential Calculus by Santi Narayan and Mittal, S.Chand Publications

Reference:-

1. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
2. Higher Engineering Mathematics by B.V.Ramana, McGraw Hills Education
3. Advanced Engineer methods by N. P. Bali & Manish Goyal.

ANNEXURE-I

R-18

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, GUNUPUR

(AUTONOMOUS)

DEPARTMENT OF BSH

ENGINEERING MATHEMATICS-II

BBSBS2010

COMMON TO ALL BRANCHES: (CSE, IT, EE, EEE, ECE, AEI, BT, CHEM, CIVIL, MECH)

L	T	P	C	QP
3	1	0	4	

UNIT - I (07 Hours)

INTRODUCTION OF PARTIAL DIFFERENTIAL EQUATIONS:

Formation of Partial differential equations ,Linear partial differential equation of first order:Lagrange's linear differential equation, Non-Linear partial differential equation of first order by Charpit's method.

UNIT-II(20 Hours)

Laplace Transforms: Definition, existence of Laplace Transforms, Properties of Laplace Transforms, Evaluation of integrals by Laplace Transforms, Inverse transforms, convolution theorem, transforms of unit step function, unit impulse function, periodic function. Simple application to ordinary differential equations by Laplace Transform method, Definition of Fourier Integral and Fourier transform

UNIT - III (10 Hours)

Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc Length, gradient, divergence, curl and their simple application.

UNIT - IV (13 Hours)

Definition and evaluation of double integration and triple integration.

Vector integral calculus: Evaluation of line integral, Surface integral and volume integral and their applications, Transforamtions theorems- Green's Theorem in plane , Stoke's Theorem,Gauss Divergence Theorem and their applications.

Prescribed Books

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10th Edition

References:

1. Higher Engineering Mathematics by B. V. Ramana , Mc Graw Hill Education.
2. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
3. Advanced Engineering mathematics by H. K. Dass.

Basic Electrical Engineering
Course category: Electrical Sciences

Unit – I : ***DC Circuits*** ***(8 hours)***

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 - II: ***AC Circuits*** ***(8 hours)***

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 – III: ***Transformers*** ***(6 hours)***

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit – IV: ***Electrical Machines*** ***(8 hours)***

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 – V: ***Power Converters*** ***(6 hours)***

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Unit – VI: ***Electrical Installations*** ***(6 hours)***

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.

Text Books &Reference 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.*
3. *L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.*
4. *E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.*
5. *V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.*

Basic Electrical Engineering Laboratory
Course category: Electrical Sciences

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. 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).

3. 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).

5. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

6. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).

7. Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

8. Demonstration of cut-out sections of machines: DC machine (commutator- brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.

9. Torque Speed Characteristic of separately excited dc motor.

10. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections.

11. Torque-Slip Characteristic of an induction motor.

12. Generator operation of an induction machine driven at super synchronous speed.

13. Synchronous Machine operating as a generator: stand-alone operation with a load Control of voltage through field excitation.

14. 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.

Course Code	Course Title	L	T	P	C	QP
BBSES1050	**Programming for Problem Solving**	**3**	**0**	**0**	**3**	

Pre -Requisite:

Course Educational Objective

CEO1: To formulate algorithm, translate into program and then execute the programs for verifying its correctness.

CEO2: To analyze a problem for knowing its efficiency and decompose it into functions using divide and conquer approach.

Course Outcome

CO1	To formulate simple algorithms for arithmetic and logical problems and translate into programs.
CO2	To develop programs, understand and analyze its complexity.
CO3	To understand and develop programs using functions and recursions
CO4	To develop programs using pointers and structures and understand their functionality.

UNIT- I **(11 Hours)**

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo-code with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Arithmetic expressions and precedence. Conditional Branching. Writing and evaluation of conditionals and consequent branching.

UNIT- II **(11 Hours)**

Loops: writing programs and evaluation of loops

while, do-while and for loop, break, continue, nested loop

Arrays: Arrays (1-D, 2-D)

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT- III **(11 Hours)**

Character arrays and Strings: String handling operations, programs on strings, string handling functions.

Functions: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference.

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series

UNIT- IV **(11 Hours)**

Pointers: Idea of pointers, Defining pointers, dynamic memory allocation, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Structure: Structures, Defining structures and Array of Structures.

Teaching Methods: Chalk& Board/ PPT

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

References:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Code	Course Title	L	T	P	C	QP
BBSES1150	**Programming for Problem Solving Laboratory**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To develop programs for problems on different applications of array, functions, pointers and structure.

CEO2: To analyze different problems by comparing and implementing in programming.

Course Outcome

CO1	To understand operating system and its simple commands, writing programs, compilation, debug and execution process.
CO2	To develop programs using loop controls, arrays and understand the complexity using different programs.
CO3	To develop programs using functions and recursive function by decomposing a problem and analyze them.
CO4	To understand numerical problems, develop programs using pointers , structures and understand their functionality.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
1) Introduction to OS: Before starting experiments explain the facilities and operations of OS.
2) Introduction to the C compiler, Compilation and Execution Process & writing simple programs.

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
1) WAP to input radius of a circle and Find the area, perimeter of it.
2) WAP to input two numbers and swap them without using intermediate variable.
3) Write a program to accept Fahrenheit and calculate its equivalent Celsius.

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
1) Write a program to input principle amount, no. of terms and rate of interest. Find simple interest.
2) WAP to input three unequal numbers and find the greatest using conditional operator.
3) Write a program to input a float value and display its integer part & fractional part separately.

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
1) Write a program to find the real roots of a quadratic equation when three co-efficient values are given.
2) Write a program to input a lower case alphabet and test whether it is vowel or consonant.
3) Write a program to find the greatest among three numbers.

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
1) Write a program to generate Fibonacci series of N numbers.
2) Write a program to find the greatest common divider of two positive numbers given.
3) Write a program to accept a positive integer and test it for palindrome or not.
4) Write a program to calculate the following sum:
Sum = 1-(x^2)/2! +(x^4)/4! – (x^6)/6! + (x^8)/8! – (x^10)/10!
5) Write a program to generate the following pyramid.

```
        1
      1 2 3
    1 2 3 4 5
  1 2 3 4 5 6 7
```

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

1) Write a program to accept 10 integers in to an array and find largest and smallest integers present in them.
2) Write a program to apply binary search on an array having elements in sorted order.
3) Write a program to accept 10 numbers in to an array and sort it using insertion sort in ascending order.

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

1) Write a program to input elements 4x4 matrix. Find the principal diagonal of them.
2) Write a program to input values into two matrices A(3x4), B(4x3). Perform matrix multiplication and display the resultant matrix.
3) Write a program to accept a string and test whether it is palindrome or not using string handling functions.

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

1) Write a C program which contains three UDF's namely add(), subtract() and multiply(). Each function accepts two integers as their arguments and calculate and return the results
2) Write a program to create an UDF and test a number is prime or not.
3) Write a program to find the factorial of a given number using UDF.

Tutorial 8: Recursion, structure of recursive calls
Lab 8: Recursive functions

1) Write a program to find greatest common divisor of two integers using recursive functions.
2) Write a program to accept 10 elements into an integer array. Find the largest element present using recursive function.
3) Write a program to generate Fibonacci series using a recursive function.

Tutorial 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 9: Programming for solving Numerical methods problems

1) Write a program to implement Newton-Raphson Method.
2) Write a program to implement Euler's method.

Tutorial 10: Pointers, structures and dynamic memory allocation
Lab 10: Pointers and structures

1) Write a program to create user defined function called swap having two integer pointers as its arguments and it has no return value. Call this function using call-by-address.

2) Write a program to store 'n integers using dynamic memory allocation. Find the average value of the integers using a user defined function.

3) Write a program to input 11 cricket players' details using a structure array having member's player name, team name, batting average. Create a function which will display the player name whose batting average is >=30.

4) Write a program to create a structure for product having members like product code, price and quantity. Store N product details using dynamic memory and display them.

Teaching Methods: Chalk& Board/ PPT/Video Lecture

Text Books:

3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
4. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

References:

2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Code	Course Title	L	T	P	C	QP
BBSES 2050	**Data Structure using 'C++'**	**3**	**0**	**0**	**3**	

Pre -Requisite:

Course Educational Objective

CEO1: Understand the object oriented concepts and to develop C++ programs for performing different operations on arrays, stack, Queue, linked list. Analyze the difference between them and understand different applications.

CEO2: Understand different searching and sorting methods and compare them in terms of performance and applications.

Course Outcome

CO1	Develop algorithms for performing different operations on 1D array, matrix, stack, Queue, analyze the difference between them and understand different applications.
CO2	Understand different searching and sorting methods, Linked lists and them compare them in terms of performance and applications.
CO3	Understand the Binary Tree and its memory representation; analyze Binary search Tree and its applications, compare the BST with AVL Tree and examine the advantages.
CO4	Design Heap Tree, observe its applications in sorting. Understand the memory representation of graph; analyze traversal methods and applications of graph. Analyze the Hashing techniques in compare with other sorting techniques.

Unit I **[12 hours]**

Basic concepts: Data abstraction, Algorithm specification, Memory Representation of 1D and 2D Array. Stack: Introduction to stack, basic operations and implementation of stack using arrays .Queue: Introduction to linear queue, basic operations and implementation of linear queue using arrays, circular queue, basic circular queue operations& Representation of Double ended Queue.

Applications on stack – Recursion, infix to postfix conversion, Evaluation of postfix

Unit II **[12 hours]**

Searching: Linear search and Binary search using linear array

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Bucket Sort using linear array.

Linked Lists: Basic operations of singly, doubly and circular linked lists, implementation of stack and queue using singly linked list.

Unit III **[12 hours]**

Trees: Introduction, Terminology, Binary Trees, Representation of Binary Trees using arrays and linked lists, Binary tree traversals, Creation of binary tree from in-order& pre-order sequences - Creation of binary tree from in-order & post-order

Binary Search Trees: definition, basic operations of BST (Searching, Insertion and deletion)

Introduction to AVL trees, Height of an AVL Tree, Balancing AVL tree by rotations after insertions and deletions of a data node.

Unit IV **[12 hours]**

Heaps: Introduction to binary heaps, definition of a Max-heap, Min-heap, creating Max-Heap, Applications: Heap sort, Priority queue.

Graphs: Definitions, Graph representation - Adjacency matrix, Incidence Matrix, adjacency lists, Graph Traversals (BFS & DFS), Single source shortest path algorithm (Dijkstra's Algorithm) Topological Sorting.

Hashing: Hashing Functions, Open hashing (chaining), closed hashing (Open addressing – linear probing, quadratic probing, double hashing), rehashing.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS
Text Books: **1.** Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson Publication. **2.** "Data structure in C" by Tanenbaum, PHI publication / Pearson publication. 3. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.
Reference Books: 1. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press. 2. "Fundamental of Data Structure" (Schaums Series) Tata-McGraw-Hill.

Course Code	Course Title	L	T	P	C	QP
BBSES 2150	**Data Structures using 'C++' Laboratory**	0	0	2	1	

Pre -Requisite:

Course Educational Objective

CEO1: Develop algorithms for performing different operations on arrays, stack, Queue, linked list. Analyze the difference between them and understand different applications.

CEO2: Understand different searching and sorting methods and compare them in terms of performance and applications. Understand and analyze Binary search Tree, AVL Tree, Heap Tree and their applications.

CEO3: Understand the memory representation of graph, its traversal methods and applications. Analyze the Hashing techniques in compare with other sorting techniques.

Course Outcome

CO1	Understand and implement the object oriented concepts by in developing the programs for different operations.
CO2	Develop programs for performing different operations on 1D array, matrix, stack, Queue, analyze the difference between them and understand their applications.
CO3	Design code for different searching and sorting methods and analyze their performance.
CO4	Develop the codes for different operations on Linked lists and compare with other data structures.

Lab1: introduction to OOPs (C++ features), cin, cout, object, class, Simple programs.

Lab2: Access Specifiers, inline, private, public, arrays of objects, programs on them.

Lab3: Experiment No.1

1) Write a C++ program to create a class called student to store your rollno, name, age. Create an array of object to input 5 students data and then display where age>=20.
2) Write a C++ program to create a class having methods for operations insertion, deletion and display to perform operations on 1D array of elements.

Lab4: Experiment No.2

Write a C++ program to create a class having methods: insertion, multiply and display for performing multiplication on a matrix of elements.

Lab5: Experiment No.3

Write a program using C++ to create a stack using class and perform:
(i) push operation (ii) pop operation (iii) display operation

Lab6: Experiment No.4

Write a C++ program that uses Stack operations to converting an infix expression into equivalent postfix expression.

Lab7: Experiment No.5

Write a C++ program to create a linear queue and perform the following operations: (i) insertion ii) deletion and iii) Traversal

Lab8: Experiment No.6

Write C++ programs that use both recursive and non-recursive functions to perform the linear & binary search operation for a Key value in a given list of integers.

Lab9: Experiment No.7

Write a C++ menu driven program to implement bubble sort, selection sort and insertion sort for a given list of integers in increasing order.

Lab10: Experiment No.8 Write a C++ program to implement quick sort to a given list of integers to sort in ascending order.
Lab11: Experiment No.9 Write a C++ program that uses functions to perform the following operations on linear linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal
Lab12: Experiment No.10 Write a C++ program that uses functions to perform the following operations on Double linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal.

Department of
COMPUTER SCIENCE & ENGINEERING

4 Years B.Tech Degree Programme

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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Affiliated to UGC New Delhi & Biju Patnaik University of Technology, Odisha

GUNUPUR – 765022, Odisha, India

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To render best platform for adequate training and opportunities to work as teams on projects with effective communication skills and leadership qualities and understand professional ethics, social awareness and organizational context in which their engineering skills are utilized.

PEO2: To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.

PEO3: To extend an ability to analyze the need of the society by providing innovative solutions, leading to their personal cum professional growth as an entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: To provide students an understanding of the expectations of industry and practical competence with a broad range of programming language and open source platforms through value added courses.

PSO 2: The ability to analyze and develop computer programs in the areas related to artificial intelligence, big data analytics and cyber security for efficient design of computer-based systems of varying complexity.

PROGRAMME OUTCOMES (POs)

PO-1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3. Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO- 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO- 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO- 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO- 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO- 9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

COURSE STRUCTURE

SEMESTER-III

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	BS	BBSBS3010	Discrete Mathematics Structures	3	1	0	4
2	PC	BCSPC3020	Design & Analysis of Algorithms	3	0	0	3
3	PC	BCSPC3030	Operating System	3	0	0	3
4	PC	BCSPC3040	OOPS through JAVA	3	0	0	3
5	ES	BCSES3050	Digital Logic Design	3	0	0	3
6	BS / HS	BBSBS3061	Environmental Engineering and Safety	3	0	0	3
		BMSHS3062	Engineering Economics and Costing				
PRACTICAL / SESSIONAL							
7	PC	BCSPC3120	Design & Analysis of Algorithms Laboratory	0	0	2	1
8	PC	BCSPC3130	Operating System Laboratory	0	0	2	1
9	PC	BCSPC3140	JAVA Programming Laboratory	0	0	2	1
10	ES	BCSES3150	Digital Logic Design Lab	0	0	2	1
TOTAL				**18**	**1**	**8**	**23**

Course Code	Course Title	L	T	P	C	QP
BBSBS3050	**Discrete Mathematical Structures**	**3**	**1**	**0**	**4**	**A**

Course Educational Objective	
CEO1:	
CEO2:	
Course Outcome: At the end of the course, the student will be capable of	
CO1	
CO2	
CO3	
CO4	

UNIT:1 MATHEMATICAL LOGIC & SET THEORY **(15 Hours)**

Propositional logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Proof methods and Strategies, Sequences and Summations, Mathematical Induction, Recursive definition and structural induction.

UNIT:2 RECURRENCE RELATION **(10 Hours)**

Recurrence relation, Solution to recurrence relation, Generating functions, Inclusion and exclusion, Relation and their properties, Closure of relations, Equivalence relations, Partial orderings.

UNIT:3 BOOLEAN ALGEBRA & ALGEBRAIC SYSTEMS **(15 Hours)**

Algebraic systems, Lattices, Distributive and Complemented Lattices, Sub-lattices, Boolean Lattices and Boolean Algebra, Boolean Functions and Boolean Expressions.
Semi groups, Monoids, Groups, Sub groups, Cosets, Lagrange theorem, Permutation groups, isomorphism, Homomorphism, Normal subgroups

UNIT:4 - GRAPH THEORY **(12 Hours)**

Basic Definitions – Some Special Graphs – Matrix , Representation of Graphs --- Paths and circuits - Eulerian and Hamiltonian Graphs – connected graphs, Planar graph, Graph coloring ,Trees - Spanning Trees - Rooted trees – Binary Trees, Minimum Spanning tree - Kruskal's algorithm , Prim's algorithm , Tree Traversal.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. L. Liu and D. Mohapatra, "Elements of Discrete Mathematics", Third Edition, 2008, Tata McGraw Hill Education, New Delhi

Ref. Books

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Sixth Edition, 2008, Tata McGraw Hill Education , New Delhi
2. N. Deo, Graph Theory and Applications to Engineering and Computer Science, Prentice Hall of India
3. Discrete Mathematics by Schaum's Outlines(Second Edition)
4. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", Fifth Edition, 2005,Pearon Education, New Delhi

Course Code	Course Title	L	T	P	C	QP
BCSPC3010	**DESIGN AND ANALYSIS OF ALGORITHMS**	**3**	**1**	**0**	**4**	**A**

PRE - REQUISITE:

Course Educational Objective	
CEO1: Analyze the asymptotic performance of algorithms	
CEO2: Demonstrate a familiarity with major algorithms	
CEO3: Apply important algorithmic design paradigms and methods of analysis	
CEO4: Synthesize efficient algorithms in common engineering design situations	
Course Outcome: At the end of the course, the student will be capable of	
CO1	Analyze worst-case running times of algorithms using asymptotic analysis
CO2	Apply the algorithms and design techniques to solve problems.
CO3	Apply the algorithms and design techniques to find the optimal solution.
CO4	Apply the approximation algorithm for time consuming problem.

UNIT:1 Introduction **(15 Hours)**

Definition, Chrematistics of algorithm, Growth of Functions, Asymptotic analysis, Amortized analysis, standard notations and common functions, limit theorem, String's formula. Recurrences: solution of recurrences by substitution, recursion tree and Master methods, Extension Master Methods. Algorithm design techniques.

UNIT:2 **(15 Hours)**

Divide-and- conquer Approach: Binary search, Quick sort, Merge sort, Heap Sort, Priority Queue, Lower bounds for sorting. Worst case analysis of Quick sort.

Dynamic programming methodology: Elements of dynamic programming, Matrix-chain multiplication, Longest common subsequence, Assembly-line scheduling.

Greedy Algorithms: Elements of Greedy strategy, Activity selection Problem, Fractional knapsack problem, Huffman codes.

UNIT:3 **(10 Hours)**

Graph Algorithms: Data structure for disjoint sets, Disjoint set operations, Linked list representation, path compression, Disjoint set forests. Graph Algorithms and their characteristics, Breadth first search and depth-first search, Minimum Spanning Trees, Kruskal algorithm and Prim's algorithms, single- source shortest paths (Bellman-ford Algorithm and Dijkstra's algorithms), All-pairs shortest paths (Floyd–Warshall Algorithm).

UNIT:4 **(10 Hours)**

Back tracking, Branch and Bound, Eight Queen problem, Sub Set Sum Problem. String matching algorithms, naïve string matching algorithm, Rabin-Karp algorithm, Knuth–Morris–Pratt algorithm, NP - Completeness (Polynomial time, Polynomial time verification, NP - Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithms characteristics, Traveling Salesman Problem, vertex Cover Problem.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. Introduction to Algorithms, T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, 2nd Edition, PHI Learning Pvt. Ltd.
2. Fundamentals of Algorithm, Horowitz & Sahani:, 2nd Edition, Universities Press.

Ref. Books :

1. Algorithms, Design and Analysis, H. Bhasin, First Edition, Oxford University
2. Design and Analysis of Algorithm, S. Sridhar, Oxford University Press
3. Algorithms, Sanjay Dasgupta, Umesh Vazirani , McGraw-Hill Education.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) DESIGN AND ANALYSIS OF ALGORITHMS												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2								3
CO2	3	3	3	3								3
CO3	3	3	3	3								2
CO4	3	3	3	3							2	3

DESIGN & ANALYSIS OF ALGORITHMS LAB.
(Sub. Code: BCSPC3110)

Course Educational Objective	
CEO1: To design and implement algorithms of Brute Force Technique.	
CEO2: To design and implement algorithms with Divide and Conquer technique.	
Course Outcome:	
CO1	Design and implement algorithms of Brute Force Technique.
CO2	Design and implement algorithms with Divide and Conquer technique.
CO3	Design and implement algorithms with Space and Time Tradeoff.
CO4	Design and implement optimization algorithms using Dynamic Programming and Greedy technique.

1. Using a stack of characters, convert an infix string to postfix string (1 class)
2. Implement insertion, deletion, searching of a BST. (1 class)
3. (a) Implement binary search and linear search in a program
   (b)Implement a heap sort using a max heap.
4. (a) Implement DFS/ BFS for a connected graph.
   (b)Implement Dijkstra's shortest path algorithm using BFS.
5. (a) Write a program to implement Huffman's algorithm.
   (b) Implement MST using Kruskal /Prim algorithm.
6. (a) Write a program on Quick sort algorithm.
   (b) Write a program on merge sort algorithm.

Take different input instances for both the algorithm and show the running time.

7. Implement Strassen's matrix multiplication algorithm.
8. Write down a program to find out a solution for 0 / 1 Knapsack problem.
9. Using dynamic programming implement LCS.
10. (a) Find out the solution to the N-Queen problem.
    (b) Implement back tracking using game trees.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) DESIGN & ANALYSIS OF ALGORITHMS LAB												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		2							
CO2	3	3	3		2							
CO3	3	3	3		2							
CO4	3	3	3	2	2							

Course Code	Course Title	L	T	P	C	QP
BCSPC3020	**Operating System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective	
CEO1: Provide an insight into the basic organization of computer systems.	
CEO2: Familiarize students with various components of an Operating System	
CEO3: Focus on fundamental problems and optimal solutions for resource managements in operating systems such as process and disk scheduling and memory management	
CEO4: understand the different possible solutions for handling deadlock situation.	
CEO5: Introduce the design of a file system on secondary storage	
CEO6: Discuss system I/O in depth	
Course Outcome: At the end of the course, the student will be capable of	
CO1	Correlate the different components of an operating system and analyze techniques for system resource management.
CO2	Compare and contrast various scheduling algorithms and their performance tradeoffs.
CO3	Analyze algorithmic solutions for process synchronization problems and handling deadlocks.
CO4	Analyze performance issues associated with I/O devices and learn the algorithms and structures used for storage management.

UNIT:1 **(10 Hours)**

Operating System Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Opening System Design and Implementation, OS Structure, Virtual machines.

UNIT:2 **(12 Hours)**

Process and CPU Scheduling - Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Case studies: Linux, Windows. Process Coordination - Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

UNIT:3 **(14 Hours)**

Memory Management and Virtual Memory - Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table. Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement Page Replacement Algorithms, Allocation of Frames, Thrashing.

Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

UNIT:4 **(14 Hours)**

File System Interface - The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance. Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management.

Protection - System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

Ref. Books :

1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, and TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, A. S. Godbole, 2nd Edition, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
8. Operating Systems in depth, T. W. Doeppner, Wiley.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
OPERATING SYSTEM

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	3							2		2	
CO3	3	3							2		2	1
CO4	3	3	2	1		2	2		3		2	1

OPERATING SYSTEM LAB.
(Sub. Code: BCSPC3120)

Course Educational Objective	
CEO1: Enable students to learn the problems in inter process communication and the possible solutions	
CEO2: Imbibe students with disk scheduling concepts and techniques	
Course Outcome: At the end of the course, the student will be capable of	
CO1	Write programs to implement the basic functionality of an operating system and its components using UNIX Commands and shell programming.
CO2	Write programs to implement the various scheduling algorithms and analyze their performance tradeoffs
CO3	Implement algorithmic solutions to process synchronization problems
CO4	Implement algorithmic solutions to handle deadlocks

1. Basic UNIX Commands.
2. Linux Administrative commands.
3. UNIX Shell Programming.
4. Programs on process creation and synchronization, inter process communication including shared memory, pipes and messages. (Dinning Philosopher problem / Cigarette Smoker problem / Sleeping barber problem)
5. Programs on UNIX System calls.
6. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing)
7. Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention
8. Program for FIFO, LRU, and OPTIMAL page replacement algorithm.
9. Android Programming for mobile application.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
OPERATING SYSTEMS - LAB

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2						1	1
CO2	3	2	2	3	2							
CO3	3	3	2	3	3	2						
CO4	3	2	2	2	2	1						

Course Code	Course Title	L	T	P	C	QP
BCSPC3030	**OOPS Through JAVA**	**3**	**0**	**0**	**3**	**A**

Course Educational Objective	
CEO1: The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism	
CEO2: Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections	
CEO3: How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.	
CEO4: How to test, document and prepare a professional looking package for each business project using java doc.	
Course Outcome: At the end of the course, the student will be capable of	
CO1	Ability to analyze ,formulate and model problems using concepts of object oriented analysis and design and implement using Java and Implement object oriented principles for reusability.
CO2	Students will be able to write programs using basic data types and strings, using loops, Array.
CO3	Analyze the problems and resolve run-time errors with Multithreading and Exception Handling techniques
CO4	Realize the power of generics and Collections Framework and Java.io package

UNIT:1 **(12 Hours)**

An introduction Object Oriented Programming, Features of Object Oriented Programming Introduction to Java. Difference between C/C++ and Java, Features of Java, First Java Program, Writing the java program, Compiling the program, JVM and its significance in executing a program?, Architecture of JVM. Understanding, Java Tokens, Data types, Operators, Control Structures and Arrays, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

UNIT:2 **(14 Hours)**

Introduction to Classes and Objects. Constructors, static Keyword, this Keyword, Array of Objects, Access Modifiers (Public, Private, Protected, Default). Inheritance, Types of Inheritance and Java supported Inheritance, super, Polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching. String Manipulations. Wrapper classes, Auto boxing and unboxing. Abstract classes, Interfaces, Multiple Inheritance Using Interfaces,

Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Types of exceptions Hierarchy of Exception classes, try, catch, finally, throw, throws, Commonly used Exceptions and their details ,User defined exception classes.

UNIT:3 **(14 Hours)**

Multithreading, Thread in Java, Thread execution prevention methods. (yield(), join(), sleep()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class.

IO Streams (java.io package) , Byte Stream and Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Util Package interfaces, List, Set, Map.

UNIT:4 **(14 Hours)**

Applet Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1 Programming in Java. Second Edition. Oxford Higher Education. (Sachin Malhotra/ Saurav Choudhary)

2 Core Java For Beginners. (Rashmi Kanta Das), Vikas Publication

Ref. Books 1. JAVA Complete Reference (9th Edition) Herbalt Schelidt

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
OOPS Through JAVA

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2		1							
CO2	2	2	2	2	1							
CO3	2	2	2	2	1							
CO4	3	3	2	3	3	1	1					

JAVA PROGRAMMING LAB.
(Sub. Code: BCSPC3130)

Course Educational Objective	
CEO1: To introduce the pure object-oriented concepts through Java programming.	
CEO2: To enable a detailed insight into the Java programming concepts such as creating classes, Methods, Interfaces, Packages, Multithreaded Environment, String handling, Enumerations, Creating small Swing application.	
Course Outcome: At the end of the course, the student will be capable of	
CO1	Apply the object-oriented concepts through Java language.
CO2	Demonstrate the concepts of polymorphism and inheritance.
CO3	Write Java programs to implement error handling techniques using exception handling
CO4	Develop solution for a real problem using Java programming.

JAVA programs on:

1. Introduction, Compiling & executing a java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do, while, for etc.
4. Classes and objects.
5. Data abstraction & data hiding, inheritance, polymorphism.
6. Threads, exception handlings and applet programs
7. Interfaces and inner classes, wrapper classes, generics

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) JAVA PROGRAMMING LAB												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	3			2		1		1			
CO3	3	2			2							1
CO4	3	3	3	2		1						

Subject Code	Course Title	L	T	P	C	QP
BCSES3040	**DIGITAL LOGIC DESIGN**	**3**	**1**	**0**	**4**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To acquire the basic knowledge of digital logic levels and implements it in digital electronics.

CEO2: Prepare the students to perform the analysis and design of various digital electronic circuits.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand working of logic families and logic gates.
CO2	Recognize and study various number systems and their application in digital design.
CO3	Design and implement combinational logic circuits.
CO4	Design and analyze sequential logic circuits.
CO5	Employ PLDs to execute the given logical problem.
CO6	Establish the process of analog to digital conversion and digital to analog conversion.

UNIT: I **8 Hours**

Number Systems and Codes: Binary, Octal, Hexadecimal and Decimal Number System and their Conversion; Representation of Signed Binary and Floating Point Number; Binary Arithmetic using 1's and 2's Complements, Binary Codes - BCD Code, Gray Code, ASCII Character Code.

Boolean Algebra and Logic Gates: Axioms and Laws of Boolean Algebra; Reducing Boolean Expressions; Logic levels and Pulse Waveforms; Logic Gates; Boolean Expressions and Logic Diagrams.

UNIT: II **(9 Hours)**

Gate-level Minimization: Canonical and Standard Forms; K-maps - Two, Three and Four Variable K-maps, Don't-Care Conditions; NAND and NOR Implementation; Other Two-Level Implementations, Exclusive-OR Function.

Combinational Logic: Combinational Circuits; Analysis Procedure; Design Procedure; Adders; Subtractors; Parallel Binary Adders; Binary Adder-Subtractor; Binary Multiplier; Magnitude Comparator; Decoders; Encoders, Multiplexers; De-multiplexers.

UNIT: III **(14 Hours)**

Synchronous Sequential Logic: Sequential Circuits; Latches, Flip-Flops; Master-Slave Flip-Flop; Conversion of Flip-Flops; Analysis of Clocked Sequential Circuits; Mealy and Moore Models of Finite State Machines.

Registers and Counters: Shift Registers; Data Transmission in Shift Registers; SISO, SIPO, PISO and PIPO Shift Registers; Counters; Asynchronous Counters; Design of Asynchronous Counters; Synchronous Counters; Design of Synchronous Counters; Ring Counter.

UNIT: IV **(14 Hours)**

Memory and Programmable Logic: Introduction; Random-Access Memory; Memory Decoding; Error Detection and Correction; Read-Only Memory; Programmable Logic Array; Programmable Array Logic; Sequential Programmable Devices.

Analog-to-Digital and Digital-to-Analog Converters: Digital-to-Analog Converters - R-2R Ladder D/A Converter, Weighted Resistor D/A Converter; Analog-to-Digital Converters - Counter-type A/D Converter, Parallel Comparator A/D Converter, Dual-Slope A/D Converter, Successive-Approximation A/D Converter, A/D Converter using Voltage-to-Frequency.

IC Logic Families: Special Characteristics; RTL, DTL, TTL, ECL, IIL, MOS and CMOS Logic Circuits.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Digital Design, 3rd Edition, M. Morris Mano, Pearson Education.
2. Digital Fundamentals, 5th Edition, T. L. Floyd and R. P. Jain, Pearson Education, New Delhi.
3. Fundamentals of Digital Circuits, 8th Edition, A. Anand Kumar, PHI.

Reference Books:

1. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
2. A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.
3. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
4. Digital Design, Robert K. Dueck, CENGAGE Learning.
5. Digital Principles and Applications, 6th Edition, Donald P. Leach, Albert Paul Malvino and Goutam Saha, Tata McGraw Hill Publishing Company Ltd., New Delhi.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
DIGITAL LOGIC DESIGN

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C1	2	3	-	1	2	-	-	1	2	2	1	3
C2	2	3	-	2	2	1	1	-	1	1	1	2
C3	3	3	3	3	3	1	-	1	2	2	2	3
C4	3	3	3	3	3	1	1	1	2	2	2	3
C5	2	1	3	3	3	2	1	1	1	2	1	2
C6	3	2	3	2	3	1	-	1	2	1	2	1

DIGITAL LOGIC DESIGN LAB.
(Sub. Code: BCSES3140)

Course Educational Objective
CEO1: To Develop assembly language programs and basic concepts of the microprocessor and microcontroller
CEO2: To provide solid foundation on interfacing the external devices to the microprocessor & microcontroller according to the user requirements in order to create novel products and solutions for the real time problems
CEO3: To Familiar and Design of any type of embedded systems related to industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.
CEO4: To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier in the field embedded systems.

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates, use of Universal NAND Gate .
2. Gate-level minimization: Two level and multi level implementation of Boolean functions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, comparators.
4. Design and Implementation of code converters, gray code to binary and BCD to seven Segment display.
5. Design and Implementation of a function using MUX/ DEMUX.
6. Design of functions using encoder, decoder.
7. Flip-Flop: assemble, test and investigate operation of SR, D & J-K flip-flops.
8. Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.
9. Counters: Design, assemble and test various ripple and synchronous counters - decimal counter, Binary counter with parallel load.
10. Design of Binary Multiplier.
11. Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 1 to 10.
12. C/C++ implementation of Experiments listed at Sl. No. 1 to 10.

Subject Code	Course Title	L	T	P	C	QP
BBSHS3062	**Environmental Engineering & Safety**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: This course introduces the students to the environmental consequences of industries, developmental actions, etc., and the methods of minimizing their impact through technology and legal systems.

Course Outcome: At the end of the course, the student will be capable of

CO1	
CO2	
CO3	
CO4	

UNIT :1 **(10 Hours)**

Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle etc., Environmental gradients, Tolerance levels of environment factors, Indian Environmental Law. Chemistry in Environmental Engineering: Atmospheric chemistry, Soil chemistry. Biodiversity and its conservation

UNIT:2 **(12 Hours)**

Water Treatment: water quality standards and parameters, DO and BOD of water. Water treatment processes: Pre-treatment of water, Conventional process, and Advanced water treatment process.

Waste Water Treatment: pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production.

Air Pollution: Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –greenhouse gases, non-criteria pollutants, Air pollution meteorology, and Atmospheric dispersion. Industrial Air Emission and Control. Flue gas desulphurization, NOx removal, Fugitive emissions. Noise pollution- Noise standards, measurement and control.

UNIT:3 **(10 Hours)**

Solid Waste Management: Source, classification and composition of MSW, Separation, storage and transportation, Reuse and recycling, Waste Minimization Techniques. Hazardous Waste Management: Hazardous waste and their generation, Treatment: Incinerators, Inorganic waste treatment. E.I.A., Environmental auditing.

UNIT:4 **(12 Hours)**

Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error. Hazard Control Measures in steel industry, Petroleum Refinery, Pharmaceutical industry. Fire Prevention -Detection, Extinguishing Fire safety, Handling and Storage of Hazardous Materials. Personal Protective Equipments.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Environmental Engineering, Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Environmental Engineering by Prof B.K. Mohapatra, Seven Seas Publication, Cuttack
3. Environmental Engineering and Safety, Raut & Sen Scientific Publishers.
4. Industrial Safety ,Desmukh

Reference Books

1. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero PHI Publication
2. Hill International Edition, 2004
3. Environmental Science, Curringham & Saigo, TMH,
4. Man and Environment by Dash & Mishra
5. Industrial Safety Management and Technology, Colling. D A – Prentice Hall, New Delhi.

Subject Code	Course Title	L	T	P	C	QP
BMGHS3061	**Engineering Economics and Costing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To teach students the basic concepts of economics, managerial and decision making ability towards cost estimation of engineering projects.

Course Outcome: At the end of the course, the student will be capable of

CO1	explain the basic concepts of the economy, supply and demand and carry out elementary economic analysis
CO2	demonstrate various types of interests involved in cost estimation
CO3	explain various types of cash flow diagrams and estimate worth of a product using different methods
CO4	Demonstrate estimations using rate of return method.

UNIT:1 **(10 Hours)**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics. Demand- Meaning of demand, Demand function, Law of Demand and its exceptions ,Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

UNIT:2 **(8 Hours)**

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

UNIT:3 **(8 Hours)**

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank. Inflation-Meaning of inflation, types, causes, measures to control inflation. National Income-Definition, Concepts of national income, Method of measuring national income. Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

UNIT:4 **(8 Hours)**

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, "Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

Ref. Books 1

COURSE STRUCTURE

SEMESTER-IV

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC	BCSPC4010	Fundamentals of Python Programming	3	1	0	4
2	PC	BCSPC4020	Database Management System	3	0	0	3
3	PC	BCSPC4030	Theory of Computation	3	0	0	3
4	ES	BCSES4050	Microprocessors and Microcontrollers	3	0	0	3
5	BS / HS	BBSBS3061	Environmental Engineering and Safety	3	0	0	3
		BMSHS3062	Engineering Economics and Costing				
PRACTICAL / SESSIONAL							
6	PC	BCSPC4110	Python Programming Laboratory	0	0	2	1
7	PC	BCSPC4120	Database Management System Laboratory	0	0	2	1
8	PC	BCSPC4130	Advanced Lab - I	0	0	4	2
9	ES	BCSES4150	Microprocessors and Microcontrollers Laboratory	0	0	2	1
TOTAL				**15**	**1**	**10**	**21**

Subject Code	Course Title	L	T	P	C	QP
BCSPC4010	**Fundamental of Python Programming**	**3**	**1**	**0**	**4**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To understand the basics of programming using Python.

CEO2: To Construct and execute basic programs in Python.

Course Outcome: At the end of the course, the student will be able to

CO1	Demonstrate the understanding and usage of core python scripting elements.
CO2	Interpret python especially the object-oriented concepts and the built-in objects of Python
CO3	Understand and apply the concepts of file and exception handling
CO4	Create practical and contemporary applications such as web applications and discrete-event simulations

UNIT:1 **(08 Hours)**

Introduction: Installation, First Python Program: Interactive Mode Programming, Script Mode Programming; Identifiers, Reserved Words, Lines and Indentation, Multi-Line Statements, Quotation & Comments; Assigning Values to Variables, Multiple Assignment.

UNIT:2 **(10 Hours)**

Standard Data Types: Numbers, Strings, Lists, Tuples, Dictionary; Data Type Conversion; Basic Operators: Arithmetic, Comparison, Assignment, Bitwise; Operators: Logical, Membership, Identity; Operators Precedence; Python Numbers & Mathematical functions.

Data Type Conversion: Basic Operators: Arithmetic, Comparison, Assignment, Bitwise; Basic Operators, Python Numbers & Mathematical functions; Python Strings.

UNIT:3 **(12 Hours)**

Python statements and Loops: if, if-else, While, for loops, break, continue, pass, Python Function; Files I/O.

Functions: Definition, call, positional and keyword parameter. Default parameters, variable number of arguments. Modules - import mechanisms. Functional programming - map, filter, reduce, max, min. lambda function - list comprehension.

UNIT:4 **(15 Hours)**

Object Oriented Programming: classes and objects - Inheritance – Polymorphism overloading; Error handling & Exceptions - try, except and raise - exception propagation

File Processing: reading and writing files

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Reference books:

1. "Learning Python", Mark Lutz, O'Reilly Media, Inc., Fifth Edition, 2013.
2. "Introduction to Computer Science Using Python", Charles Dierbach, Wiley Publication, Second Edition, 2012.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)

Fundamental of Python Programming

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3								1	
CO2		3	3		2		2				2	
CO3	1	3	3					2	2			1
CO4	2	3	3		3						3	

PYTHON PROGRAMMING LAB
(Sub. Code: BCSPC4110)

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10
c) Write a program using a for loop that loops over a sequence. What is sequence?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

a) Write a program combine_lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute GCD, LCM of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints

b) Write a program to perform addition of two square matrices

c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

a) Install packages requests, flask and explore them using (pip)

b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)

c) Write a simple script that serves a simple HTTP Response and a simple HTML Page

Exercise - 13 OOP

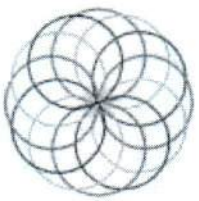
a) Class variables and instance variable

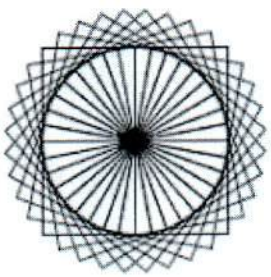
i) Robot

ii) ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk.
2. Write a program to implement following figures using turtle





Exercise - 15 - Testing

a) Write a test-case to check the even numbers function even_numbers which return True on passing a list of all even numbers.

b) Write a test-case to check the function reverse_string which returns the reversed.

Exercise - 16 - Advanced

a) Build any one classical data structure.

b) Write a program to solve knapsack problem

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)

Python Programming Lab.

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3								1	
CO2		3	3		2		2				2	
CO3	1	3	3					2	2			1
CO4	2	3	3		3						3	

Subject Code	Course Title	L	T	P	C	QP
BCSPC4030	**Database Management System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Gain a good understanding of the architecture and functioning of Database Management Systems as well as associated tools and techniques.

CEO2: Understand and apply the principles of data modeling using Entity Relationship and develop a good database design.

CEO3: Understand the use of Structured Query Language (SQL) and its syntax

CEO4: Apply Normalization techniques to normalize a database.

CEO5: Understand the need of Database processing and learn techniques for controlling the consequences of concurrent data access.

Course Outcome: At the end of the course, the student will be capable of

CO1	***Identify*** and ***Classify*** the concepts of Database Management system, Data models and architecture of database, ER to Relational mapping concepts.
CO2	***Applying*** the constraints in database using different query languages like:- relational algebra and calculus, SQL and QBE for the ***implementing*** the Data definition and data manipulate languages in Database.
CO3	***Compare*** the different normal forms to ***Apply*** normalization process to construct the consistent Database.
CO4	***Design and Develop*** the Database by inspecting concurrency control and recovery strategies to make complete Database without confliction and anomalies in concurrent access environment.

UNIT:1 **(15 Hours)**

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

UNIT:2 **(13 Hours)**

Entity relationship model, Components of ER model, Mapping E-R model to Relational schema, Relational Algebra, Tuple & Domain Relational Calculus, Relational Query Languages: SQL and QBE. Database Design:-Database development life cycle (DDLC), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design, Normalization, Normal forms:1NF, 2NF,3NF, and BCNF, Multi-valued Dependencies, 4NF & 5NF. Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization, Query cost estimation.

UNIT:3 **(10 Hours)**

Network and Object Oriented Data models, Storage Strategies: Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing Data Dictionary.

UNIT:4 **(12 Hours)**

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System, Types of Data Base failure & Types of Database Recovery, Recovery techniques, fundamental concepts on Object-Oriented Database, Object relational database, distributed database, Parallel Database, introduction to Data warehousing & Data Mining.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1 Sudarshan, Korth: **Database System Concepts**, 6th edition, McGraw-Hill Education
2. Elmasari &Navathe: **Fundamentals of Database System**, Pearson Education.

References Books:

1. Elmasari &Navathe: **Fundamentals of Database System**, Pearson Education.
2. Ramakrishnan: **Database Management Systems**, McGraw-Hill Education.
3. Andrew S. Tanenbaum: **Modern Operating Systems**, 3rd Edition, Pearson Education.
4. Terry Dawson, Olaf Kirch: **Linux Network Administrator's Guide**, 3rd Edition O'Reilly Media

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
DATABASE MANAGEMENT SYSTEM

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1								2
CO2	1	2	1	3	3							2
CO3	1	3	3	2								2
CO4	1	2	3	2	3	3	1					3

DATABASE MANAGEMENT SYSTEM LAB.

(Sub. Code: BCSPC4130)

Course Educational Objective	
CEO1: Design and create a ERD (Entity Relationship Diagram) using software tool.	
CEO2: Learn how to design and create and use a relational database system.	
Course Outcome	
CO1	***Implement*** the concept of Entity-Relationship (E-R) model from specified information and to transform into to relational model.
CO2	***Apply*** the different types of Constraints in relational database and defines the database.
CO3	***Compares*** the different types of manipulation and access methods of data from database.
CO4	***Analyze*** and simple database application that demonstrates understanding of all the above, working as a team.

1. Use of SQL syntax: insertion, deletion, join, updation using SQL.
2. Programs on join statements and SQL queries including where clause.
3. Programs on procedures and functions.
4. Programs on database triggers.
5. Programs on packages.
6. Programs on data recovery using check point technique.
7. Concurrency control problem using lock operations.
8. Programs on ODBC using either VC++.
9. Programs on JDBC.
10. Programs on embedded SQL using C / C++ as host language.

Additional Assignments

1. Use of NoSQL database like MongoDB.
2. Programs on connectivity to MongoDB using MEAN.
3. Programs on connectivity to Mongo-DB using Python.
4. Programs on connectivity to MongoDB using PHP.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
DATABASE MANAGEMENT SYSTEM LAB

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		2							
CO2	3	3	3	2	2							
CO3	3	3	3									
CO4	3	3	3	2	2				3	2		

Subject Code	Course Title	L	T	P	C	QP
BCSPC4050	**Theory of Computation**	**3**	**1**	**0**	**4**	A

Pre -Requisite:

Course Educational Objective

CEO1: To familiarize students to construct regular expressions, regular grammars & to identify non - regular languages

CEO2: Teach students to identify context - free languages, to convert the given grammar to various normal forms, & to make use of membership algorithm.

CEO3: Teach students to construct Push - Down Automata which represent context - free languages, closure properties, & to identify non - context - free languages.

CEO4: To familiarize students to Recursively Enumerable languages, Recursive languages, construction of Turing Machines, PCP, & un decidable problems.

Course Outcome: At the end of the course, the student will be capable of

CO1	Explain the basic concepts of formal computation and its relationship to language.
CO2	Get the ability to classify language into their types and its equivalent regular expression are derived.
CO3	Apply formal reasoning to construct different language and grammar set.
CO4	Analyze various problem solving technique using PDA and TM with recursion and complexity and computability

UNIT:1 **(12 Hours)**

Mathematical preliminaries: Alphabet, String, Languages, Grammars, Strings and operations on strings.

Finite Automata: Definition, Basic model, Types of Finite Automata, Design of DFA, Design of NFA, NFA vs. DFA, Eliminating ε transitions from NFA, NFA to DFA conversion, NFA or DFA as a language acceptor, Minimization of Finite Automata. Equivalence of two Finite Automata

UNIT:2 **(14 Hours)**

Regular Expressions: Regular Set and Regular Expressions. Operators in Regular expressions, Building Finite Automata from Regular expression, Arden's theorem & Building Regular expression from Finite Automata, Pumping Lemma for Regular languages, Closure properties of Regular languages.

Grammar: Definition, Regular Grammar, Regular Grammar to Finite Automaton, Finite Automaton to Regular Grammar, Designing Context Free Grammar, String Derivation, Parse Tree Construction, Ambiguous Grammar, Chomsky and Greibach Normal Forms, CYK parsing algorithm,Closure

Properties of CFL, Pumping Lemma for CFL, Introducing Non-Context Free Grammar, Chomsky Hierarchy.

UNIT:3 **(12 Hours)**

Push Down Automata: Basic Model, Components, Moves of a PDA, ID of a PDA, Design of Deterministic PDA and Non-deterministic PDA, PDA to CFG and CGA to PDA conversion.

Turing Machines: Basic Model, Components, move of a TM, ID of TM, Design of a TM, Variants Of Turing Machine, Recursively Enumerable Languages, Undecidable problems, Post correspondence problem as an Undecidable Problem. Linear Bounded Automata and Context Sensitive Languages

UNIT:4 **(10 Hours)**

Primitive Recursive functions: μ- Recursive functions, Cantor and Godel numbering, ckermann's function, Excursiveness of Ackermann and Turing computable functions. Church Turing hypothesis, Recursive and Recursively Enumerable sets, NP Completeness: P and NP, NP complete and NP Hard problems.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Introduction to the theory of computation, Michael Sipser, Cengage Learning.
2. Formal Language and Automata Theory, C. K. Nagpal, Oxford University Press.

References:

1. Theory of Computer Science : Automata,Languages And Computation by by *K L P Mishra* and N Chandrasekaran
2. Introduction to Automata Theory, Languages and Computation: J. E. Hopcroft, J.D Ullman, Pearson Education.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
THEORY OF COMPUTATION

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		1							
CO2		3	1	3			2					
CO3		3	2	3	2	2	2					
CO4	1			2					1	3	2	1

Subject Code	Course Title	L	T	P	C	QP
BECES4040	**Microprocessors and Microcontrollers**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To Develop assembly language programs and basic concepts of the microprocessor and microcontroller

CEO2: To provide solid foundation on interfacing the external devices to the microprocessor & microcontroller according to the user requirements in order to create novel products and solutions for the real time problems

CEO3: To Familiar and Design of any type of embedded systems related to industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.

CEO4: To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier in the field embedded systems.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the architecture of 8085 ,8086 &8051
CO2	Impart the knowledge about the instruction set
CO3	To use the basic idea about the data transfer schemes and its applications
CO4	Develop skill in simple program writing for 8085 , 8086 and 8051 applications
CO5	To design circuits for various applications using microcontrollers.
CO6	To introduce the need & use of Interrupt structure 8085, 8086 & 8051.

UNIT:I **(10 Hours)**

Introduction to 8 bit Microprocessors

Introduction to 8085 microprocessor, Architecture, Signal Descriptions ,Buses-Address bus ,data bus and control Bus ,Instruction format ,Instruction sets ,addressing Modes, Assembly Language Programming ,Timing diagram, stack and sub routine, Data Transfer Schemes ,Memory Interfacing and 8085 interrupts.

UNIT:2 **(12 Hours)**

Advanced Microprocessor

Introduction to 8086 microprocessor, 8086 Architecture, Register Organization, signal descriptions, Memory Segmentation. Physical memory organization. Addressing Modes, instruction Set .Minimum and Maximum mode operation, Bus Cycle of minimum mode and maximum mode. Interrupts of 8086, Memory interfacing & Assembly Language Program.

UNIT:3 **(10 Hours)**

Peripheral Devices

Programmable Peripheral Interface (8255), Programmable Interval Timer (8254)Programmable Interrupt Controller (8259A) - Programmable DMA Controller(8257),Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

UNIT:4 **(12 Hours)**

8051 Microcontroller

Overview of 8051 microcontroller. Architecture. I/O Ports. Memory organization, Addressing modes, data transfer instructions, Logical instructions, Arithmetic instructions, Branching (Jump & Call) instructions, Bit addressable instructions and special instructions, Interrupts and interrupt handler sub routines (Interrupt Service Routines).Assembly language program.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book(s)

1 Microprocessor Architecture, Programming and application with 8085, R.S. Gaonkar, PRI Penram International publishing PVT. Ltd., 5thEdition

2. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd edition 2006.

3. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.M C Kinlay, Pearson Education, Second Edition, 2008.

Reference Book(s)

1. Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096, Krishna Kant, PHI Publication, 2007.
2. Microprocessors and Interfacing, Programming and Hardware, Douglas V Hall, TMH Publication, 2006.
3. Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevananthan and S.K. Shah, Oxford University Press.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
MICROPROCESSORS AND MICROCONTROLLERS

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C1	3	1	3		2	2	1	1	2	3	1	2
C2	2	3	3	2	3	1	2	2	3	1		1
C3	1	2	1	3	1	1	3		2	2	3	1
C4	1	3	2	1	2		1	1	1	2	1	2
C5	2	2	3	2		1	2	2	1	1		1
C6	1	2	1	3	2	1	2	1	2	1	1	2

Department of
COMPUTER SCIENCE & ENGINEERING

4 Years B.Tech Degree Programme

REGULATION & SYLLABUS 2018

Choice Based Credit System
Outcome Based Assessment

SEMESTER- V & VI

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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Affiliated to UGC New Delhi & Biju Patnaik University of Technology, Odisha

GUNUPUR – 765022, Odisha, India

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To render best platform for adequate training and opportunities to work as teams on projects with effective communication skills and leadership qualities and understand professional ethics, social awareness and organizational context in which their engineering skills are utilized.

PEO2: To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.

PEO3: To extend an ability to analyze the need of the society by providing innovative solutions, leading to their personal cum professional growth as an entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: To provide students an understanding of the expectations of industry and practical competence with a broad range of programming language and open source platforms through value added courses.

PSO 2: The ability to analyze and develop computer programs in the areas related to artificial intelligence, big data analytics and cyber security for efficient design of computer-based systems of varying complexity.

PROGRAMME OUTCOMES (POs)

PO-1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3. Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO- 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO- 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO- 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO- 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO- 9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

COURSE STRUCTURE

SEMESTER-V

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC	BCSPC5010	Compiler Design	3	1	0	4
2	PC	BCSPC5020	Computer Organization & Architecture	3	0	0	3
3	PC	BCSPC5030	Software Engineering	3	0	0	3
4	PC	BCSPC5030	Data Mining & Data Warehousing	3	0	0	3
5	OE	BCSOE5051	Biology for Engineering	3	0	0	3
		BCSOE5052	Genetic Engineering				
		BCSOE5053	Green Buildings and Energy Conversion				
PRACTICAL / SESSIONAL							
6	PC	BCSPC5110	Computer Organization & Architecture Laboratory	0	0	2	1
7	PC	BCSPC5120	Software Engineering Laboratory	0	0	2	1
8	PC	BCSPC5130	Data Mining & Data Warehousing Laboratory	0	0	2	1
9	EC	BCSEC5150	*Skill Development Project and Hands on Training	0	0	2	1
10	EC	BCSEC5170	^Summer Internship-I	0	0	2	1
TOTAL				**15**	**1**	**10**	**21**

*College should conduct at least one NSDC program under this category.

^ Four (4) weeks duration summer internship either in industry or in an R&D organization, including educational institutes with excellent research culture. The student is expected to submit a formal report at the end of the programme.

On-line MOOC courses may contribute upto 20% of the credits, with in-house examination being conducted.

Course Code	Course Title	L	T	P	C	QP
BCSPC5040	**Compiler Design**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce the major concept areas of language translation and compiler design.

CEO2: To enrich the knowledge in various phases of compiler and its use.

CEO3:To provide practical programming skills necessary for constructing a compiler

Course Outcome: At the end of the course, the student will be capable of

CO1	Acquire the knowledge of compiler and its features.
CO2	Use the knowledge of patterns, tokens and regex for solving the problems in the field of data mining
CO3	Optimize the performance of a program in terms of speed and space.
CO4	Ability to use different powerful compiler generation tools and derive the machine dependent code.

UNIT:1 **(12 Hours)**

Introduction: Overview and phases of compilation. Lexical Analysis: Non-deterministic and deterministic finite automata (NFA & DFA), regular grammar, design of a lexical analyzer, lexical analyzer generator. Lex and flex Syntax Analysis:_Role of a parser, context free grammars and context free languages, parse trees and derivations, ambiguous grammar. Top Down Parsing: Recursive descent parsing, LL(1) grammars, non-recursive predictive parsing, error reporting and recovery.

UNIT:2 **(12 Hours)**

Bottom Up Parsing: Handle pruning and shift reduces parsing, SLR parsers and construction or SLR parsing tables, LR(1) parsers and construction of LR(1) parsing tables, LALR parsers and construction of efficient LALR parsing tables, parsing using ambiguous grammars, error reporting and recovery, parser generator. Syntax Directed Translation**:** Syntax directed definitions (SDD), inherited and synthesized attributes, dependency graphs, evaluation orders for SDD, semantic rules, application of syntax directed translation.

UNIT:3 **(10 Hours)**

Symbol Table: Structure and features of symbol tables, symbol attributes and scopes. Intermediate Code Generation: DAG for expressions, three address codes - quadruples and triples, types and declarations, translation of expressions, array references, type checking and conversions, translation of Boolean expressions and control flow statements, back patching, intermediate code generation for procedures. Run Time Environment: storage organizations, static and dynamic storage allocations, stack allocation, handlings of activation records for calling sequences.

UNIT:4 **(10 Hours)**

Code Generations: Factors involved, registers allocation, simple code generation using stack allocation, basic blocks and flow graphs, simple code generation using flow graphs .Elements of Code Optimization: Objective, peephole optimization, concepts of elimination of local common sub-expressions, redundant and un-reachable codes, basics of flow of control optimization.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:

1. Compilers – Principles, Techniques and Tools Authors: Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman Publisher: Pearson

Ref. Books:

1. Morden Compiler Design, D. Galles, Pearson Education.
2. Compiler Design in C, Allen I. Holub, PHI

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) COMPILER DESIGN												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	3	2	2								
CO3	2	3	2					2				
CO4				2	3							

Course Code	Course Title	L	T	P	C	QP
BCSPC5010	**Computer Organization and Architecture**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite: Fundamental of computer and basic mathematics.

Course Educational Objective

CEO1: Identify the functional units in a digital computer system,

CEO2: Distinguish between the various ISA styles and trace the execution sequence of an instruction through the processor.

CEO3: Compare different approaches used for implementing a functional unit and evaluate different computer systems based on performance metrics.

CEO4: provide an outline of working principles of components of computer.

Course Outcome: At the end of the course, the student should be able to

CO1	***explain*** and ***illustrate*** the execution cycle of a program.
CO2	***classify*** the components of digital computer and ***designing*** of control and memory units with performance ***evaluation***.
CO3	***compute*** different type of binary arithmetic operation. .
CO4	***identify*** the characteristics of memories and ***explain*** memory and IO devices working process.

UNIT:1 **(12 Hours)**

FUNDAMENTALS OF A COMPUTER SYSTEM: Functional Units of a Digital Computer ,Hardware ,Software Interface, Translation from a High Level Language to the Hardware Language Instruction Set Architecture, Styles and features, RISC and CISC Architectures ,Performance Metrics ,Amdahl's Law ,Case Studies of ISA.

UNIT:2 **(12 Hours)**

BASIC PROCESSING UNIT: Components of the Processor, Data path and Control – Execution of a Complete Instruction, Hardwired and Micro programmed Control, Instruction Level Parallelism, Basic Concepts of Pipelining, Pipelined Implementation of Data path and Control, Hazards, Structural, Data and Control Hazards ,Exception handling. Parallelism and Multiprocessor Architecture, Flynn's Classification, UMA, NUMA, Distributed Memory Architecture. Array and Vector Processor.

UNIT:3 **(12 Hours)**

ARITHMETIC FOR COMPUTERS: Addition and Subtraction, Fast Adders, Binary Multiplication, Fast Multiplication, Binary Division and its techniques, Floating Point Numbers, Representation, Arithmetic Operations.

UNIT:4 **(12 Hours)**

MEMORY AND I/O : Need for a hierarchical memory system, Types and characteristics of memories ,Memory location and address, Endianness of memory representation, Cache memories, Improving cache performance, Virtual memory ,Memory management techniques, cache mapping and its techniques ,Associative memories. Replacement Algorithms. Accessing I/O devices – Programmed Input/output, Interrupts, Direct Memory Access ,Interface circuits ,Need for Standard I/O Interfaces like PCI, SCSI, USB.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.
3. Kai Hwang and F.A. Briggs, "Computer Architecture and Parallel Processing", McGraw Hill.

Ref. Books:

1. M. Morris Mano, "Computer System Architecture", PHI
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.

3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
4. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
COMPUTER ORGANIZATION AND ARCHITECTURE

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	3	3	3									
CO3	2	3	3									
CO4	1	3	3									

COMPUTER ORGANIZATION & ARCHITECTURE LAB
(Sub. Code: BCSPC5110)

Course Educational Objective: the object of the course is to	
CEO1: Identify, assembling and disassembling the functional units in a digital computer system,	
CEO2: troubleshooting and study of dot matrix printer and component of Computer.	
CEO3: design assembly language program and VHDl programs.	
Course Outcome: At the end of the course, the student should be able to	
CO1	***Identify*** components of digital computer and demonstration of assembling and disassembling of computer.
CO2	***Detect*** the troubles in dot matrix printer, CPU and SMPS.
CO3	***Write*** and ***resolve*** the assembling language programming in 8085 and 8086.
CO4	***Design*** and ***examine*** the Adder, Decoder and MUX in VHDl programming.
CO5	***Write*** and ***resolve*** the representation of floating point numbers and Booth's algorithm.

SYLLABUS

1. (a) Identification of different components of a PC. [CO1]
   (b) Assembling & disassembling of a PC. [CO1]
2. Study of different troubleshooting of a dot matrix printer using LX 1050+ Printer Trainer Module. [CO2]
3. Study of the functions of SMPS using SMPS Trainer Kit. [CO2]
   (a) Study of SMPS with Single Output under Line Regulation.
   (b) Study of SMPS with Multi Output under Line Regulation.
   (c) Study of SMPS with Single Output under Load Regulation.
4. Study of different troubleshooting of CPU using CPU Trainer Module. [CO2]
5. Familiarization of different types of byte addressing instruction using 8085 simulator. [CO3]
6. Study of assembly Language program in PC using 8086 architecture. [CO3]
7. Design of digital circuits (H/A, F/A, Decoder & Encoder) in VHDL using Active VHDL. [CO4]
8. Design of digital circuits (MUX, DEMUX & ALU) in VHDL using Active VHDL. [CO4]
9. Write a C/C++ program to perform signed bit multiplication using Booth's Algorithm. [CO5]
10. Write a C/C++ program for IEEE-754 floating point representation and perform Addition/Subtraction. [CO5]

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
COMPUTER ORGANIZATION AND ARCHITECTURE LAB

Course outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	3						1	1	2		
CO2	2	3						1	1	2		
CO3	1	2	2	1	2			1		1		
CO4	3		3	1	3					3		
CO5	1	1	1	3	2					1		

Course Code	Course Title	L	T	P	C	QP
BCSPC5020	**Software Engineering**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand the phases in a software project.

CEO2: Understand fundamental concepts of requirements engineering and analysis modeling.

CEO3: Understand the major considerations for enterprise integration and deployment.

CEO4: Learn various testing and maintenance measures.

Course Outcome: At the end of the course, the student will be capable of

CO1	Interpreting the key activities for managing a software project and Compare different process models.
CO2	Analyze different types of software requirements and identify the suitable model for the new system.
CO3	Apply systematic procedure for software design.
CO4	Implement and test the software which will meet the software requirement specifications.

UNIT:1 **(14 Hours)**

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models: The Waterfall Model, Incremental Process Models, The RAD Model, Prototyping Model, V- Model, Spiral Model, Agile and Scrum Model. Software Project Management: Estimation, LoC and FP based Estimation, COCOMO Model, and Project Scheduling: Scheduling, Earned Value Analysis, and Risk Management.

UNIT:2 **(10 Hours)**

Software Requirements: Functional and Non-functional, User requirements, System requirements, Software Requirements Document, Requirement Engineering Process: Feasibility Studies, Requirement elicitation and analysis, Requirement validation, Requirements Management, Classical Analysis: structured system analysis, Petri Nets – Decision table, Decision tree, Documentation and Gunning's fog Index. CASE TOOL: Application on Documentation

UNIT:3 **(10 Hours)**

Design process: Design concepts, Design Model, Design Heuristic Architectural Design: Architectural Mapping using Data Flow Structure Chart design using DFD. Transform Analysis, Transaction Analysis: OOD Modeling Using UML, User Interface Design.
CASE TOOL: Application on Design

UNIT:4 **(14 Hours)**

Software implementation techniques: coding practices: Refactoring, Code Review, Code Inspection, Driver and Stub Module. Software Testing Fundamentals: Internal and external views of Testing- White Box Testing, Basis path testing, control structure testing. Black Box Testing: Regression Testing, Unit Testing, Integration Testing, Validation Testing, System Testing and Debugging. CASE TOOL: Test-Case Design, Software Reliability Measures and Growth Modeling: SEI CMM: Characteristics of Software Maintenance, Reverse Engineering, Re-engineering.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Roger S Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw Hill International Edition.
2. Rajib mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited.

Reference Books:

1. Ian Sommerville, "Software Engineering", Ninth Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering- A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt. Ltd, 2007.
4. Stephen R. Schach, "Software Engineering", Tata McGraw Hill Publishing Company Limited, 2007.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SOFTWARE ENGINEERING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1		3	1					
CO2	1	3	1	1		1	1					
CO3	3	3	3	2		3	1	1	2	1	3	1
CO4	2	3	3	2	3	2	1	2	2	2	3	2

SOFTWARE ENGINEERING LAB.
(Sub. Code: BCSPC5120)

1: Develop requirements specification for a given problem (The requirements specification Should include both functional and non-functional requirements. For a set of about 20 sample problems, see the questions section of Chap 6 of Software Engineering book of Rajib Mall)

2: Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required)

3: Develop structured design for the DFD model developed

4: Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML, or Visual Paradigm etc. is required)

5: Develop Sequence Diagrams.

6: Develop Class diagrams.

7: Develop code for the developed class model using Java.

8: Use testing tool such as Junit.

9: Use a configuration management tool.

10: Use any one project management tool such as Microsoft Project or Gantt Project, etc.

Course Code	Course Title	L	T	P	C	QP
BCSPC5030	**Data Mining & Data Warehousing**	**3**	**1**	**0**	**4**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To understand the data warehouse and mining them to extract knowledge.

CEO2: To understand the concepts of Association Rule Mining, Classification and Clustering applying various algorithms to different datasets.

CEO3: To understand the data warehouse and mining them to extract knowledge.

CEO4: To understand the concepts of Association Rule Mining, Classification and Clustering applying various algorithms to different datasets.

Course Outcome: At the end of the course, the student will be capable of

CO1	Mine the patterns from the dataset for useful inferences.
CO2	Classify the records, groups the objects/records and predict the class label of datasets. At the end of the course, the student should be able to
CO3	Mine the patterns from the dataset for useful inferences.
CO4	Classify the records, groups the objects/records and predict the class label of datasets.

UNIT:1 **(12 Hours)**

Overview: Data warehousing, The compelling need for data warehousing, the Building blocks of data warehouse, data warehouses and data marts, overview of the components, metadata in the data warehouse, trends In data warehousing, emergence of standards, OLAP Vs OLTP, data cube, multidimensional data warehouse.

UNIT:2 **(12 Hours)**

Introduction to Data mining, Data mining Functionalities, Data preprocessing (data summarization, data cleaning, data integration and transformation, data reduction, data discretization), Mining frequent patterns, associations, correlations (market basket analysis, the a-priori algorithm, mining various kinds of association rules, from association mining to correlation analysis).

UNIT:3 **(12 Hours)**

Classification: classification by decision tree induction, Rule based classification, classification by neural networks, and classification by genetic algorithm. Cluster Analysis: types of data in cluster analysis, A categorization of major clustering methods (partitioning methods, hierarchical methods), clustering high dimensional data, outlier analysis Advanced techniques: web mining, spatial mining, temporal mining.

UNIT:4 **(12 Hours)**

Introduction to the data warehouse project, Data warehousing implementation, Web enabled data warehouse, Data mining applications in (financial data Analysis, retail industry, telecommunication industry, Biological data analysis, intrusion detection, in other scientific applications), and Data warehouse project.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Data Mining: Concepts and techniques: J.Han and M.Camber, Elsevier.
2. Data warehousing Fundamentals: Paulraj Ponniah, Willey India.

Ref. Books

1. Data Mining –A Tutorial based primer by R.J.Roiger, M.W.Geatz, Pearson Education.
2. Data Mining & Data Warehousing Using OLAP: Berson, TMH.
3. Data Warehousing: Reema Thareja, Oxford University Press

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) DATA MINING & DATA WAREHOUSING												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2									1	3
CO2	3	2	1	2							2	3
CO3	3	3	2	3					1		2	2
CO4	2	2	3	2		1	1				1	3

DATA MINING & WAREHOUSING LAB
(Sub. Code: BCSPC5130)

1. Demonstration of preprocessing on dataset student.arff.
2. Demonstration of preprocessing on dataset labor.arff.
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm.
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm.
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm.
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm.
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm.
8. Demonstration of classification rule process on dataset employee.arff using naïve Bayes algorithm.
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means.
10. Demonstration of clustering rule process on dataset student.arff using simple kmeans.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) DATA MINING & DATA WAREHOUSING LAB												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									
CO2		2			2							
CO3		2			2							
CO4		3			2							
CO5	1											

Course Code	Course Title	L	T	P	C	QP
BBTOE5052	**Genetic Engineering**	**3**	**1**	**-**	**4**	**-**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce the basic of Genetic Engineering and its application

CEO2: To understand the functions gene transfer to organisms

Course Outcome: At the end of the course, the student will be capable of

CO1	Students will obtain knowledge in genomic structure in cells.
CO2	The undergraduate will understand the DNA replication and protein synthesis
CO3	Familiar with the topics of vectors used in gene transfer
CO4	They have the idea on types and application of molecular markers

UNIT:1 **(12 Hours)**

Genome Organization Prokaryotes and Eukaryotes, Nuclear genome and Organellar genome, DNA as the genetic material, Central dogma of molecular biology; DNA Replication: Process of DNA replication (Initiation, Elongation and Termination). Gene cloning vectors- Plasmid, bacteriophage, cosmid, BAC, YAC; restriction enzymes

UNIT:2 **(12 Hours)**

The Relationship between genes and protein, The transcriptions: The basic process, Transcription and RNA Processing in Eukaryotic cells, Encoding genetic information capping, polyadenylation, pre-mRNA splicing, formation of commitment complex, creation of catalytic sites. Translation.

UNIT:3 **(10 Hours)**

Gene cloning vectors- Plasmid, bacteriophage, cosmid, BAC, YAC; Expression vectors: basic concept, bacteria and yeast based expression vector.

UNIT:4 **(12 Hours)**

Molecular markers- Types (RFLP, RAPD, AFLP, SCAR, SSR, SNP, EST), Principle and methodology; Application of molecular markers: in diagnostics, gene tagging, gene mapping, Human Genome project, Gene therapy and its applications; DNA vaccines

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books 1 Biotechnology by P K Gupta
2. Biotechnology by B D Singh

Ref. Books 1. An introduction to genetic engineering to Desmond S.T.Nicholl, Cambridge university press
2. Genetic engineering by Smita Rastgi and Neelam Pathak, Oxford press

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
GENETIC ENGINEERING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3		1	1		2			2
CO2	2	3	3	2		2		1		2	2	2
CO3	3	2	3	1	1		3	2				
CO4	2	1	3	2	2	3	1		1	2	2	1

Course Code	Course Title	L	T	P	C	QP
BBTOE5051	**BIOLOGY FOR ENGINEERING**	**3**	**1**	**-**	**4**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce the basic of biology and its application

CEO2: To understand the functions of living system

Course Outcome: At the end of the course, the student will be capable of

CO1	Students will obtain knowledge in the biological processes occurring in the cells.
CO2	The undergraduate will understand the cellular organization in living system
CO3	Study about the cellular metabolism
CO4	Understand the causes and mechanism of cancer biology

UNIT:1 **(10 Hours)**

Structural & chemical composition of plant and animal cells, Organization of cell (Prokaryotic and Eukaryotic), Cell Wall & Cell Membrane, Cell Organelles, Endoplasmic reticulum, Nucleus, Cytoskeleton, Molecular Organization of Chromosome (Nucleosome concept).

UNIT:2 **(12 Hours)**

Cell Cycle, Cell Divisions- Mitosis and Meiosis, Stem Cell (Embryonic and adult types and characteristics), Membrane transport & trafficking, cell death pathways, Cancer Cell Biology (Cause, Cell Characteristics).

UNIT:3 **(10 Hours)**

Cellular metabolism: Respiration (glycolysis, Krebs cycle, electron transport system). Photosynthesis: light reaction, photo systems, dark reaction (C_3 cycle,C_4 cycle, CAM).

UNIT:4 **(12 Hours)**

Proteins: Structural aspects – General introduction, Classification & General characteristics, Structure of Primary, Secondary, Tertiary & Quaternary proteins. An introduction to enzyme; How enzyme works; Reaction rate. Enzyme kinetics – Approach to mechanism.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology by P S Verma and VK Agrawal, S. Chand
2. Cell biology and Genetics by P K Gupta Rastogi Publication

Ref. Books:

1. Molecular Biology of the Cell 4th Edition Bruce Alberts
2. The Cell A Molecular Approach Geoffrey M Cooper. Boston University 2nd edition

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
BIOLOGY FOR ENGINEERING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3		1	1		2			2
CO2	3	3	2	3		2		1		2	2	2
CO3	3	2	3	1	1		3	2				
CO4	2	1	3	2	1	3	1		1	2	3	1

Course Code	Course Title	L	T	P	C	QP
B**OE6053	**Green Buildings and Energy Conversion**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: This course is designed to enlighten students to the current green building trend and to help them realize the impact and applications of green building as a practice not just a trend.

Upon completion of the course:

CEO2: Students should have an understanding of core building science fundamentals.

CEO3: Students will understand and perform some building sustainability concepts

CEO4: Students will understand energy efficiency in relation to cost performance, ROI, etc.

CEO5: Students will understand and perform some weatherization fundamentals.

Course Outcome: At the end of the course, the student will be capable of

CO1	Importance of the green buildings and its site selection
CO2	Environmentally friendly building materials and technologies
CO3	Integrating renewable energy technologies
CO4	Able to analyze different renewable source with case study.
CO5	Impacts of climatic conditions on green building design
CO6	Able to understand building assessment techniques.

UNIT:1 **(12 Hours)**

Green Buildings: Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage

Environmentally friendly building materials and technologies: Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, ferro-cement and ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

UNIT:2 **(12 Hours)**

Energy and resource conservation: Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings-water harvesting in buildings – waste to energy management in residential complexes or gated communities.

Use of renewable energy resources: Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy based buildings in India.

UNIT:3 **(10 Hours)**

Climate Design: Local climatic conditions – temperature, humidity, wind speed and direction-impact of climate change on built environment – comforts: the desirable conditions – Principles of thermal design – means of thermal –light and lighting-building acoustics- energy efficient lighting, Ventilation and air quality requirement, various techniques for passive cooling, garden roofs, case studies for passive cooling and thermal comfort.

UNIT:4 **(12 Hours)**

Green Building Rating Systems: Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment – Modular wastewater treatment systems for built environment – Building automation and building management systems.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books: 1. Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.

2. Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) Green Buildings and Energy Conversion												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1	1	1	2	2	1	2	-	-	2
2	2	3	2	1	1	2	3	1	2	-	-	2
3	3	3	3	2	2	2	2	1	2	-	-	1
4	3	3	2	2	2	2	3	3	2	2	3	-
5	2	2	1	1	2	2	3	2	2	1	1	2
6	1	2	1	1	3	2	3	1	2	1	1	1

SEMESTER-VI

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC	BCSPC6010	Computer Networks	3	0	0	3
2	PC	BCSPC6020	Data Analytics	3	0	0	3
3	PC	BCSPC6030	Real Time Systems	3	0	0	3
4	PE	BCSPE6041	Machine Learning	3	0	0	3
		BCSPE6042	Computer Vision				
		BCSPE6043	Multimedia Computing				
		BCSPE6044	Internet Working Technology				
		BCSPE6045	Web Designing				
		BCSPE6046	Software Quality Assurance & Management				
5	OE	BCSOE6051	Renewable Energy Sources	3	0	0	3
		BCSOE6052	Information theory and coding				
		BCSOE6053	Air & Noise Pollution				
PRACTICAL / SESSIONAL							
6	PC	BCSPC6110	Computer Networks Laboratory	0	0	2	1
7	PC	BCSPC6120	Data Analytics Laboratory	0	0	2	1
8	PC	BCSPC6130	Advanced Laboratory-II	0	0	4	2
9	EC	BTPEC6160	#Soft Skill and Employability Skill	0	0	2	1
TOTAL				**15**	**1**	**10**	**20**

#To be conducted by the Training & Placement Department of the College.

Course Code	Course Title	L	T	P	C	QP
BCSPC6010	**Computer Networks**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To discuss the digital data communication techniques

CEO2: Gain knowledge on basic concepts of data communication layers, protocols and performance

CEO3: Understand a few representative protocols and network components

CEO4: To introduce the functions of different layers from deployed examples

Course Outcome: At the end of the course, the student will be capable of

CO1	At the end of the course the students will be able to:
CO2	Describe the hardware and software commonly used in data communications
CO3	Analyse the services and features of various layers of data networks
CO4	Design, implement and analyze simple networks that need data communication.

UNIT:1 **(12 Hours)**

Overview of Data Communications and Networking.

Networks models – TCP/IP Protocol Suite , OSI model – Layers in OSI Digital Transmission: Line coding, Block coding, Sampling, Transmission mode. Analog Transmission: Modulation of Digital and Analog Data; Transmission Media: Guided Media, Unguided media (wireless) Circuit switching: Circuit switching (Data gram Networks and Virtual circuit networks)

UNIT:2 **(12 Hours)**

Data Link Layer

Error Detection and correction: Types of Errors, Detection, Error Correction Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC. Point-to –Point Access: PPP Point –to- Point Protocol, PPP Stack, Multiple Access Random Access, Controlled Access, Channelization.

UNIT:3 **(10 Hours)**

Local area Network: Ethernet. Traditional Ethernet, Fast Ethernet, Gigabit Ethernet. Token bus, token ring Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

Network Layer:

Host to Host Delivery: Internetworking, addressing and Routing Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6

UNIT:4 **(10 Hours)**

Transport Layer: Process to Process Delivery: UDP; TCP congestion control and Quality of service. **Application Layer :** Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

TEXT BOOKS:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

Ref. Books:

1. Computer Networks: A system Approach: Larry L, Peterson and Bruce S. Davie, Elsevier, 4th Ed
2. Computer Networks: Natalia Olifer, Victor Olifer, Willey India
3. Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson, 9th Ed. 4. Data communication & Computer Networks: Gupta, Prentice Hall of India Network for Computer Scientists & Engineers: Zheng, Oxford University Press

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) COMPUTER NETWORKS												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3									
CO2		3	3									
CO3		3	3									
CO4		3	3		3							

COMPUTER NETWORKS LAB
(Sub. Code: BCSPC6110)

List of Experiments:

1. Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of network devices in detail
3. Implement Sub-netting concept using Network tool
4. Write a program to find out class of a given IP address, sub-net mask, first & last IP address of that subnet
5. Creating a network by implementing different topologies through Lan Trainer Software supported by Netsim.
6. To create scenario and study the performance of CSMA/CD protocol through simulation.
7. To create scenario and study the performance of token bus and token ring protocols through simulation
8. Implementation and study of stop and wait protocol through analysis
9. IP Addressing, Static and Dynamic Routing
10. Implementation and study of Goback-N and selective repeat protocols through analysis
11. Socket Programming, Network Management/ Monitoring Tools

Course Code	Course Title	L	T	P	C	QP
BCSPC6020	**Data Analytics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Provide an insight into Data pre-processing, summarization, and visualization techniques.
CEO2: Teach role of data analytics in business decision making.
CEO3: Teach Model building and validation using various techniques.

Course Outcome: At the end of the course, the student will be able to

CO1	Understand and build regression models and use them for prediction
CO2	Analyze data to infer underlying patterns and formulate recommendations.
CO3	Outline the scope and limitations of several state-of-the-art data analytics methods.
CO4	Implement different data analytics models in a business environment.

UNIT:1 **(10 Hours)**

Predictive Analytics: Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression , Linear Discriminate Analysis , Logistic regression, Perception learning algorithm.

UNIT:2 **(10 Hours)**

Neural Networks (NN), Support Vector Machines (SVM) and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest–Neighbor classifiers (Image Scene Classification).

UNIT:3 **(10 Hours)**

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis.

Inferential Statistics and Prescriptive analytics Assessing Performance of a classification Algorithm (t-test, McNemar's test, Paired t-test, paired F-test), Analysis of Variance, Creating data for analytics through designed experiments. Introduction to big data and Challenges for big data analytics.

UNIT:4 **(10 Hours)**

Implementation of following methods using R or Mat lab (One of the class tests with a weight age of 15 marks be used to examine these implementations): Simple and multiple linear regression, Logistic regression, Linear discriminate analysis, Ridge regression, Cross-validation and boot strap, Fitting classification and regression trees, K-nearest neighbors, Principal component analysis, K-means clustering.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1.Trevor Hastie, Robert Tibshirani,Jerome Friedman , The Elements of Statistical Learning-Data Mining, Inference,and Prediction,Second Edition , Springer Verlag, 2009.
2. G.James,D.Witten,T.Hastie,R.Tibshirani-An introduction to statistical learning with applications in R,Springer,2013.
3 E.Alpaydin, Introduction to Machine Learning, Prentice Hall Of India,2010.

Ref. Books:

1.C.M.Bishop –Pattern Recognition and Machine Learning,Springer,2006
2. L.Wasserman-All of statistics

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) DATA ANALYTICS												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3	2									
CO3	3	3	3									
CO4	3	2	3	2	2							

DATA ANALYTICS LAB USING R
(Sub. Code: BCSPC6120)

1. Installing R on personal machines. Retrieving R packages. Basics of R, R Studio.
2. Basic data types and operations: numbers, characters and composites.
3. Vectors, creating sequences, common functions.
4. Importing tabular data. Simple summaries of categorical and continuous data.
5. More on data frames and lists. Writing functions in R. If/else statements.
6. A common data cleaning task. For loop, while loops. Using apply () to iterate over data. Using with () to specify environment.
7. Testing for differences in means between two groups QQ plots Tests for 2x2 tables plotting confidence intervals.
8. Linear regression, Diagnosing and interpreting regression.
9. Multiple regression, Diagnosing and interpreting regression.
10. Interpreting categorical variables in regression.
11. Case study.
12. Project work.

Course Code	Course Title	L	T	P	C	QP
BCSPC7020	**Real Time System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: The primary goal of this course is to meet the basics of real-time systems and enable the students with the knowledge and skills necessary to design and develop embedded applications by means of real-time operating systems.

Course Outcome: At the end of the course, the student will be capable of

CO1	Use the multitasking techniques in real-time systems.
CO2	Use real time scheduling policies in applications
CO3	Design embedded applications using RTOS.
CO4	Use RTOS software mechanisms

UNIT:1 **(12 Hours)**

Introduction: What is real time, Applications of Real-Time systems, a basic model of Real Time system, Characteristics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modelling timing constraints (Using Automata).

Real-Time Task Scheduling: important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Some issues Associated with RMA. Issues in using RMA practical situations.

UNIT:2 **(12 Hours)**

Handling Resource Sharing and dependencies among Real-time Tasks: Resource sharing among real-time tasks. Priority inversion. Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP). Priority Ceiling Protocol (PCP). Different types of priority inversions under PCP.Important features of PCP. Stack based PCP and PCP in Dynamic Priority System, Some issues in using a resource sharing protocol. Handling task dependencies.

Scheduling Real-time tasks in multiprocessor and distributed systems: Multiprocessor task allocation, Dynamic allocation of tasks, Minimization of total communication cost. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization

UNIT:3 **(10 Hours)**

Real-time Databases: Example applications of Real-time databases. Review of basic database concepts, Real-time databases, Characteristics of temporal data. Concurrency control in real-time databases. Commercial real-time databases. Real-time Communication: Examples of applications requiring real-time communication, Basic concepts, Real-time communication in a LAN. Soft Real-time communication in a LAN. Hard real-time communication in a LAN. Bounded access protocols for LANs. Performance comparison, Real-time communication over packet switched networks. QoS framework, Routing, Resource reservation, Rate control, QoS models.

UNIT:4 **(8 Hours)**

Commercial Real-time operating systems: Time services, Features of a Real-time operating system, UNIX as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system, POSIX, A survey of contemporary Real-time operating systems. Benchmarking real-time systems.

Case study: RTLinux, Windows CE

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books 1Real-time Systems Theory and Practice by Rajib Mall, Pearson Publication,2008.

Ref. Books 1.Jane W. S. Liu, Real-Time Systems, Pearson Education, 2000.
2. C.M. Krishna and K.G. Shin, Real-Time Systems, TMH.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) REAL TIME SYSTEM												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1		1	1					
CO2	1	2	1	1		1	1					
CO3	1	2	2	1		1	1	1	2	1	3	1
CO4	2	3	2	2	3	2	1	2	2	2	3	2

Course Code	Course Title	L	T	P	C	QP
BCSPE6041	**Machine Learning**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Introduce Basics of Matrices, Random Variables and Distributions relevant for the study of Machine Learning Techniques

CEO2: Formulate a well defined machine learning problem with clear Metrics

CEO3: Familiarize with techniques for Dimensionality reduction and Computational Efficiency

CEO4: Understand the notions of Hypotheses Space, Hypotheses Structure and Search

Course Outcome: At the end of the course, the student will be able to

CO1	List different categories of Data attributes, Dimensions, Sample sizes
CO2	Understand and Apply Supervised, Unsupervised Learning techniques
CO3	Differentiate classifications based on Logistic and Linear Regression and Function Estimation
CO4	Produce Rules and Associations for impactful recommendations from data

UNIT:1 **(14 Hours)**

Introduction: Learning Problems ,Designing Learning systems, Perspectives and Issues ,Concept Learning ,Version Spaces and Candidate Elimination Algorithm ,Inductive bias ,Decision Tree learning ,Representation ,Algorithm, Heuristic Space Search.

Analytical learning and reinforced learning: Perfect Domain Theories ,Explanation Based Learning, Inductive, Analytical Approaches ,FOCL Algorithm, Reinforcement Learning, Task – Q-Learning, Temporal Difference Learning

UNIT:2 **(12 Hours)**

Neural networks and genetic algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

UNIT:3 **(12 Hours)**

Bayesian and computational learning: Bayes Theorem ,Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier ,Gibbs Algorithm, Naïve Bayes Classifier ,Bayesian Belief Network ,EM Algorithm ,Probably Learning ,Sample Complexity for Finite and Infinite Hypothesis Spaces ,Mistake Bound Model.

UNIT:4 **(10 Hours)**

Instant based learning and learning set of rules: K- Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Sequential Covering Algorithms, Learning Rule Sets, Learning First Order Rules, Learning Sets of First Order Rule, Induction as Inverted Deduction ,Inverting Resolution.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books 1 Tom M. Mitchell,(2013), Machine Learning, McGraw-Hill Education (INDIAN EDITION)

Ref. Books 1 Ethem Alpaydin, (2013), Introduction to Machine Learning, 2nd Ed., PHI Learning Pvt. Ltd.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
MACHINE LEARNING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2	2									
CO3	3	3	2									
CO4	2	3	3									

Course Code	Course Title	L	T	P	C	QP
BCSPE6042	**Computer Vision**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To create an awareness of the imaging fundamentals in terms of acquisition, storage and display

CEO2: To gain an insight into the mathematical transforms necessary for binary and gray scale images.

CEO3: To study the quality of the image and study the enhancement of the images in spatial and frequency domains

CEO4: To translate the techniques of gray scale images to 3D/colour images

Course Outcome: At the end of the course, the student will be able to

CO1	Understand and Identify typical defects in an image and apply a suitable technique for enhancing the image by removing the defect.
CO2	Interpret and apply methods to automatically extract regions of interest in binary, grayscale or color images.
CO3	Understand and apply different image processing algorithms for different applications
CO4	Identify hardware available for acquisition and viewing of images and infer a suitable imaging modality for a given application.

UNIT:1 **(10 Hours)**

Introduction to Computer Vision: A brief history of computer vision, the digital camera, Point operators, Linear filtering, Neighborhood operators, basics of frequency domain processing

UNIT:2 **(10 Hours)**

Feature detection and matching and segmentation: points, lines, split and merge, mean-shift ,Introduction to photography

UNIT:3 **(12 Hours)**

Computational photography: Photometric calibration, high dynamic range imaging, super resolution and blur removal, basics of image matting and texture analysis

UNIT:4 **(14 Hours)**

Stereo and 3D reconstruction – stereo: an introduction, epipolar geometry, sparse and dense correspondence, local methods, feature tracking and optical flow , **Recognition:** Object detection, face recognition, category recognition, context and scene understanding

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:1. "Computer Vision: Algorithms and Applications", Richard Szeliski, 2nd Edition, Springer, 2010.
2. "Computer Vision – A Modern Approach", Forsythe and Ponce, 2nd Edition Pearson, 2011.
3. "Dictionary of Computer Vision and Image Processing", R. B. Fisher, T. P. Breckon, K. Dawson Howe, A. Fitzgibbon, C. Robertson, E. Trucco, C. K. I. Williams.Chichester, West Sussex : John Wiley & Sons Inc., 2014

Ref. Books 1

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
COMPUTER VISION

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	3	3	2									
CO3	3	3	3									
CO4	3	1	3									

Course Code	Course Title	L	T	P	C	QP
BCSPE6043	**Multimedia Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Teach the basic concepts of Multimedia and Hypermedia, World Wide Web and Overview of the Multimedia Software Tools. Exploring multimedia applications.

CEO2: Train students to Understand Graphics and Image Data Representation, Color in Image and Video and types of Video Signals and Basics of Digital Audio.

CEO3: Teach various text, image and video compression standards.

CEO4: Identify the current and future issues related to multimedia technology.

Course Outcome: At the end of the course, the student will be capable of

CO1	Apply different compression techniques depending on the multimedia object streams; interpret the various standards for multimedia communications & their features.
CO2	Demonstrate multimedia and its applications to potential clients.
CO3	Identify and describe the function of the general skill sets in the multimedia industry.
CO4	Identify the basic hardware and software requirements for multimedia development and playback.
CO5	Design and develop applications and exercise proper design choices and meet Quality of Service requirements.

UNIT:1 **(14 Hours)**

Introduction: Branch-overlapping Aspects of Multimedia, Content, Global Structure.

Media and Data Streams: Medium, Main properties of a multimedia stream, Multimedia System Definition, combination of media, Independence, Computer-supported Integration, Communication system.

UNIT:2 **(12 Hours)**

Multimedia: Traditional Data Streams Characteristics, Data stream Characteristics for Continuous media.

Sound/Audio: Basic Sound Concepts, Speech.

Images and Graphics: Basic concepts, Computer Image processing.

Video and Animation: Basic concepts, Television, Computer-based Animation, Data compression.

UNIT:3 **(12 Hours)**

Data Compression: Storage space, Coding Requirement, Basic Compression Techniques JPEG.

Multimedia Operating System: Introduction, Real time, Resource Management, Process Management, File system, Additional operating System Issues.

UNIT:4 **(10 Hours)**

Multimedia Communication System: Application subsystem, Transport Subsystem, quality of Service and Resource Management.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books1: Ralf Steinmetz and Klara Nahrstedt.m Multimedia: Computing, Communications Applicatios, Pearson Education, New Delhi 2006.

Ref. Books :

1. P.K. Andleigh – Multimedia Systems Design, PHI, New Delhi-2005.
2. R. Parekh – Principles of Multimedia, TMH, New Delhi -2006.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) MULTIMEDIA COMPUTING												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									
CO2	1	1	3	2	2							
CO3	3	1	3	1	2				2	3	1	
CO4	2	3	2	2	3		1	1	2	2	3	1

Course Code	Course Title	L	T	P	C	QP
BCSPE6045	**Web Designing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To teach students HTML,HTML5 and CSS for designing WebPages

CEO2: To introduce students to the basics of JavaScript as a programming language

CEO3: To familiarize students with the Document Object Model and enable them to create dynamic WebPages that react to user input

CEO4: To teach students about installing and configuring Apache Server and incorporating backend support for their web pages

CEO5: To familiarize students with JQuery & Bootstrap.

Course Outcome: At the end of the course, the student will be capable of

CO1	Design visually appealing websites using HTML, CSS
CO2	Design solutions for programming questions using JavaScript
CO3	Setup a web server and host a website with backend support
CO4	Use Bootstrap and JQuery to enhance the functionality of their websites

UNIT:1 **(12 Hours)**

Introduction: Internet, WWW, Web Servers & Browsers, URLS, MIME, http **HTML, HTML5 & CSS:** Basic Markup, Images, Hyperlinks, List, Tables, Forms, DataList, Canvas, Audio & Video, Geo-location, Local Storage, Web Workers, Offline Web Applications, Drag and Drop.

UNIT:2 **(12 Hours)**

JavaScript: Introduction to client side scripting, JavaScript Basics, Screen Input & Keyboard Output, Functions, Objects, Inheritance, hoisting ,Arrays JavaScript Objects, Accessing & Modifying DOM, Events & Event Handlers - load, mouse, Synthetic Events, key and form related events, event bubbling, cookies. **Apache:** httpd server, request response formats Basics, Configuration, Debugging, htaccess.

UNIT:3 **(12 Hours)**

PHP: Basics, File Handling & System Calls, Strings & Regular Expressions, Arrays, Cookies, Sessions, Functions, Classes Database Access. **Bootstrap:** Grid Systems, Layout, Tables & Forms, Buttons & Images, progress bar, navigations

UNIT:4 **(10 Hours)**

JQuery : Usage, Selecting DOM Elements, Getting and Setting Attributes , Changing Styles.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books 1

1. "Learning PHP, MySQL, JavaScript, CSS & HTML5", Robin Nixon, O'Reilly, 3rd Edition, 2014.
2. "Programming The World Wide Web", Robert W. Sebesta, Pearson, 7th Edition, 2013.
3. "HTML5 Up and Running", Mark Pilgrim, O'Reilly, 1st Edition, 2012.
4. "W3 Schools", http://www.w3schools.com

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
WEB DESIGNING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	3		1				2			
CO2		3	2	1								
CO3	2				2							
CO4		2			2							

Course Code	Course Title	L	T	P	C	QP
BEEOE6051	**Renewable Energy Sources**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Write theory of sources like solar, wind and also experiments of same.

CEO2: Analyze operating conditions like stand alone and grid connected of renewable sources,

CEO3:Reproduce different Storage Systems, concept of Integration and Economics of Renewable Energy System

Course Outcome: At the end of the course, the student will be capable of

CO1	To develop fundamental understanding about Solar Thermal and Solar Photovoltaic systems.
CO2	To provide knowledge about development of Wind Power plant and various operational as well as performance parameter/characteristics.
CO3	To explain the contribution of Biomass Energy System in power generation.
CO4	To teach different Storage systems, Integration and Economics of Renewable Energy System.

UNIT:1 **(06 Hours)**

Solar Thermal: Solar radiation at the earth's surface, Solar constant, Spectral distribution, Extraterrestrial Radiation, Solar Terrestrial Radiation, Solar radiation geometry, Computation of cosθ for any location having any orientation, Empirical equations for predicting the availability of solar radiation: Monthly average daily and hourly global and diffuse radiation, Beam and Diffuse radiation under cloudless skies, Solar radiation on tilted surfaces : a)Beam radiation, b)Diffuse radiation, c)Reflected radiation, d)Flux on tilted surface.

Instruments for measuring solar radiation, Devices for thermal collection and storage, Thermal applications, designing and Performance analysis of liquid flat plate collector for given heat removal factor and loss coefficient. Introduction to concentrating solar power (CSP) plants using technologies like a) Parabolic troughs b) Linear Fresnel reflector, c) Paraboloid Dish, etc.

UNIT:2 **(06 Hours)**

Solar Photovoltaic: Introduction to family of solar film technology, Single c-Si, Poly c-Si PV Cell, Module and Array, Array Design (factors influencing the electrical design of the solar array) : a) Sun Intensity, b)Sun Angle, c) Shadow Effect, d) Temperature Effect, e) Effect of Climate, f) Electrical Load Matching, g) Sun Tracking, Peak Power Point Operation, Electrical characteristics of Silicon PV Cells and Modules, PV System Components, Efficiency of PV system, MPPT of solar system, PV system designing, PV powered water pumping.

UNIT:3 **(06 Hours)**

Wind Energy System: Power Contained in Wind, Thermodynamics of Wind Energy, Efficiency Limit for Wind Energy Conversion, Maximum Energy obtained for a Thrust-operated converter (Efficiency limit), Design of Wind Turbine Rotor, Power-Speed Characteristics, Torque-Speed Characteristics, Wind Turbine Control Systems: a) Pitch Angle Control, b) Stall Control, c) Power Electronics Control, d) Yaw Control, Control Strategy, Wind Speed Statistics, Statistical Wind Speed

Distributions, Site and Turbine Selection, Extraction of wind energy and wind turbine power. Introduction to Offshore Wind Energy System and its comparison with Wind Energy System,

UNIT:4 **(06 Hours)**

Fuel cell and Storage Systems:

a) Fuel Cells: Operating principles of Fuel Cell, Fuel and Oxidant Consumption, Fuel Cell System Characteristics, Introduction to Fuel Cell Technology and its type, application and limits.

b) Storage systems: Hydrogen storage: Hydrogen production, relevant properties, Hydrogen as an Engine Fuel, methods of Hydrogen storage.

Batteries: Introduction to Batteries, Elements of Electro Chemical Cell, Battery classification, Battery Parameters, Factors affecting battery performance.

Introduction to other storage technologies: pump storage, SMES, compressed air storage

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. S.P. Sukhatme, "Solar Energy", Tata McGraw Hill
2. Mukund R. Patel, "Wind and Power Solar System", CRC Press
3. Tony Burton, Nick Jenkins, David Sharpe, "Wind Energy Hand Book-Second Edition", John Wiley & Sons, Ltd., Publication
4. Godfrey Boyle, "Renewable Energy", Third edition, Oxford University Press
5. Gilbert M. Masters, "Renewable and Efficient Electrical Power Systems", Wiley - IEEE Press, August 2004
6. Chetan Singh Solanki, "Solar Photovoltaics-Fundamentals, Technologies and Applications", PHI Second Edition.
7. H. P. Garg, J. Prakash, "Solar Energy-Fundamentals and Applications", Tata McGraw hill Publishing Co. ltd., First Revised Edition.

Ref. Books :

1. D.P.Kothari, K.C.Singal, Rakesh Rajan,"Renewable Energy Sources and Emerging Technologies", PHI Second Edition
2. Paul Gipe, "Wind Energy Comes of Age", John Wiley & Sons Inc.
   Donald L. Klass, "Biomass for Renewable Energy, Fuels, and Chemicals, Elsevier, Academic Press

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
RENEWABLE ENERGY SOURCES

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	2	1	2	-	-	3
CO2	3	3	3	1	1	2	2	1	2	-	2	3
CO3	3	2	3	3	1	2	2	1	2	-	-	3
CO4	3	3	3	3	3	2	2	2	2	3	2	3

Course Code	Course Title	L	T	P	C	QP
BCVOE6053	**AIR & NOISE POLLUTION**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Identify sampling and analysis techniques for air quality assessment
CO2	Describe the plume behavior for atmospheric stability conditions
CO3	Apply plume dispersion modeling and assess the concentrations
CO4	Design air pollution controlling devices

UNIT:1 **(8 Hours)**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

UNIT:2 **(8 Hours)**

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

UNIT:3 **(10 Hours)**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT:4 **(10 Hours)**

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality .Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

Teaching Methods: Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books:

Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata McGraw Hill, New Delhi, 1996.

Ref. Books:

1. Heumann. W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New York, 1997.
2. Mahajan S.P., "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. "Environmental Engineering", McGraw Hill, New Delhi, 1985.
4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 1998
5. Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw Hill, New Delhi, 1991.
6. Thod Godesh, "Air Quality, Lewis India Edition, 2013.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)

AIR & NOISE POLLUTION

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	1	3	3	2	2	3	2	3
CO2	2	1	3	2	2	3	2	2	2	2	2	2
CO3	1	2		2	3	2				2	2	2
CO4	2	1	3		3	2	2	2	2	2	2	2

Course Code	Course Title	L	T	P	C	QP
BECOE6052	**INFORMATION THEORY AND CODING**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: The participants will learn the basic concepts of information theory and coding, including information, source coding, channel model, channel capacity, channel coding and so on.

CEO2: The main purpose of this course is to help students to complete the understanding of the wireless communication system with other advanced courses in wireless communication.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
CO2	Describe the real-life applications based on the fundamental theory.
CO3	Calculate entropy, channel capacity, bit error rate, code rate, and steady-state probability and so on.
CO4	Implement the encoder and decoder of one block code or convolutional code using any program language.

UNIT:1 **(10 Hours)**

Basic Concepts of Information Theory- The concept of Amount of Information, Average Information, Entropy, Information rate, Mutual information; Shannon's Theorem, Channel capacity; BSC and other channels, Capacity of a Gaussian Channel, Bandwidth – S/N Tradeoff; Introduction to Channel Capacity & Coding; Channel Models, Channel Capacity Theorem, Shannon Limit.

UNIT:2 **(12 Hours)**

Introduction to Error Control Coding- Linear Block Codes- Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, Hamming Code. Cyclic Codes- Description of Cyclic codes, Generator and parity check matrices of cyclic codes, error detection decoding of cyclic codes. BCH Codes- Description of codes; Decoding of BCH codes; Implementation of error connection.

UNIT:3 **(9 Hours)**

Convolution Codes- Encoding of convolution codes; structural properties of Convolution codes; Distance Properties of convolution codes. Automatic Repeat Request Strategies- Stop and wait, Go back and selective repeat ARQ strategies, Hybrid ARQ Schemes.

UNIT:4 **(11 Hours)**

Discrete Messages and information content- The Concept of amount of Information, Average Information, Entropy; Information rate, Source coding to increase average information per bit; Shanon-Fano coding; Huffman source coding algorithm, Lempel Ziv source coding algorithm.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

TEXT BOOKS

1. Information Theory, Coding and Cryptography, Ranjan Bose, TMH Publication
2. Introduction to Error Control Codes, S Gravano, Oxford University Press
3. Digital Communications – Fundamentals and applications, Bernard Sklar, Pearson education Publication, 2ndEdition, 2009.

REFERENCE BOOKS

1. Information Coding Techniques, R. Avudaiammal, Tat McGraw-Hill Education Pvt. Ltd., 2ndEdition New Delhi
2. Information Theory, F.M Reza: McGraw Hill
3. Error Control Coding, Shu Lin& J Costeib:, PHI

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
INFORMATION THEORY AND CODING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1		1	2	2	2	2		2	2
CO2	3	2	2		2	2	2		1	1	2	2
CO3	2	2	2	1	2	2	2		2	1	1	2
CO4	2	1	1	2	2	2			2	2	2	1

Department of
COMPUTER SCIENCE & ENGINEERING

4 Years B.Tech Degree Programme

REGULATION & SYLLABUS 2018

Choice Based Credit System
Outcome Based Assessment

SEMESTER- VII & VIII

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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Affiliated to UGC New Delhi & Biju Patnaik University of Technology, Odisha

GUNUPUR – 765022, Odisha, India

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To render best platform for adequate training and opportunities to work as teams on projects with effective communication skills and leadership qualities and understand professional ethics, social awareness and organizational context in which their engineering skills are utilized.

PEO2: To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.

PEO3: To extend an ability to analyze the need of the society by providing innovative solutions, leading to their personal cum professional growth as an entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: To provide students an understanding of the expectations of industry and practical competence with a broad range of programming language and open source platforms through value added courses.

PSO 2: The ability to analyze and develop computer programs in the areas related to artificial intelligence, big data analytics and cyber security for efficient design of computer-based systems of varying complexity.

PROGRAMME OUTCOMES (POs)

PO-1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3. Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO- 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO- 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO- 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO- 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO- 9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

COURSE STRUCTURE

SEMESTER-VII

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC	BCSPC7010	Computer Graphics	3	0	0	3
2	PC	BCSPC7020	Artificial Intelligence & Expert System	3	0	0	3
3	PE	BCSPE7021	Advanced statistical techniques for analytics	3	0	0	3
		BCSPE7022	Advanced Database System				
		BCSPE7023	Cloud Computing				
		BCSPE7024	Cryptography and Network Security				
		BCSPE7025	Software Testing				
		BCSPE7026	Software Engineering Management				
4	PE	BCSPE7031	Big data Using Hadoop	3	0	0	3
		BCSPE7032	Data Storage Technology & Networking				
		BCSPE7033	Wireless Sensor				
		BCSPE7044	Satellite Communication				
		BCSPE7045	Object Oriented Analysis & Design				
		BCSPE7046	Secure Software Engineering				
5	OE	BCSOE7051	Sensor Technology	3	0	0	3
		BCSOE7052	Advance Automation				
		BCSOE7053	CAD / CAM				
PRACTICAL / SESSIONAL							
6	PC	BCSPC7110	Computer Graphics Laboratory	0	0	2	1
7	EC	BCSPC7150	Mini Project / Projects on Internet of Things	0	0	6	3
8	EC	BCSPC7170	^Summer Internship-II	0	0	2	1
TOTAL				**15**	**0**	**10**	**20**

Course Code	Course Title	L	T	P	C	QP
BCSPC7010	**Computer Graphics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

CEO2: Introduce the use of geometric transformations on graphics objects and their application in composite form.

CEO3: Impart frame extraction with different clipping algorithms and transformation to a graphics display device.

CEO4: Introduce projections and visible surface detection techniques for display of 3D scene on 2D screen and rendering of projected objects to naturalize the scene in 2D view.

Course Outcome: At the end of the course, the student will be capable of

CO1	To ***explain*** the structure of modern computer graphics systems and ***implement*** its primitives
CO2	To ***design, develop*** and ***model*** key algorithms for modeling and .
CO3	Apply Graphics in greater depth to more complex courses like Image Processing, Virtual, Augmented Reality, etc
CO4	To ***visualize*** surface detection and Virtual reality for a better visual effects.

UNIT:1 **(10 Hours)**

Overview of Graphics System: Video Display Units, Raster-Scan and Random Scan Systems, Graphics Input and Output Devices, monitor and work station. Graphics output Primitives: point and line, drawing Algorithms: DDA and Bresenham's, Circle drawing Algorithms: Midpoint Circle and Bresenham's filled area primitives.

UNIT:2 **(12 Hours)**

Two Dimensional Geometric Transformations: Translation, rotation, Scaling, Reflection, Shear, Matrix Representation, Composite Transformations, Transformation between coordinate systems. Window-to- View port Coordinate Transformation. Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland Hodgeman Algorithm).

Three Dimensional Geometric and Modeling Transformations: Translation Rotation, Scaling, Reflections, shear, Composite Transformation. Projections: Parallel Projection and Perspective Projection.

UNIT:3 **(10 Hours)**

Object representation: Spline Representation, Bezier Curves and B-Spline Curves. Fractal Geometry: Fractal Classification and Fractal Dimension. Visible Surface Detection Methods: Back-face Detection, Depth Buffer, A- Buffer, Scan- line Algorithm and Painters Algorithm

UNIT:4 **(12 Hours)**

Light pattern and Illumination Models: Aliasing and Anti aliasing, Half toning, Thresholding and Dithering, Basic Models, Displaying Light Intensities. Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading and Phong Shading.
Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, methods of controlling Animation, Morphing. Virtual Reality: Types of Virtual reality systems, Input and Output Virtual Reality devices

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Computer Graphics with Virtual Reality System, Rajesh K.Maurya, WileyDreamtech.
2. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education

Ref. Books

1. Computer Graphics Principle and Practice , J.D. Foley, A.Dam, S.K. Feiner, Addison, Wesley
2. Procedural Elements of Computer Graphics- David Rogers (TMH)

3. Computer Graphics: Algorithms and Implementations – D.P Mukherjee & Debasish Jana (PHI)
4. Introduction to Computer Graphics & Multimedia – Anirban Mukhopadhyay

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
COMPUTER GRAPHICS

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2		2					1		
CO2	3	3	1	1	3							
CO3	2	2	2	2	3		1	3	2	1		2
CO4	2	1				1		3		1	1	2

COMPUTER GRAPHICS LAB
(Sub. Code: BCSPC7110)

Course Outcome: At the end of the semester student will be able to	
CO1	***Explain*** and implement different types of graphics drawing and scan conversion algorithms.
CO2	***Apply*** the concepts of 2D and 3D Geometrical Transformations
CO3	***Design*** clipping and viewing algorithms
CO4	***Model*** illumination model with surface elimination and shading

1. Implementation of DDA and Bressenham's line drawing algorithm
2. Implementation of Midpoint and Bressenham's circle drawing algorithm
3. Implementation of 2D transformation
4. Implementation of composite 2D transformation
5. Implementation of Cohen Sutherland 2D line Clipping Algorithm
6. Implementation of Sutherland Hodgeman polygon clipping algorithm
7. Implementation of 3D transformation
8. Implementation of 3D composite transformation
9. Implementation of B-spline and Bezier curve
10. Implementation of fractals

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
COMPUTER GRAPHICS LAB.

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	1	2							3
CO2		3	1									
CO3	2		2		3			3			2	
CO4	2	1	3	3		1			1			2

Course Code	Course Title	L	T	P	C	QP
BCSPC7020	**Artificial Intelligence and Expert Systems**	**3**	**1**	**0**	**4**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Provide an introduction to machine intelligence, problem solving, heuristic search

CEO2: Provide an introduction to game playing.

CEO3: Provide and introduction to various knowledge representation techniques, reasoning, and expert systems.

CEO4: Provide an introduction to planning and learning in AI.

Course Outcome: At the end of the course, the student will be able to

CO1	Understand and analyze different AI related state space search techniques.
CO2	Outline and model simple knowledge-based systems.
CO3	Apply knowledge representation techniques and identify algorithms for reasoning with knowledge.
CO4	Identify appropriate planning and learning algorithm to enhance AI problem solving.

UNIT:1 **(12 Hours)**

What is Artificial Intelligence? AI Technique, Level of the Model, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, and Issues in the Design of Search Programs. Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis

UNIT:2 **(14 Hours)**

Knowledge Representation: Representations and Mappings, Approaches to Knowledge Representation, **Using Predicate Logic**: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction. **Using Rules**: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge. **Symbolic Reasoning Under Uncertainty**: Introduction to Non monotonic Reasoning, Logics for Non monotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, and Breadth-first Search. **Weak and Strong Slot-and-Filler Structures**: Semantic Nets, Frames, Conceptual Dependency Scripts, CYC.

UNIT:3 **(10 Hours)**

Game Playing: The Mini-max Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening. **Planning**: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Other Planning Techniques. **Understanding**: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

UNIT:4 **(10 Hours)**

Learning: Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning. **Expert Systems**: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books 1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009

Ref. Books
1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3	2									
CO3	3	3	2									
CO4	3	2										

Course Code	Course Title	L	T	P	C	QP
BCSPE7031	**Advanced Statistical Techniques for Analytics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce more advanced statistical methods that are used in data analysis and social research.

CEO2: Teach students statistical theories and inference techniques with focuses on statistical theories, probability distributions, bi-variate and multivariate analysis.

Course Outcome: At the end of the course, the student will be capable of

CO1	Demonstrate competency on a variety of well-known distributions and the calculations involved.
CO2	Understand the theories of statistical inferences and apply the appropriate models in different settings to solve real-life problems
CO3	Perform statistical inferences involving two or more populations using statistical software
CO4	Design and perform simple and multiple regression analysis using statistical software

UNIT:1 **(12 Hours)**

INTRODUCTION : Analyses, Methods, Techniques, Discussion Items on Statistical Methods ,Discussion Items on Statistical Techniques , Statistical Methods and Analyses Revisited , Concepts of Probability , Laplacian Probability , Relative Frequency, Hypothetical Limiting Relative Frequency, Epistemic Probability , Transition to Approaches to Statistical Analysis

APPROACHES BASED ON RANDOMIZATION ,Populations, Attributes and Responses, Finite, Physically Existing Populations ,Sampling : The Sampling Frame , Population Statistics as Parameters, Simple Random Sampling, Estimation For Simple Random Samples, The Basic Estimators, Properties of the Estimators, Unequal Probability Samples, Obtaining Samples Through the Use of Restricted Randomization, Inclusion Probabilities and Linear Estimators The Overall Generalization , Interval Estimation

UNIT:2 **(12 Hours)**

THE EXPERIMENTAL APPROACH : Scientific Abstraction and Experiments ,The Nested Syllogism of Experimentation , Randomized Treatment Assignment , Quantifying Differences Among ,Permutation Tests, Toward Inductive Inference , Randomization Tests , Experiments Lacking Random ,Experiments With Constructed Units , Random Selection of

STATISTICAL MODELING: Statistical Abstraction: Random Variables, Probability Distributions, Statistical Abstraction.

UNIT:3 **(12 Hours)**

FAMILIES OF DISTRIBUTIONS: Exponential Families and Properties of ,Parameterizations, Exponential Dispersion Families, Exponential Families for Samples ,Location-Scale Families and Properties

MODEL SPECIFICATION: Objectives of Analysis , Additive Error ,Constant Variance ,Linear and Nonlinear Models, Models with Known and Unknown Variance Parameters , Models Based on Response Distributions, Multiple Random Components ,Stochastic ,

ESTIMATION AND INFERENCE: Estimators Based on Sample , Least Squares Estimation , Basic , Modified Likelihood , False Likelihood Functions

UNIT:4 **(02 Hours)**

MODEL ASSESSMENT: Analysis of Residuals, A General Notational Framework, Types of ,Plotting Residuals, Tests With Residuals , Cross Validation : concepts, types , Discrepancy Measures.

BAYESIAN ANALYSIS: Bayesian Paradigms, Strict Bayesian Analysis ,Bayesian Analysis of, Sequential Bayes, Prior Distributions, Exchangeability, Conjugate Priors, Non informative

BASIC ESTIMATION AND INFERENCE: Point Estimation, Interval Estimation, Model, Predictive Inference Simulation of Posterior Distributions, Fundamental Methods and

Principles of Simulation , The Gibbs Sampler , Metropolis Hastings.
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS
Text Books 1 Advanced Statistical Methods Mark S. Kaiser Department of Statistics, Iowa State University, Fall 2005
Ref. Books 1 2

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
ADVANCED STATISTICAL TECHNIQUES FOR ANALYTICS

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1								
CO2	1	2										
CO3	1	2	2	1								
CO4	2	3	2	2								

Course Code	Course Title	L	T	P	C	QP
BCSPE7032	**Advanced Database System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Learn new ways to query

CEO2: Learn new techniques to model data.

CEO3: Become familiar with the expanding role of database technology.

Course Outcome: At the end of the course, the student will be capable of

CO1	***Apply*** and ***customize*** state-of-the-art implementation techniques for single-node database management systems following modern coding practices.
CO2	***Identify*** trade-offs among database systems techniques and contrast alternatives for both on-line transaction processing and on-line analytical workloads.
CO3	***Develop*** and justify design decisions in the context of a high-performance database system.
CO4	***Implement*** and ***evaluate*** complex, scalable database systems, with emphasis on providing experimental evidence for design decisions.

UNIT:1 **(10 Hours)**

Review of Relational Data Model. Reporting and Analytical databases: Data Warehousing, OLAP, SQL Analytical Functions, Case Studies (Postgres, Oracle).

UNIT:2 **(12 Hours)**

Parallel & Distributed Databases and Introduction to NoSQL: Concepts, Parallel and Distributed databases and issues; Emergence of NoSQL databases, Characteristics of NoSQL, Categories of NoSQL systems, CAP Theorem.

UNIT:3 **(14 Hours)**

NoSQL Databases: Document databases with example,(MongoDB, CouchDB); Column Oriented databases with example(Cassandra); Key-Values Stores with example (Riak, Voldemort,etc.); Graph databases with example (Neo4J).

UNIT:4 **(10 Hours)**

Introduction to Big Data: What is Big Data, Hadoop, HDFS, and Spark. Specialty Databases: In-Memory databases for RDBMS (VoltDB) and Key-Value Store (Redis). Specialty databases – Spatial, Temporal, and Deductive.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Ref. Books:

1. "Database System Concepts", Silberschatz, Korth and Sudarshan,6th Edition, McGraw Hill,2013.
2. "Database Management Systems", Raghu Ramakrishnan, 3rd Edition, McGraw- Hill, 2014.
3. "Fundamentals of Database Systems", Elmasri & Navathe, 7th Edition, Pearson Education, 2015.
4. "NoSQL Distilled", Pramod J. Sadalage and Martin Fowler, Addison Wesley, 2012.
5. "Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement", Eric Redmond & Jim R. Wilson, O'Reilly, 2012.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
ADVANCED DATABASE SYSTEM

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1		1						1
CO2	2	3	2	1	2		3					2
CO3	3	2	3		1							1
CO4	3	3		3		2						2

Course Code	Course Title	L	T	P	C	QP
BCSPE7033	**Cloud Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand the rationale behind the cloud computing revolution

CEO2: Introduce various models of cloud computing

CEO3: Understand how to design applications on cloud and the role of security

CEO4: Understand and design distributed systems for scalability

Course Outcome: At the end of the course, the student will be able to

CO1	Understand the technical and business rationale behind cloud computing
CO2	Outline the model of cloud computing to use for solving a particular problem
CO3	Design and Build applications for the cloud and understand the security implications
CO4	Understand and Apply the fundamentals of distributed systems design to cloud computing

UNIT:1 **(12 Hours)**

Cloud Computing: Introduction, Types of cloud: private, public and hybrid cloud, . Hardware and Infrastructure: IaaS, PaaS, SaaS. public vs private clouds, Benefits and challenges of cloud computing, Virtualization : Types of Virtualization, Implementation Levels , Virtualization Structures , Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices ,Virtual Clusters and Resource management – Virtualization for Data-center Automation. role of virtualization in enabling the cloud,

UNIT:2 **(14 Hours)**

Cloud infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources. Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages Benefits and challenges to Cloud architecture, Application availability, performance, security and disaster recovery; next generation Cloud Applications.

UNIT:3 **(12 Hours)**

Cloud service management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g. Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

UNIT:4 **(10 Hours)**

Cloud security: 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. Cloud based service, applications and development platform

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill
2. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978-0521137355],2010
3. Rajkumar Buyya, Christian Vecchiola, S.Tamarai Selvi, 'Mastering Cloud Computing", TMGH, 2013.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) CLOUD COMPUTING												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1									
CO2	3	2	1									
CO3	3	2	3									
CO4	3	3	3									



Course Code	Course Title	L	T	P	C	QP
BCSPE7034	**Cryptography and Network Security**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Provide an overall view of what Computer & Network Security is all about and generate interest in this field to be able to take this as a further specialization area or a career path.

CEO2: Introduce of Perimeter Security (Firewall, IDS, IPSEC, and VPN), Authentication and Access management, Cryptography, Malware, Secure Programming, Applications Security, Security and Privacy Policy.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand about Cryptography and Network Security.
CO2	Design and implement various encryption/decryption algorithms.
CO3	Relate different algorithms to real time application.
CO4	Understand and classify different protocols related to web security.

UNIT:1 **(10 Hours)**

INTRODUCTION & NUMBER THEORY: Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat"s and Euler's theorem-Testing for primality-The Chinese remainder theorem- Discrete logarithms.

UNIT:2 **(14 Hours)**

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY: Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

HASH FUNCTIONS AND DIGITAL SIGNATURES: Authentication requirement–Authentication function – MAC – Hash function – Security of hash function and MAC –MD5-SHA-HMAC–CMAC-Digital signature and authentication protocols–DSS–EIGamal–Schnorr.

UNIT:3 **(12 Hours)**

SECURITY PRACTICE & SYSTEM SECURITY: Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT:4 **(10 Hours)**

E-MAIL, IP & WEB SECURITY: E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IP Security: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3-Exportability-Encoding-Secure Electronic Transaction (SET).

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. "Cryptography and Network Security: Principles and Practice" by William Stallings
2. Cryptography and Network Security"by Behrouz A.Forouzan,Debdeep Mukhopadhya

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) Cryptography and Network Security												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									
CO2	2	3	3									
CO3	2	2	3									
CO4	3	2	3									



Course Code	Course Title	L	T	P	C	QP
BCSPE7035	**Software Testing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Introduce the concepts of Software Quality and types of testing

CEO2: Familiarize the students with different levels of testing

CEO3: Understand the challenges in test management, test automation

CEO4: Gain hands on knowledge of tools, JUnit/JMeter/Selenium/ Bugzilla

Course Outcome: At the end of the course, the student will be capable of

CO1	Apply the concepts of Quality Engineering
CO2	Apply proper testing technique at different phases of development
CO3	Identify difficulties and complexities in Software Quality
CO4	Plan, employ and measure proper Quality approaches applied

UNIT:1 **(10 Hours)**

Basics of software testing and examples: Basic definitions of software testing Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, commission problem, The Simple Automatic Teller Machine (SATM) problem.

UNIT:2 **(10 Hours)**

Decision table-based testing: Decision tables, Test cases for the triangle problem, Test cases for the NextDate function, Test cases for the commission problem, Guidelines and observations. **Data Flow testing:** Definition of Use testing, Slice-based testing, Guidelines and observations. **Levels of testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, separating integration and system testing. **Integration Testing:** A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations, Case study.

UNIT:3 **(14 Hours)**

System testing: Basic concepts of Threads, requirement specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, guidelines for System testing, Atomic System Functions (ASF) testing examples. **Interaction Testing:** Context of interaction, A taxonomy of interactions, Interaction, composition, and Determinism, Client/Server Testing,. **Issues in object-oriented testing:** Units for object-oriented testing, Implications of composition and encapsulation, inheritance and polymorphism, Levels of object-oriented testing, GUI testing, dataflow testing for object-oriented software, Examples. **Class Testing:** Methods as units, Classes as units. **Exploratory testing:** The context-driven school, Exploring exploratory testing with familiar examples, Exploratory and context-driven testing observations. **Model-based testing:** Testing based on models, appropriate models, Use case-based testing, Commercial tool support for model-based testing

UNIT:4 **(12 Hours)**

Object-oriented integration testing: UML support for integration testing, MM-paths for object-oriented software, A framework for object-oriented dataflow and integration testing. **GUI testing:** The currency conversion program, Unit testing, Integration Testing and System testing for the currency conversion program. **Object-Oriented System Testing:** Currency converter UML description, UML-based system testing, State chart-based system testing. **Test-Driven Development:** Test-Driven code cycles, automated test execution, Java and JUnit examples, Pros, cons, and open questions of TDD, Retrospective on MDD versus TDD.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books 1. Paul C. Jorgensen, (2013), *Software Testing, A Craftsman's Approach*ll, 3rd Edition, Auerbach Publications

Ref. Books 1. Aditya P Mathur, (2008), *Foundations of Software Testing*, Pearson,
2. *Software Testing and Analysis – Process, Principles and Techniques*, John Wiley & Sons,

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) SOFTWARE TESTING												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2							1	3
CO2	3	1	1	2		2					3	3
CO3	2	2	2	2							1	2
CO4	3	3	3	3							2	3



Course Code	Course Title	L	T	P	C	QP
BCSPE7041	**Big Data Using Hadoop**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To learn advanced cutting edge and state-of-the-art knowledge and implementation in big data.

CEO2: To read and understand research publications in the technical area of big data, beyond that of the traditional textbook level.

CEO3: To conduct independent project and to equip for scholarly research in big data.

CEO4: To explore the next generation of big data tools and applications, and other advanced topics if time permits.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the principles and design of alternative storage technologies for Big data.
CO2	Understand and Apply different algorithms for processing Big Data using open source Hadoop, HDFS, MapReduce, Hive, Pig, Mahout, etc.
CO3	Understand and classify different computational issues and infrastructure for Big Data
CO4	Understand the impact of big data for business decisions and strategy.

UNIT:1 **(14 Hours)**

INTRODUCTION TO BIG DATA :Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce

INTRODUCTION HADOOP :Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT:2 **(12 Hours)**

HADOOP ARCHITECTURE :Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT:3 **(8 Hours)**

HADOOP ECOSYSTEM AND YARN: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT:4 **(10 Hours)**

HIVE AND HIVEQL, HBASE: Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley,ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
3. Tom White, "HADOOP: The definitive Guide", O Reilly 2012. 6 IT2015 SRM(E&T)
4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.

Ref. Books 1

Course Code	Course Title	L	T	P	C	QP
BCSPE7042	**Data Storage Technology and Networking**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:learning concepts virtualization technologies

CEO2:Storage area network (SAN) and network attached storage (NAS)

CEO3:How to provide storage security

CEO4: Storage infrastructure management processes

Course Outcome: At the end of the course, the student will be capable of

CO1	Implement virtualization technologies
CO2	Provide security to data storage
CO3	Understand the concept behind cloud computing

UNIT:1 **(12 Hours)**

Data Storage Fundamentals, Introduction to enterprise IT infrastructure components, server-storage connectivity, virtualization technologies, storage devices such as magnetic disk drive and solid state drive, and the factors to consider for storage investment

UNIT:2 **(10 Hours)**

Enterprise Storage Solutions Introduction to storage system architecture, RAID, types of storage systems, storage area network, and network attached storage.

UNIT:3 **(10 Hours)**

Business Continuity and Storage Security Introduction to business continuity, data replication, data backup architecture and methods, and an overview of storage infrastructure security.

UNIT:4 **(12 Hours)**

Storage Infrastructure Management, Cloud Computing, and Trends in the Storage Industry Introduction to storage infrastructure management processes, cloud computing and cloud storage, and an overview of the technology trends in the storage industry.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Introduction to Data Storage and Management Technologies, Pramod Prasad
2. The Complete Guide to Data Storage Technologies for Network-centric Computing 1st Edition by Franklyn E. Dailey

Ref. Books 1

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
DATA STORAGE TECHNOLOGY AND NETWORKING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2								2
CO2	2		3		2		2				3	
CO3	1	2	3		1	3			2			

Course Code	Course Title	L	T	P	C	QP
BCSPE7043	**Wireless Sensor**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Develop an understanding of advanced topics in wireless networking technology, including fundamental network design concepts/algorithms and existing network protocols.

CEO2: Acquire competence to analyze the design principles and communication protocols in wireless ad hoc & sensor networks

CEO3: Examine current problems and proposed solutions in wireless ad hoc & sensor networks and design and optimize communication protocols and algorithms in sensor networks.

Course Outcome: At the end of the course, the student will be capable of

CO1	Identify the major issues associated with Ad-hoc/sensor networks.
CO2	Identify various protocols as applicable to applications.
CO3	Analyze the design issues in wireless sensor networks
CO4	Develop ideas for pursuing student projects in wireless sensor networking domain

UNIT:1 **(10 Hours)**

OVERVIEW OF WIRELESS SENSOR NETWORKS

Introduction to wireless sensor networks - Challenges and Constraints - Application of sensor networks - Node architecture - Operating System - Fundamental aspects.

UNIT: 2 **(12 Hours)**

ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT:3 **(04 Hours)**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT : 4 **(12 Hours)**

INFRASTRUCTURE ESTABLISHMENT

Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

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

Ref. Books :

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

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) WIRELESS SENSOR												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2			1						
CO2	3	2	2	1			1				1	
CO3	2	3	2		2							1
CO4	3	3	3	2	1	3	1		3	2	2	



Course Code	Course Title	L	T	P	C	QP
BCSPE7044	**Satellite Communication**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To calculate the received carrier power at the input of earth station receiver or satellite transponder.

CEO2: To design domestic satellite system using small earth station.

Course Outcome: At the end of the course, the student will be capable of

CO1	Define And Describe the dynamics of the satellite.
CO2	Calculate orbital parameters, look angles and learn the operation of launching method.
CO3	Analyze the commands monitoring power systems and developments of antennas.
	Classify different multiple access techniques like TDMA, CDMA, FDMA, DAMA.
CO4	Design antennas of Uplink and down link Frequency of Satellite real time applications
	Judge the impacts of GPS, Navigation, and NGSO constellation design for tracking.

UNIT: 1 **(12 Hours)**

INTRODUCTION TO SATELLITE COMMUNICATION: Orbital mechanics and parameters look angle determination, Launches and Lunch vehicle, Orbital effects in communication system performance. Attitude and orbit control system (AOCS), TT&C, Description of spacecraft System ; Transponders,

SATELLITE LINK DESIGN: Basics of transmission theory, system noise temperature and G/T ratio, Uplink and Downlink design, design of satellite links for specified (C/N) performance.

UNIT:2 **(10 Hours)**

ANALOG TELEPHONE AND TELEVISION TRANSMISSION: Energy dispersal, digital transmission

MULTIPLE ACCESSES: Multiplexing techniques for satellite links, Comprehensive study on FDMA, TDMA and CDMA; Spread Spectrum Transmission and Reception; Estimating Channel requirements, SPADE, Random access

UNIT:3 **(11 Hours)**

PROPAGATION ON SATELLITE: Earth paths and influence on link design; Quantifying attenuation and depolarization, hydrometric & non hydrometric effects, ionosphere effects, rain and ice effects.

SATELLITE ANTENNAS: Types of antenna and relationships; Basic Antennas Theory – linear, rectangular & circular aperture; Gain, pointing loss,

UNIT:4 **(07 Hours)**

EARTH STATION TECHNOLOGY: Earth station design; Design of large antennas – Cassegrain antennas, optimizing gain of large antenna, antenna temperature, feed system for large cassegrain antennas,

DESIGN OF SMALL EARTH STATION ANTENNAS: Front fed Paraboloid reflector antennas, offset fed antennas, beam steering, Global Beam Antenna, equipment for earth station.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Invited Guest lecture/ Demonstration. etc.

Text Books

1. Satellite Communication, T. Pratt, C. Bostian, John Wiley Co, 2nd Edition.
2. Satellite Communication, Principles & Applications, R.N.Mutagi, Oxford University Press, 1st Edition, 2016

Ref. Books

1. Digital Communication with Satellite and Fiber Optic Application, HarlodKolimbins, PHI, Satellite Communication, Robert M. Gagliardi, CBS Publishers
2. Satellitte Communication Systems, Richharia. BSP BOOKS PVT LTD.
3. Satellitte Communication Engg., MichealKolawole, BSP BOOKS PVT LTD

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) SATELLITE COMMUNICATION												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	3	1	1	2	1			2	
CO2	3	3	1	1		2	3		2		1	3
CO3	2	3	2	3	1		3	1	3	2		2
CO4	3	2	2	2					2	1	2	1

Course Code	Course Title	L	T	P	C	QP
BCSPE7045	**Object Oriented Analysis and Design**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Introduce the students to Object Oriented Analysis and Modeling using the Unified Modeling Language (UML)

CEO2: Familiarize them with the models used in UML, including static as well as dynamic \ (behavioural) models

CEO3: Make the students appreciate the importance of system architecture and system design in product development

Course Outcome: At the end of the course, the student will be capable of

CO1	Use UML to model a complex system by defining actors and use cases and constructing class models
CO2	Analyze the dynamics of a system using Activity, Sequence, State, and Process models
CO3	Depict the architecture of a software system by using component and deployment models, and design a database based on a class model
CO4	Use GRASP and SOLID principles in the design of software

UNIT:1 **(10 Hours)**

INTRODUCTION: Complexity- Structure of complex of systems, Inherent complexity of software, attributes of a complex system, Evolution of object models – Foundations of Object model, Elements of Object model – Major elements: Abstraction, Encapsulation, Modularity and Hierarchy- Minor elements Typing, Concurrency, Persistence (5+2)

UNIT:2 **(14 Hours)**

CLASSES AND OBJECTS – Nature of an object- Relationships among objects – Nature of class – Relationship among classes – Interplay of Classes and objects- on building quality classes and objects Classification: Importance of Proper Classification- Identifying classes and objects –Key Abstractions and Mechanisms

METHODOLOGY AND MODELING: Object Oriented methodologies - Introduction, Survey of some Object oriented methodologies – Rumbaugh, Booch, Jacobson ,Patterns, Frameworks, Unified approach

UNIT:3 **(12 Hours)**

UNIFIED MODELING LANGUAGE: Introduction – Diagram Taxonomy, static and dynamic models

CLASS DIAGRAM: Notation- Object diagram, Class interface notation, Binary Association notation, Association Rule, Qualifier, Multiplicity, OR Association, Association Class, N-ary association, Aggregation and Composition, Generalization

USE CASE MODELING: Components of a use case diagram- Use case identification and description-construction

UNIT:4 **(10 Hours)**

UML DYNAMIC MODELING: UML Interaction DIAGRAMS: Sequence Diagrams, Collaboration Diagrams- UML State chart diagram, UML Activity diagram, Implementation diagrams: Component diagram, Deployment diagram

MODEL MANAGEMENT: Packages and Model Organization, UML Extensibility: Model constraints and comments, note, stereotype – UML meta model CASE STUDIES: Object Oriented Analysis process, Object oriented Design process - Automatic Teller Machine

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. Grady Booch, Robert A.Maksimchuk, Michael. W. Engle, Bobbi J. Young, JIM Conallen, Kelli A. Houston "Object Oriented Analysis and Design with Applications", Pearson Education Inc., USA, 2010

2. Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, Singapore, 2008.

Ref. Books

1. Rumbaugh J, Blaha M, Premerlani W, Eddy F and Lorensen W, "Object Oriented Modeling and Design", Prentice Hall of India/ Pearson Education, New Delhi, 2004.

2. Kendall Scott, martin Fowler, "UML Distilled : A brief guide to the standard Object modeling Language ", Addison Wesley, USA, 2009

3. Atul Kahate, "Objetct Oriented Analysis and Design ", Tata McGraw-Hill , New Delhi 2007. 4. Sudha Sadasivam G., " Object-Oriented Analysis and Design", Macmillian India, New Delhi, 2009.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
OBJECT ORIENTED ANALYSIS AND DESIGN

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1				1	1		
CO2	3	1	3	2	1				1	1		
CO3	2	2	3	2	1				1	2	2	3
CO4	3	3	2	3	3	1	1	1	3	2	2	2

Course Code	Course Title	L	T	P	C	QP
BCSPE7046	**SECURE SOFTWARE ENGINEERING**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Students will demonstrate an understanding of the proper contents of a software requirements document for secure software engineering.

CEO2: Students will author a formal specification for secure software systems.

CEO3: Students will be able to identify specific components of a software design that can be targeted for reuse.

CEO4: Students will author a software testing plan and metrics for secure software engineering.

Course Outcome: At the end of the course, the student will be capable of

CO1	Incorporate requirements into secured software development process and test software for security vulnerability
CO2	Identifying vulnerable code in implemented software and describe attack consequences
CO3	Applying mitigation and implementation practices to construct attack resistant software
CO4	Examining features of different security metrics.

UNIT:1 **(10 Hours)**

Why Is Security a Software Issue? Introduction, The problem, Software assurance and software security, Threats to software security, Sources of software insecurity, The benefits of detecting software security defects early, Managing secure software development.

What Makes Software Secure? Defining properties of secure software, How to influence the security properties of software, How to assert and specify desired security properties.

UNIT:2 **(12 Hours)**

Requirements Engineering for Secure Software Introduction, Misuse and Abuse Cases, The SQUARE process model: SQUARE sample outputs, Requirements elicitation, Requirements Prioritization. Secure Software Architecture and Design Introduction, Software security practices for architecture and design: Architectural risk analysis.

Software security knowledge for architecture and design: Security principles, Security guidelines, and Attack patterns.

UNIT:3 **(12 Hours)**

Considerations for Secure Coding and Testing Introduction, Code analysis, Coding practices, Software security testing, Security testing considerations throughout the SDLC. Security and Complexity: System Assembly Challenges Introduction, Security failures, Functional and attacker perspectives for security analysis, System complexity drivers and security, Deep technical problem complexity.

UNIT:4 **(12 Hours)**

Governance, and Managing for More Secure Software Introduction, Governance and security, Adopting an enterprise software security framework, How much security is enough?, Security and project management, maturity of practice.

Security Metrics: Defining security metrics, Diagnosing problems and measuring technical security, Analysis techniques, Organize, aggregate, and analyze data to bring out key insights.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books: 1. Software Security Engineering: A Guide for Project Managers, by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley, 1st edition, 2008.

2. Security Metrics: Replacing Fear, Uncertainty, and Doubt, by Andrew Jaquith, Addison Wesley , 1st edition , 2007.

Ref. Books:

1. Integrating Security and Software Engineering: Advances and Future Vision, by

Haralambos Mouratidis, Paolo Giorgini, IGI Global, 2006.
2. Software Security: Building Security In , by Gary McGraw , Addison-Wesley, 2006
3. The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities, by Mark Dowd, John McDonald, Justin Schuh, Addison-Wesley, 1st edition, 2006
4. Building Secure Software: How to Avoid Security Problems the Right Way by John Viega,Gary McGraw, Addison-Wesley, 2001
5. Writing Secure Code, by M. Howard, D. LeBlanc, Microsoft Press, 2nd Edition, 2003.
6. Exploiting Software: How to break code, by G. Hoglund, G. McGraw, Addison Wesley, 2004.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SECURE SOFTWARE ENGINEERING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	1	1	1			
CO2	3	2	2	3	2	2	1	1	1			
CO3	3	3	3	2	3	2	2	1	1			
CO4	3	3	3	2	3	2	2	2	1			

Course Code	Course Title	L	T	P	C	QP
BAEOE7051	**Sensor Technology**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understanding Sensors and there interaction with environment.
CO2	Clear Idea of Physical Principles of Sensing
CO3	Practical implementation of interfacing sensors with micro-controllers
CO4	Analyze and understand various applications of sensors

UNIT:1 **(08 Hours)**

Sensors Fundamentals and Characteristics Sensors, Signals and Systems; Sensor Classification; Units of Measurements; Sensor Characteristics

UNIT:2 **(14 Hours)**

Physical Principles of Sensing Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements Interface Electronic Circuits Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

UNIT:3 **(10 Hours)**

Sensors in Different Application Area Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors Sensor Materials and Technologies: Materials, Surface Processing, Nano-Technology.

UNIT:4 **(12 Hours)**

Applications of different sensors.

Chemical Sensors: Blood –Gas and Acid –base physiology Electrochemical sensors, Chemical Fibro sensors, Iron-Selective Field-Effect Transistor (ISFET), Immunologically Sensitive Field Effect Transistor (IMFET) , Integrated flow sensor and Blood Glucose sensors.

Optical Sensors: Fiber optic light propagation, Graded index fibers, Fiber optic communication driver circuits, Laser classifications, Driver circuits for solid –state laser diodes, Radiation sensors and Optical combinations

Biomedical Sensors: Sensors Terminology in human body, Introduction, Cell, Body Fluids Musculoskeletal system, Bioelectric Amplifiers, Bioelectric Amplifiers for Multiple input Circuits, Differential Amplifiers, Physiological Pressure and other cardiovascular measurements and devices.

Aerospace Sensor: Laser Gyroscope and accelerometers. Sensors used in space and environmental applications.

Electrodes: –Electrodes for Biophysical sensing, Electrode model circuits, Microelectrodes, ECG, EEG, electrodes ECG signals, waveforms, Standard lead system, Polarization Polarizable, Non polarizable electrodes and body surface recording electrodes. Ultrasonic Transducers for Measurement and therapy – radiation detectors – NIR spectroscopy .

Teaching Method(s): Chalk & Board/ PPT/ Internship/Industry Guest Lecture/ Demonstration.

Text Books :

1. Sensors Hand Book Sabaree Soloman - Sensors Hand Book, McGraw Hill,1998
2. Smith H.M. - Principles of Holography, John Wiley & Sons, New York, 1975
3. J.G. Webster Medical instrumentation Application and Design, Houghton Mifilin Co. 2004

Reference Book:

1. Carr and Brown - Introduction to Medical Equipment Technology, Addison Wesley. 1999
2. Culshaw B and Dakin J (Eds) Optical Fibre Sensors, Vol. 1 & 2 Artech House, Norwood. (1989)-
3. P. Garnell– Guided Weapon Control Systems – Pergamon Press. 1980

4. J. Fraden, Handbook of Modern Sensors: Physical, Designs, and Applications, AIP Press, Springer
5. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
6. Mechatronics- Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SENSOR TECHNOLOGY

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	1	3	3	2	2	3	2	3
CO2	2	1	3	2	2	2	2	2	2	2	2	2
CO3	1	2		2	3	2				2	2	2
CO4	2	1	3		3	2	2	2	2	2	2	2

Course Code	Course Title	L	T	P	C	QP
BAEOE7053	**ADVANCE AUTOMATION**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the current voltage characteristics of semiconductor devices
CO2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
CO3	Design and analyze of electronic circuits,
CO4	Evaluate frequency response

UNIT:1 **(09 Hours)**

Process Control: Introduction: Process Definition, Feedback Control, PID Control, Multi variable Control. (Chapter 1 of Text Book 1)

PID Controller Tuning: Introduction, Zeigler-Nichols Tuning Method (Based on Ultimate Gain and Period, and Process Reaction Curve), Digital PID Controllers. (Chapter 13 of Text Book 2)

UNIT:2 **(10 Hours)**

Special Control Structures: Cascade Control, Feed forward Control, Feed forward-Feedback Control Configuration, Ratio Control, Selective Control, Adaptive Control, Adaptive Control Configuration. (Chapter 10 and 11 of Text book 3)

Actuators: Introduction, Pneumatic Actuation, Hydraulic Actuation, Electric Actuation, Motor Actuators and Control Valves. (Chapter 8 of Text Book 1)

UNIT:3 **(09 Hours)**

Industrial Automation: Programmable Logic Controllers: Introduction, Principles of operation, Architecture, Programming (Programming Languages, Ladder Diagram, Boolean Mnemonics) (Chapter 5 of Text Book 1)

UNIT:4 **(10 Hours)**

Distributed Control: Distributed vs. Centralized, Advantages, Functional Requirements, System Architecture, Distributed Control Systems (DCS), Communication options in DCS.

Real-time Programming: Multi-tasking, Task Management, Inter-task Communication, Real time Operating System. (Chapter 9 of Text Book 1)

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Krishna Kant, "Computer-Based Industrial Control", PHI, 2009.
2. M. Gopal, "Digital Control and State Variable Methods" Tata McGraw Hill, 2003.
3. Surekha Bhanot, Process Control: Principles and Applications, Oxford University Press, 2010

Ref. Books:

1. Smith Carlos and Corripio, "Principles and Practice of Automatic Process Control", John Wiley & Sons, 2006.
2. Jon Stenerson, "Industrial Automation and Process Control", Prentice Hall, 2003.
3. C. Johnson, "Process Control Instrumentation Technology", PHI, New Delhi
4. D.R. Coughnowr, "Process System analysis and Control", McGraw Hill.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
ADVANCE AUTOMATION

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	1	3	2	2	2	1	3
CO2	2	2	2	2	2	1	2	2	2	2	1	3
CO3				2	1	2				1	2	
CO4	2	2	2	2	2	1	2	2	2	2	1	3

Title of the Subject						
Subject Code		L	T	P	C	QP
BMEPE6044	**CAD / CAM**	**3**	**0**	**0**	**3**	

Pre -Requisite:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the basic fundamentals of computer aided design and manufacturing and to learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.
CO2	To understand the different geometric modeling techniques like solid modeling, surface modeling, feature based modeling etc. and to visualize how the components look like before its manufacturing or fabrication.
CO3	To learn the part programming, importance of group technology, computer aided process planning, computer aided quality control.
CO4	To learn the overall configuration and elements of computer integrated manufacturing systems.

UNIT:1 **(14 Hours)**

Fundamentals of CAD: Design process, Applications of computer for design, Creating the Manufacturing Database, The Design workstation, Graphical Terminal, Operator input Devices, Plotters and other devices, Central Processing Unit, Memory types

UNIT:2 **(14 Hours)**

Computer graphics Software and Database: Configuration, Graphics Packages, Constructing the Geometry, Transformations of geometry, Database structure and content, Wire frame versus solid modeling, Constraint– Based modeling, Geometric commands, Display control commands, Editing

UNIT:3 **(14 Hours)**

CAM - Numerical Control and NC Part Programming: Numerical Control, Numerical Control elements, NC Cordinate system, NC motion control system, Manual and Computer Aided programming, the APT language, Miscellaneous Functions, M, Advanced part-programming methods. Problems with conventional NC, NC technology: CNC, DNC, Combined DNC/ CNC system, Adaptive control manufacturing systems, Computer Integrated Manufacturing system, Machine Tools and related equipment, Materials Handling system: AGV, Robots, Lean manufacturing.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1.CAD/CAM Computer Aided Design and Manufacturing, M.P.Goover and E.W.Zimmers, Jr.,Pearson.

2. CAD & CAM, J Srinivas, Oxford University Press

Ref. Books

1. CAD/CAM Theory and Practice, Zeid and Subramanian, TMH
2. CAD/CAM Principles, Practice and Manufacturing Management, McMahon and Browne, Pearson Education
3. CAD/CAM Concepts and Applications, C.R. Alavala, PHI

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
CAD/CAM

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2				1	1	1	1
CO2	3	3	2	2	3				1	1	2	1
CO3	3	3	2	2	3				1	1	2	1
CO4	3	3	2	2	3				1	1	2	1

SEMESTER-VIII

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PE	BCSPE8011	Information retrieval	3	0	0	3
		BCSPE8012	Bioinformatics				
		BCSPE8013	Client server computing				
		BCSPE8014	Parallel computing				
		BCSPE8015	Software for embedded systems				
		BCSPE8016	Software maintenance management				
2	PE	BCSPE8021	Pattern Recognition	3	0	0	3
		BCSPE8022	Human Computer Interface				
		BCSPE8023	Social networking				
		BCSPE8024	Cyber security				
		BCSPE8025	Software project management				
		BCSPE8026	Software usability Engineering				
3	OE	BCSOE8031	Satellite communication	3	0	0	3
		BCSOE8032	Pollution and its control				
		BCSOE8033	Advanced computer graphics and solid modelling				
PRACTICAL / SESSIONAL							
4	EC	BCSEC8150	Major Project / Industrial Project / Startup Training cum Project	0	0	12	6
5	EC	BCSEC8180	Seminar and Technical Writing	0	0	4	2
6	EC	BCSEC8190	Comprehensive Viva-Voce	0	0	4	2
TOTAL				**9**	**0**	**20**	**19**

Course Code	Course Title	L	T	P	C	QP
BCSPE8011	**Information Retrieval**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To understand information retrieval process.

CEO2: To understand concepts of clustering and how it is related to Information retrieval.

CEO3: To deal Storage, Organization & Access to Information Items.

CEO4: To evaluate the performance of IR system.

Course Outcome: At the end of the course, the student will be capable of

CO1	Student should be able to understand the concept of Information retrieval.
CO2	Student should be able to deal with storage and retrieval process of text and multimedia data.
CO3	Student should be able to evaluate performance of any information retrieval system.
CO4	Student should be able to understand importance of recommender system.

UNIT:1 **(12 Hours)**

Introduction to information retrieval: Boolean retrieval, term vocabulary and postings list, index construction and optimization, vector-space model, computing scores, fuzzy string matching, content extraction, introduction to Apache Lucene

UNIT:2 **(10 Hours)**

Web search: Web search basics, economic model of web search, search user experience, web crawling and indices, link analysis, the PageRank algorithm, building a complete search system using Apache (Nutch, Solr, Lucene)

UNIT:3 **(10 Hours)**

Recommender systems: Introduction and taxonomy of recommender systems, collaborative filtering (user-user, item-item), and content based recommenders, evaluation of recommender systems, applications using Apache Mahout.

UNIT:4 **(14 Hours)**

Text Classification and Clustering: Naïve Bayes, Multinomial and Bernoulli models, feature selection, evaluation of classification models, Vector space classification – Rocchio, kNN, SVM classifiers, use of NLP, applications using Apache Mahout , Clustering in information retrieval, clustering algorithms (flat, probabilistic, hierarchical), applications using Apache Mahout

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. **Text Classification and Clustering:** Naïve Bayes, Multinomial and Bernoulli models, feature selection, evaluation of classification models, Vector space classification – Rocchio, kNN, SVM classifiers, use of NLP, applications using Apache Mahout , Clustering in information retrieval, clustering algorithms (flat, probabilistic, hierarchical), applications using Apache Mahout

Ref. Books 1

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
INFORMATION RETRIEVAL

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
CO1	2	1	1		1		1		1	1		
CO2	3	1	3	1	1	3			3	1	2	
CO3	3	3	3	3	1		2		1	3	2	3
CO4	3	3	2	3	2	1	1	1	3	2	2	2

Course Code	Course Title	L	T	P	C	QP
BCSPE8012	**Bioinformatics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce students with Synthesis of DNA and RNA, major databases and applications in Bioinformatics along with classification schema.

CEO2: Study of various data visualization and statistical techniques to discover new patterns in protein structure, through Clustering and Classification

CEO3: Study of various Data Mining and Pattern Matching techniques for knowledge discovery in Bioinformatics Databases through sequence alignment algorithms.

CEO4: Analysis of various simulation tools in Bioinformatics for similarity search and study of prediction algorithms.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand basic DNA and RNA structure, features and classification schema for databases, applications in Bioinformatics.
CO2	Use various statistical concepts and visualization tools to discover new patterns in Protein Structures and analyze randomness in data.
CO3	Explore the various Bioinformatics Databases for knowledge discovery given by Data Mining and Pattern Matching techniques through study of various sequence alignment algorithms.
CO4	Offer appropriate solutions for similarity search through similarity search and prediction algorithms. 5. Understand modeling and simulation in bioinformatics with the help of simulation and statistical protocols, basic drug discovery process.

UNIT:1 **(14 Hours)**

The Central Dogma ,The Killer Application, Parallel Universes, Watson's Definition, Top Down Versus Bottom up, Information Flow, Convergence, Databases, Data Management, Data Life Cycle, Database Technology, Interfaces ,Implementation ,Networks , Geographical Scope, Communication Models ,Transmissions Technology, Protocols, Bandwidth ,Topology ,Hardware, Contents ,Security, Ownership, Implementation, Management

UNIT:2 **(10 Hours)**

The search process, Search Engine Technology, Searching and Information Theory ,Computational methods, Search Engines and Knowledge Management, Data Visualization ,sequence visualization, structure visualization, user Interface, Animation Versus simulation ,General Purpose Technologies.

UNIT:3 **(12 Hours)**

Statistical concepts , Microarrays ,Imperfect Data, Randomness, Variability, Approximation ,Interface Noise, Assumptions ,Sampling and Distributions, Hypothesis Testing, Quantifying Randomness ,Data Analysis ,Tool selection statistics of Alignment, Clustering and Classification ,Data Mining, Methods ,Selection and Sampling ,Preprocessing and Cleaning , Transformation and Reduction ,Data Mining Methods, Evaluation ,Visualization, Designing new queries, Pattern Recognition and Discovery ,Machine Learning ,Text Mining, Tools.

UNIT:4 **(12 Hours)**

Pair wise sequence alignment, Local versus global alignment, Multiple sequence alignment, Computational methods, Dot Matrix analysis ,Substitution matrices, Dynamic Programming ,Word methods, Bayesian methods, Multiple sequence alignment, Dynamic Programming ,Progressive strategies, Iterative strategies, Tools, Nucleotide Pattern Matching, Polypeptide pattern matching, Utilities ,Sequence Databases. Drug Discovery ,components, process, Perspectives ,Numeric considerations, Algorithms ,Hardware, Issues, Protein structure, Ab Initio Method, Heuristic methods, Systems Biolo, Tools, Collaboration and Communications, standards, Issues ,Security, Intellectual property.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education,2003.
2. D. E. Krane and M. L. Raymer, Fundamental Concepts of Bioinformatics, Pearson

Education, 2003. 3. T. K. Attwood and D. J. Parry-Smith, Introduction to Bioinformatics, Pearson Education, 2003. 4. J. H. Zar, Biostatistical Analysis, 4/e, Pearson Education, 1999.
Ref. Books 1

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) BIOINFORMATICS												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
CO1	2	1	1		1		1		1	1		1
CO2	2	1	2	1	1	3		2	3	1	2	
CO3	3	2	3	3	1		2		1	3		3
CO4	2	3	2	2	2	1	1	1	3	2	2	2



Course Code	Course Title	L	T	P	C	QP
BCSPE8013	**Client Server Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Gain Exposure on most common used servers.

CEO2: Understand the concept of client-server development and learn problem solving skills through design scenarios for network environment

CEO3: Develop a client –server based application.

Course Outcome: At the end of the course, the student will be capable of

CO1	Define the underlying concepts in client server development using common access databases
CO2	Devise popular servers with two tier scenarios
CO3	Design and Set up a client /server environment using LAN and WAN Scenarios.
CO4	Describe the concept of middleware, and communication protocols

UNIT:1 **(10 Hours)**

INTRODUCTION : Client Server Computing, Benefits, Evolution of client server computing, Client Server Applications, Components, Classes of Client Server Computing – Categories of Client Server Computing

UNIT:2 **(10 Hours)**

CLIENT/SERVER OPERATING SYSTEMS: Dispelling the myths, Obstacles upfront and hidden, open systems and standards, factors needed for success. Standards setting organizations

UNIT:3 **(14 Hours)**

THE CLIENT AND THE SERVER : Client Hardware and software, Client components, Client Operating Systems, GUI, X windows and Windowing, Database Access Application Logic, Client Software Products, Client Requirements, Server Hardware, Categories, Features classes of Server Machines, Server Environment, Network management environment, network Computing Environment, Network Operating Systems, Server requirements, Platform Independence, Transaction Processing, Connectivity. Server Data Management and Access Tools

UNIT:4 **(12 Hours)**

LIENT SERVER AND INTERNET: Client server and internet, Web client server, 3 tier client server web style, CGI , the server side of web, CGI and State, SQL database servers, Middleware and federated databases, data warehouses, EIS/DSS to data mining, GroupWare Server , what is GroupWare, components of GroupWare.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Dawana Travis Dewire, "Client Server Computing", Tata Mc-Graw Hill Education Pvt. Ltd.,New Delhi, 2003
2. Robert Orfali, Dan Harkey & Jeri Edwards, "Essential Client/Server Survival Guide",second edition, John Wiley & Sons, Singapore, 2003.

Ref. Books:

1. Eric J Johnson, "A complete guide to Client / Server computing", first edition, Prentice Hall, New Delhi, 2001.
2. Smith & Guengerich, "Client /Server Computing", Prentice Hall, New Delhi, 2002
3. James E.Goldman, Phillip T.Rawles, Julie R.Mariga, "Client/Server Information Systems, A Business Oriented Approach", John Wiley & Sons, Singapore, 2000.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) CLIENT SERVER COMPUTING												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	2	2	2									
CO3	1		3									
CO4	1	2	1									



Course Code	Course Title	L	T	P	C	QP
BCSPE8014	**Parallel Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand various models of parallel computations such as threads, OpenMP, MPI, clusters.

CEO2: Develop programs using parallel languages and appreciate parallel compilers using parallel architectures.

Course Outcome: At the end of the course, the student will be capable of

CO1	Design efficient parallel algorithms and applications.
CO2	Analyse the effectiveness of any parallel program.

UNIT:1 **(14 Hours)**

Computer Architecture and Systems: Memory Subsystem & Cache , Shared Memory Systems :Memory Consistency Models , Cache Coherence AND Distributed Memory Systems : Message Passing, Network Topologies , Synchronization , Primitives and Implementation: Locking, Barrier, Semaphore , Probs: Deadlock, Livelock, Starvation, Priority Inv., Race Cond,Architecture : Multicore , Manycore , GPU , Vector Machines , Multithreading.

UNIT:2 **(12 Hours)**

Data/Task Distribution: Load Balancing: Static and Dynamic Graph Partitioning: Algorithms ,Locality in Simulation : cyclic, blocked, block-cyclic data distribution, surface to volume minimization , Exascale challenges : Fault tolerance , Communication (memory hierarchy) , Power management

UNIT:3 **(12 Hours)**

Languages/Libraries : Data Parallel Languages: CUDA, Global Address Space Languages: UPC, Compiler-aided Parallelization: Open MP, Message-Passing Library: MPI, Performance modeling of Networks: PRAM, Alpha/Beta Model, LogP/LogGP, Roofline Model

UNIT:4 **(10 Hours)**

Applications/Algorithms : Dense/Sparse Linear Algebra : Matrix Multiplication (Canon's algorithm, SUMMA, Vasily's study, Gaussian Elimination, LU , Sparse GE/LU, sparse matrix storage ,Autotuning , N-Body/Particle Simulations , Barnes Hut , FMM , Finite Difference Approximations to PDEs , Jacobi, SOR, conjugate gradients, Multigrid , FFT , Structured and Unstructured Grids , AMR , Graph Algorithms ,scans on GPU , pointer-jumping , list ranking , parallel prefix

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. James Demmel, CS267 Applications of Parallel Computers Lectures, 2010,
2. John L. Hennessy and David A. Patterson, Computer Architecture~ A quantitative Approach (Fourth Edition), Morgan Kaufman Publishers, San Francisco, CA, 2007
3. David E. Culler, Jaswinder Pal Singh and Anoop Gupta, Parallel Computer Architecture - A Hardware/Software Approach, Morgan Kaufman Publishers, San Francisco, CA, 1999
4. Jack Dongarra et al., Sourcebook of Parallel Computing, Morgan Kaufman Publishers, San Francisco, CA, 2003

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)

Parallel Computing

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3									
CO2	2	2										
CO3	2	2	3	2	2							
CO4	2	2	1									

Course Code	Course Title	L	T	P	C	QP
BCSPE8015	**Software for Embedded System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To discuss about real-time and quality of service system principles.

CEO2: Develop knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware and wide competence from different areas of technology.

CEO3: To educate students to meet current and future industrial challenges and emerging embedded systems engineering trends.

Course Outcome: At the end of the course, the student will be capable of

CO1	Gain knowledge of architectural aspects, interfacing and programming details for microcontroller
CO2	Familiar with embedded system's hardware components and software tool chain.
CO3	Develop systems with RTOS features like inter process communication, process synchronization techniques, and process scheduling algorithms.
CO4	Design an embedded system, Debug and test it

UNIT:1 **(10 Hours)**

POGRAMMING EMBEDDED SYSTEMS: Embedded Program, Role of Infinite loop, Compiling, Linking and locating ,downloading and debugging, Emulators and simulators processor ,External peripherals, Memory testing ,Flash Memory.

UNIT:2 **(14 Hours)**

OPERATING SYSTEM: Embedded operating system, Real time characteristics, Selection process, Flashing the LED, serial ports, Zilog 85230 serial controlled code efficiency, Code size, Reducing memory usage, Impact of C++.

HARDWARE FUNDAMENTALS: Buses, DMA, interrupts, Built-ins on the microprocessor, Conventions used on schematics, Microprocessor Architectures, Software Architectures, RTOS Architectures, Selecting and Architecture.

UNIT:3 **(10 Hours)**

RTOS : Tasks and Task states, Semaphores, Shared data, Message queues, Mail boxes and pipes, Memory management ,Interrupt routines, Encapsulating semaphore and queues, Hard Real-time scheduling, Power saving.

UNIT:4 **(10 Hours)**

EMBEDDED SOFTWARE DEVELOPMENT TOOLS: Host and target machines, Linkers Locators for Embedded Software, Debugging techniques, Instruction set simulators Laboratory tools, Practical example ,Source code.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. David E.Simon, "An Embedded Software Primer", Perason Education, 2003.
2. Michael Bass, "Programming Embedded Systems in C and C++", Oreilly, 2003.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SOFTWARE FOR EMBEDDED SYSTEM

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
CO1	2	2										
CO2	1	2										
CO3	1	2	3									
CO4	1	2	3		1							

Course Code	Course Title	L	T	P	C	QP
BCSPE8021	**Pattern Recognition**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To study the Pattern Recognition techniques and its applications

CEO2: To learn the fundamentals of Pattern Recognition techniques

CEO3: To learn the various Statistical Pattern recognition techniques

CEO4: To learn the various Syntactical Pattern recognition techniques

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the major concepts and techniques in pattern recognition.
CO2	Identify classes of images.
CO3	Analyze classifying features in images or patterns
CO4	Design various classification algorithm & pattern recognition systems

UNIT:1 **(10 Hours)**

PATTERN RECOGNITION OVERVIEW: Pattern recognition, Classification and Description Patterns and feature Extraction with Examples—Training and Learning in PR systems Pattern recognition Approaches

UNIT:2 **(14 Hours)**

STATISTICAL PATTERN RECOGNITION: Introduction to statistical Pattern Recognition supervised Learning using Parametric and Non Parametric Approaches.

LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING: Introduction—Discrete and binary Classification problems—Techniques to directly Obtain linear Classifiers -- Formulation of Unsupervised Learning Problems—Clustering for unsupervised learning and classification.

UNIT:3 **(10 Hours)**

SYNTACTIC PATTERN RECOGNITION: Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via grammatical inference.

UNIT:4 **(10 Hours)**

NEURAL PATTERN RECOGNITION: Introduction to Neural networks—Feed forward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. Robert Schalkoff, "Pattern Recognition: Statistical Structural and Neural Approaches", John wiley & sons, Inc, 1992.
2. Earl Gose, Richard johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India,.Pvt Ltd, New Delhi, 1996.
3. Duda R.O., P.E.Hart & D.G Stork, " Pattern Classification", 2nd Edition, J.Wiley Inc2001
4. Duda R.O.& Hart P.E., "Pattern Classification and Scene Analysis", J.wiley Inc, 1973.
5. Bishop C.M., "Neural Networks for Pattern Recognition", Oxford University Press, 1995.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
PATTERN RECOGNITION

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2		1								
CO3		3		1	1							
CO4	3	3	3		1							

Course Code	Course Title	L	T	P	C	QP
BCSPE8022	**Human Computer Interface**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To stress the importance of a good interface design.

CEO2: To understand the importance of human psychology in designing good interfaces

CEO3: To motivate students to apply HMI in their day – to – day activities.

CEO4: To bring out the creativity in each student – build innovative applications that are user friendly.

CEO5: To encourage students to indulge into research in Machine Interface Design.

Course Outcome: At the end of the course, the student will be capable of

CO1	Learner will be able to…
CO2	To design user centric interfaces.
CO3	To design innovative and user friendly interfaces.
CO4	To apply HMI in their day-to-day activities.

UNIT:1 **(10 Hours)**

Introduction: Introduction to Human Machine Interface, Hardware, software and operating environment to use HMI in various fields. The psychopathology of everyday things – complexity of modern devices; human-centered design; fundamental principles of interaction; Psychology of everyday actions- how people do things; the seven stages of action and three levels of processing; human error;

UNIT:2 **(14 Hours)**

Goal directed design; Implementation models and mental models; Beginners, experts and intermediates – designing for different experience levels; Understanding users; Modeling users – personas and goals. **GUI** : benefits of a good UI; popularity of graphics; concept of direct manipulation; advantages and disadvantages; characteristics of GUI; characteristics of Web UI; General design principles.

UNIT:3 **(12 Hours)**

perception, Gesalt principles, visual structure, reading is unnatural, color, vision, memory, six behavioral patterns, recognition and recall, learning, factors affecting learning, time. **Interaction styles** menus; windows; device based controls, screen based controls;

UNIT:4 **(10 Hours)**

Communication: text messages; feedback and guidance; graphics, icons and images; colours

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale "Human Computer Interaction", Prentice Hall.
2. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley publication.
3. Alan Cooper, Robert Reimann, David Cronin, "About Face3: Essentials of Interaction design", Wiley publication.
4. Jeff Johnson, "Designing with the mind in mind", Morgan Kaufmann Publication.
5. Donald A. Normann, "Design of everyday things", Basic Books; Reprint edition 2002.

Ref. Books

1. Donald A. Norman, "The design of everyday things", Basic books.
2. Rogers Sharp Preece, "Interaction Design: Beyond Human Computer Interaction", Wiley.
3. Guy A. Boy "The Handbook of Human Machine Interaction", Ashgate publishing Ltd.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) Human Computer Interface												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1	1			1	1		1
CO2	1	3	3	2	1	2	3	2	1	1		
CO3	3	2	1	2	2	3	2		1	2	1	1
CO4	3	3	2	3	3	3	1	1	3	2	2	2

Course Code	Course Title	L	T	P	C	QP
BCSPE8023	**Social Networking**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Provide students background on concept of various types and kinds of Social Networks, their structural properties and related measures

CEO2: Train students to observe and measure unique aspects of network formation and growth of social networks

CEO3: Enable students to understand social phenomena such as diffusion and cascades.

CEO4: Expose students to Strategic Networks, the incentive model for connection formation

CEO5: Expose students to Game theory and Games on Networks , concepts related to strategies and optimality

Course Outcome: At the end of the course, the student will be capable of

CO1	Model a given scenario/problem as a network, evaluate the type and kind of such a network and measure structural properties of that network.
CO2	Apply algorithms to detect communities and decipher phenomena peculiar to social networks such as small worlds and power laws
CO3	Model a social process such as spread of information and diseases using diffusion model.
CO4	Model and analyze strategic networks and measure network properties.

UNIT:1 **(10 Hours)**

Background and Fundamentals of network analysis: Introduction to Networks and Examples, Ego-centric Networks, Exchange Networks, Graph-Theory, Directions and Weights, Adjacency Matrices, homophily, Tie-strengths and structural holes. Representing and Measuring Networks: Degree distribution, diameters, path-lengths, centrality, closures, clustering

UNIT:2 **(10 Hours)**

Models of Network formation: Random Networks, Small World, Growing Random Networks, Growth Models, Distribution of expected degrees, Preferential attachment, Fat tails, Power Laws, Fat Tails, Scale-free networks, Affiliation Networks, Cliques and Cores, Cohesion, Communities and Community Detection Algorithms

UNIT:3 **(12 Hours)**

Implications of Network Structure: Diffusion through Networks:-The Bass Model, Diffusion in Random networks, Giant Components, Models to study disease and information spreads, Cascades and Contagions , Assortativity, Percolation and Robustness of Networks, Effects of communities and centralities on diffusion

UNIT:4 **(14 Hours)**

Strategic Networks and Games on Networks: Economic Game Theoretic Models of Network Formation, Connections Model, Pair-wise Stability, Efficient and Pareto-efficient networks, Externalities and Coauthor Models, Pair-wise Nash Stability, Complements and Substitutes.

Introduction to Games, Reasoning about behavior in a Game, Prisoner's Dilemma, Best response and Dominant Strategies, Nash Equilibrium, Multiple equilibriums: Co-ordination Games, Hawk-Dove Game, Mixed Strategies, Pareto Optimality and Social Optimality.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Ref. Books:
1."Introduction to Social Network Methods", Robert A. Hanneman, University of California Riverside, 2005.
2."Social and Economic Networks", Mathew O Jackson, Princeton University Press, 2008.
3."Networks, Crowds, and Markets: Reasoning About a Highly Connected World", D. Easley and J. Kleinberg, Cambridge University Press, 2010.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SOCIAL NETWORKING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1	1			1	1		1
CO2	3	3	3	2	1	2	3	2	1	1		
CO3	3	2	3	2	2	3	2		1	2	2	1
CO4	3	3	2	3	3	3	1	1	3	2	2	2

Course Code	Course Title	L	T	P	C	QP
BCSPE8024	**Cyber Security**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand the essentials of information security.

CEO2: Learn the algorithms for implementing security

CEO3 To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security

Course Outcome: At the end of the course, the student will be capable of

CO1	Students shall be able to understand what are the common threats faced today
CO2	What is the foundational theory behind information security
CO3	What are the basic principles and techniques when designing a secure system
CO4	How today's attacks and defenses work in practice

UNIT:1 **(14 Hours)**

Introduction to security- Cyber Intrusions and Security: Cyberbullies, Online Reputation Attacks, Reputation Management, Protecting from Cyberbullies, Phishing, Recognizing Phishing trip, Protection from Phisher's hook up, Online Shopping Basics, Hijackers, Ensuring Safe Shopping, Security Tokens, Cookies, Making cookies work for you, tips for staying Safe and Social, Meeting People Online, Liars, Creeps, Cyberstalkers, Protecting yourself from creeps, Internet Monitoring CIA triad-Case studies- security attacks-issues related to social networking – Guidelines

UNIT:2 **(12 Hours)**

METHODS TO SECUREYOURSELF IN THE CYBER WORLD AND SECURE TRANSACTIONS: Why and What of Reversible and Irreversible Cryptographic mechanisms? -Applications of Digital Signature - Good password practices, What is E-commerce?–Online banking security- Online shopping fraud-Guidelines and Recommendations

UNIT:3 **(10 Hours)**

EVERYDAY SECURITY: Connecting your laptop, mobile devices, PDAs to Internet-Managing your browser - Face book Security-E-mail security, Safe guarding from Viruses, Antivirus.

UNIT:4 **(10 Hours)**

CYBER SECURITY LAWS AND COMPETENT AUTHORITIES: Indian IT Act, 2008 - What is Cyber Forensics? – Functions of cybercrime cell ,Responding to a cyber attack

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. "Information Security Awareness Handbook, ISEA, Department of Electronics and Information Technology", Government of India, 2010
2. Cyber Security by Godbole, Wiley India

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
CYBER SECURITY

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	1		1	3					
CO2	2	2	1	1		1	1					
CO3	1	2	2	1		1	1	1	3	1	3	1
CO4	2	3	2	2	3	2	1	2	2	2	3	2

Course Code	Course Title	L	T	P	C	QP
BCSPE8025	**Software Project Management**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To outline the need for Software Project Management

CEO2: To highlight different techniques for software cost estimation and activity planning.

CEO3: At the end of the course the students will be able to practice Project Management principles while developing software.

Course Outcome: At the end of the course, the student will be capable of

CO1	Develop increased awareness in project planning, scheduling, tracking, risk analysis and Project cost estimation.
CO2	Apply the report writing techniques and standards to project report.
CO3	Monitoring the progress of projects and to assess & evaluate the risk of project.
CO4	To identify the factors that influence people's behavior in a project environment and selection of appropriate people for the project and to improve group working.

UNIT:1 **(10 Hours)**

Project evaluation and project planning: Importance of Software Project Management ,Activities Methodologies, types of Software Projects ,Setting objectives ,Management Principles ,Management Control , Project portfolio Management, Cost-benefit evaluation technology , Strategic program Management , Stepwise Project Planning.

UNIT:2 **(12 Hours)**

Project life cycle and effort estimation: Engineering and production stages, inception, Elaboration, construction, transition phases. Process Models, Choice of Process models, Rapid Application development , Agile methods, Extreme Programming ,SCRUM ,Managing interactive processes ,Basics of Software estimation: Effort and Cost estimation techniques, COSMIC Full function points , COCOMO II A Parametric Productivity Model ,Staffing Pattern.

UNIT:3 **(14 Hours)**

Activity planning and risk management and control : Objectives of Activity planning, Project schedules ,Activities Sequencing and scheduling ,Network Planning models , Forward Pass & Backward Pass techniques, Critical path (CRM) method ,Risk identification ,Assessment, Monitoring , PERT technique ,Monte Carlo simulation ,Resource Allocation, Creation of critical patterns, Cost schedules. Framework for Management and control, Collection of data Project termination ,Visualizing progress, Cost monitoring ,Earned Value Analysis, Project tracking ,Change control, Software Configuration Management ,Managing contracts, Contract Management.

UNIT:4 **(10 Hours)**

Staffing in software projects :Managing people , Organizational behavior, Best methods of staff selection, Motivation ,The Oldham, Hackman job characteristic model, Ethical and Programmed concerns, Working in teams, Decision making ,Team structures, Virtual teams , Communications genres ,Communication plans. Process Automation: Automation Building blocks, The Project Environment.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books 1

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki "Effective Software Project Management" – Wiley Publication, 2011.
3. Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
4. Gopala swamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

Ref. Books 1. Royce, "Software Project Management", Pearson Education, 1999.
2. Jalote, "Software Project Management in Practice", Pearson Education, 2002.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SOFTWARE PROJECT MANAGEMENT

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	1	1			
CO2	1	2	2	2	2	1	1	1	1			
CO3	2	2	2	2	3	2	1	2	1			
CO4	1	2	2	3	2	2	1	1	1			

Course Code	Course Title	L	T	P	C	QP
BCSPE8026	**Software Usability Engineering**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce the need for human-computer-interaction study or human-centered software design.

CEO2: To explain usability engineering lifecycle for designing a user-friendly software

CEO3:To familiarize information, interaction and GUI design process for enhancing user-experience:

CEO4: To develop usability evaluation skills for software testing.

Course Outcome: At the end of the course, the student will be capable of

CO1	Justify the need to study human-computer-interaction or human-factors while designing software.
CO2	Discuss the process of designing user-friendly software based on usability engineering guidelines
CO3	Apply interaction design and UI design process in enhancing user-experience of an application.
CO4	Conduct usability evaluation of user-interfaces or software applications.

UNIT:1 **(12 Hours)**

HCI AND USABILITY : What is HCI design? Disciplines contributing to HCI, Psychology of everyday things, Importance of human factors in design, Need Satisfaction curve of technology, Levels of human computer interaction What is Usability? benefits and cost savings, usability slogans, attributes of system acceptability, definition of usability, usability trade-Offs , categories of users and individual user differences, generations of user interfaces, scenario-based usability engineering case study - A Virtual Science Fair.

THE USABILITY ENGINEERING LIFECYCLE: know the user, user-profile questionnaire, field-study◊User research and requirements analysis methods, contextual inquiry and analysis, hierarchical task analysis, ethnography, cultural probe, affinity diagramming, persona, scenarios of use, use cases. setting usability criteria or goals, participatory design (getting users involved),Iterative Design guidelines and heuristic evaluation, prototyping and scenarios , examples of problem scenarios, iterative design, interface evaluation, meta methods. simple and natural dialogue, speak the users' language, minimize user memory,Usability Heuristics load, consistency, feedback, clearly marked exits, shortcuts, good error messages, prevent errors, help and documentation, heuristic evaluation.

UNIT:2 **(8 Hours)**

INFORMATION DESIGN AND INTERACTION DESIGN: Information architecture concepts, stages of action in human-computer, Information design interaction, perceiving information, interpreting information, making sense of information. selecting system goal, planning action sequence, executing action sequence, study of information and interaction design Goals of UID, User Interface Models , conceptual model and mock-ups of GUI,User Interface Design choosing prototyping alternatives - paper prototyping, rapid prototyping, storyboarding, wireframes, Cost/benefit of good interface design , Case Study.

UNIT:3 **(12 Hours)**

USABILITY EVALUATION :Developing usability specifications for evaluation - case study, criteria for user feedback techniques, formative and summative techniques of evaluation heuristic evaluation, user-interface guideline reviews, Usability Inspections (testing without users) cognitive walkthrough, model-based analysis developing usability or test specifications with case study , test: Usability Testing (testing with users) goals and test plans , getting test users, choosing experimenters, ethical aspects of tests with human subjects, test tasks, stages of a test, performance measurement, thinking-aloud testing, usability laboratories, remote evaluation, observation, user satisfaction questionnaire (rating scale), interviews,◊Methods beyond testing system usability scale (SUS), focus groups, logging actual use, user feedback, choosing a methods.

UNIT:4 **(14 Hours)**

USER-INTERFACE AND USABILITY STANDARDS: User benefits, vendor benefits, dangers of standards, principles of good UI design, national international standards, internationalization - international GUI, guidelines for internationalization , localization and multi locale interfaces, UI standards - control standards, window standards, dialog box standards, message box standards, device interaction standards, feedback standards, developing style guides and toolkits , user documentation- manuals, tutorials, information in the interface

RECENT ADVANCES AND TRENDS : Theoretical solutions, technological solutions, CAUSE tools, emerging paradigms of user interaction collaborative systems, ubiquitous computing , intelligent user-interfaces , simulation and virtual reality , case study , usability issues in organizations- case studies , organizational roles and structures , ethics of usability, web analytics.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Nielsen, J. (1994), "Usability Engineering", Elsevier.
2. Rosson, M. B., & Carroll, J. M. (2001), "Usability Engineering: Scenario-Based development of human-computer interaction", Elsevier.
3. Mayhew, D. (1999), "The Usability Engineering Lifecycle: A Practitioner's Handbook for user interface design", Morgan Kaufmann

Ref. Books:

1. Cooper A. et. al. (2007), " The Essentials of Interaction Design", Wiley
2. Cooper, A. (1995)," The Essentials of User Interface Design", IDG Books, New Delhi
3. Schneiderman, B. (2005), " Designing the User Interface", Pearson Education, New Delhi
4. Dix A. et. al.(1993), " Human - Computer Interaction", Prentice Hall, USA

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
SOFTWARE USABILITY ENGINEERING

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1	1			1	1		1
CO2	1	1	3	2	1	2	3	2	1	1		
CO3	3	2	1	2	2	3	2		1	2	1	2
CO4	1	3	2	3	3	3	1	1	3	2	2	2

Course Code	Course Title	L	T	P	C	QP
BCHOE8032	**POLLUTION AND ITS CONTROL**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Explain about the different types of solid waste
CO2	Understand the various collection and disposal method
CO3	Apply the knowledge to utilize solid waste in different way.
CO4	Develop new method for degradation process of solid waste

UNIT:1

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT:2

Industrial wastewater Management: – Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT:3

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling. Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal method

UNIT:4

Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods. Sustainable Development: Definition- elements of sustainable developments- Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability– Industrialization and sustainable development – Cleaner production in achieving sustainability-sustainable development

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1: Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.

2: Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.

Ref. Books: 1. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
POLLUTION AND ITS CONTROL

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	2	-	-	2	-	2
CO2	3	2	2	1	1	1	1	-	-	2	2	3
CO3	3	1	2	1	-	2	-	-	2	1	-	2
CO4	3	2	2	-	-	2	2	-	2	-	-	3

Course Code	Course Title	L	T	P	C	QP
BECOE8031	**SATELLITE COMMUNICATION**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the motion of satellite in the orbit and its link design.
CO2	Compute the coverage angle, angle of visibility and consequently determine the coverage area.
CO3	Demonstrate the impacts of GPS, Navigation, constellation design for tracking and launching with various multiple access techniques like TDMA, CDMA, FDMA, and DAMA
CO4	Relate the coverage area with the beam width of satellite antenna and analyze the propagation on satellite with hydrometric and non-hydrometric effect.
CO5	Design antenna systems to accommodate the needs of a particular satellite system.
CO6	Able to study the design of Earth station and tracking of the satellites.

UNIT:1

INTRODUCTION TO SATELLITE COMMUNICATION: Orbital mechanics and parameters look angle determination, Launches and Lunch vehicle, Orbital effects in communication system performance. Attitude and orbit control system (AOCS), TT&C, Description of spacecraft System ; Transponders,

SATELLITE LINK DESIGN: Basics of transmission theory, system noise temperature and G/T ratio, Uplink and Downlink design, design of satellite links for specified (C/N) performance.

UNIT:2

ANALOG TELEPHONE AND TELEVISION TRANSMISSION: Energy dispersal, digital transmission

MULTIPLE ACCESSES: Multiplexing techniques for satellite links, Comprehensive study on FDMA, TDMA and CDMA; Spread Spectrum Transmission and Reception; Estimating Channel requirements, SPADE, Random access

UNIT:3

PROPAGATION ON SATELLITE: Earth paths and influence on link design; Quantifying attenuation and depolarization, hydrometric & non hydrometric effects, ionosphere effects, rain and ice effects.

SATELLITE ANTENNAS: Types of antenna and relationships; Basic Antennas Theory – linear, rectangular & circular aperture; Gain, pointing loss,

UNIT:4

EARTH STATION TECHNOLOGY: Earth station design; Design of large antennas – Cassegrain antennas, optimizing gain of large antenna, antenna temperature, feed system for large cassegrain antennas,

DESIGN OF SMALL EARTH STATION ANTENNAS: Front fed Paraboloid reflector antennas, offset fed antennas, beam steering, Global Beam Antenna, equipment for earth station.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

TEXT BOOKS

1. Satellite Communication, T. Pratt, C. Bostian, John Wiley Co, 2nd Edition.
2. Satellite Communication, Principles & Applications, R.N.Mutagi, Oxford University Press, 1st Edition, 2016

Ref. Books:

1. Digital Communication with Satellite and Fiber Optic Application, HarlodKolimbins, PHI
2. Satellite Communication, Robert M. Gagliardi, CBS Publishers
3. Satellites Communication Systems, Richharia. BSP BOOKS PVT LTD.
4. Satellites Communication Engg., MichealKolawole, BSP BOOKS PVT LTD

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS) SATELLITE COMMUNICATION												
Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	1	3	3	2	2	3	2	3
CO2	2	1	3	2	2	2	2	2	2	2	2	2
CO3	1	2		2	3	2				2	2	2
CO4	2	1	3		3	2	2	2	2	2	2	2
CO5	3	2	2	3	3	3		3	3		3	
CO6	2	2	2	2		2	2			2	2	2



Course Code	Course Title	L	T	P	C	QP
BMEPE8014	**ADVANCED COMPUTER GRAPHICS AND SOLID MODELING**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To Introduce various Graphics Applications in real world scenario Introduce advanced techniques for creating, manipulating, and editing solid models.

CEO2: Refine solid modeling, assembly modeling, and engineering drawing skills using commercial software.

CEO3: Introduce computer animation as a technical presentation method.

CEO4: To be learn more about 2D, 3D and Curve applications Applying efficient graphics technique to solve engineering problems

Course Outcome: At the end of the course, the student will be capable of

CO1	Explain about graphics primitives and work with coordinate spaces, coordinate conversion, and transformations of graphics objects.
CO2	Analyse line, circle, ellipse and character generation algorithms.
CO3	Explain various 3D projections and current models for curves and surfaces.
CO4	Apply appropriate techniques and by using modern tools, to generate & analyse 3D solid models in order to solve Mechanical Engineering problems.

UNIT:1 **(10 Hours)**

Introduction: Computer I/O devices- Video display devices- Refresh CRT - Raster scan display - Color CRT monitor - Co-ordinate representation - Ggraphic displays in engineering workstations - 2D graphics Transformations- 3D geometry, primitives and transformations

UNIT:2 **(8 Hours)**

Basic raster graphics algorithm for drawing 2D primitive - Output characteristics: Aspect ratio - Line drawing algorithm - DDA algorithm - Circle generation algorithm - Mid point circle algorithm - Ellipse generation algorithm

UNIT:3 **(10 Hours)**

Classification of Geometric Modeling - Wire frame, Surface and Solid Modeling, applications -representation of curves and surfaces - Parametric form - Design of curved shapes- Cubic spline - Bezier curve - B-spline curve - Design of Surfaces - features of Surface Modeling

UNIT:4 **(10 Hours)**

Introduction to 3-D modelling - Generation of various 3D Models through Protrusion - revolve, shell sweep - Creation of various features - Study of parent child relationships - Feature based and Boolean based modeling - Constructive solid geometry.
Standards for computer graphics (GKS) and Data exchange standards: IGES, STEP - Data structures for Entity storage - Data structures for interactive modeling.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Saxena, A., Sahay, B., Computer Aided Engineering Design, Springer, 2005
2. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education

Ref. Books:

1. Anand, V. B., Computer and Geometric Modeling for Engineers, John Wiley & Sons.
2. Hoffmann, C.M., Geometric & Solid Modeling, An Introduction, Morgan Kaufman.
3. Computer Graphics, Z. Xiang, R. A. Plastock, Schaum's Outlines, Mcgraw Hill

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
ADVANCED COMPUTER GRAPHICS AND SOLID MODELING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
CO1	3	2	2	2	3		1		1	1		1
CO2	3	3	2	2	3		1		1	1		1
CO3	3	2	2	2	3		1		1	1		1
CO4	2	2	3	3	3		1		1	1		2