ENGINEERING THIRD YEAR:SEMESTER-2							
Sl. No.	Course Type	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PCC	20CS3201	Cryptography and Networks Security	3	1	0	4
2	PCC	20CS3202	Artificial Intelligence	3	1	0	4
3	PEC	20CS32XX	Elective – II	3	0	2	3
4	PEC	20CS32XX	Elective – III	3	0	2	3
5	OEC	20XX32XX	Open Elective-I	3	0	0	3
6	HSC	EG3283	English-Language communication Skills Lab-I -III	0	0	3	1.5
7	PR	20CS3291	Mini Project	0	0	6	3
8	MC	20CS3203	Career Development Course	2	0	0	0
9		20CS3292	Summer Internship	0	0	6	3
Total				**16**	**0**	**15**	**21.5**
10	20CS3292		Summer Internship	0	0	6	3

LIST OF PROFESSIONAL ELECTIVE COURSES

PROGRAM ELECTIVE COURSES							
Sl. No.	Course Type	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PEC	20CS3121	Data Mining	3	0	0	3
2	PEC	20CS3122	Mobile Application Development	3	0	0	3
3	PEC	20CS3123	Distributed Computing	3	0	0	3
4	PEC	20CS3124	Advanced Computer Architecture	3	0	0	3
5	PEC	20CS3221	Object Oriented Analysis & Design (OOAD)	3	0	0	3
6	PEC	20CS3123	Distributed Computing	3	0	0	3
7	PEC	20CS3223	Real Time Operating System	3	0	0	3
7	PEC	20CS3223	Embedded Systems	3	0	0	3
8	PEC	20CS3225	Digital Image Processing	3	0	0	3
9	PEC	20CS3231	Information Retrieval	3	0	0	3
10	PEC	20CS3232	Software Testing	3	0	0	3
11	PEC	20CS3233	Mobile Computing	3	0	0	3
12	PEC	20CS3234	Data Compression	3	0	0	3
13	PEC	20CS3235	Computer Graphics	3	0	0	3
14	PEC	20CS4141	Data Science	3	0	0	3
15	PEC	20CS4142	Unix and Shell Programming	3	0	0	3
16	PEC	20CS4143	VLSI	3	0	0	3
17	PEC	20CS4144	Soft Computing	3	0	0	3
18	PEC	20CS4145	File Structure	3	0	0	3
19	PEC	20CS4251	Optimization Technique	3	0	0	3
20	PEC	20CS4252	Design Patterns	3	0	0	3
21	PEC	20CS4253	Cloud Computing	3	0	0	3
22	PEC	20CS4254	Block Chain Technology	3	0	0	3
23	PEC	20CS4255	Internet Of Things	3	0	0	3
24	PEC	20CS4257	Computer Vision	3	0	0	3

LIST OF OPEN ELECTIVE COURSES OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

OPEN ELECTIVE COURSES FOR ALL BRANCHES							
Sl. No.	Course Type	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	OEC	20CS4261	Big Data Analytics	3	0	0	3
2	OEC	20CS4262	Biometric Security	3	0	0	3
3	OEC	20CS4263	Human Computer Interaction	3	0	0	3
4	OEC	20CS4264	Cyber Security	3	0	0	3
5	OEC	20CS4265	Robotics	3	0	0	3
6	OEC	20CS4266	Computer Forensics	3	0	0	3
OPEN ELECTIVE COURSES FOR ALL BRANCHES except CSE							
7	OEC	20CSXX71	Object Oriented Programming through Java	3	0	0	3
8	OEC	20CSXX72	Database Management System	3	0	0	3
9	OEC	20CSXX73	Computer Graphics	3	0	0	3
10	OEC	20CSXX74	Distributed Computing	3	0	0	3
11	OEC	20CSXX75	Digital Image Processing	3	0	0	3

ENGINEERING THIRD YEAR: SEMESTER-II

ourse code	Course name	Course Category	L-T-P	Credits
20CS3201	Cryptography and Network Security	PCC	3-1-0	4

Course Learning Objectives:

1. To understand basics of Cryptography and Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threats in the networks.

Course Content:

Unit 1: **(10 Contact hours)**

Introduction to security attacks, services and mechanism, introduction to cryptography - Conventional Encryption: Conventional encryption model, classical encryption techniques - substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers ,Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, AES.

Unit II: **(8 Contact hours)**

Confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation, Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete algorithms.

Unit III: **(7 Contact hours)**

Principles of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption, Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS.

Unit IV: **(7 Contact hours)**

MD5 message digest algorithm, Secure hash algorithm (SHA), Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm, Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security, pretty good privacy (PGP), S/MIME.

Unit V: **(7 Contact hours)**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Unit VI: **(7 Contact hours)**

Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET), System Security: Intruders - Viruses and related threats, IDS.

Learning Resources

Text books:

1. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI.
2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson.

Reference Books:

6. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education.
7. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.

Course code	Course name	Course Category	L-T-P	Credits
20CS3202	Artificial Intelligence	PEC	3-1-0	4

Course Learning Objectives:

1. Definitions of Artificial Intelligence, Different Perspectives, Historical background
2. To understand those elements constituting problems and learn to solve it by various searching techniques
3. To understand those formal methods for representing the knowledge and the process of inference to derive new representations of the knowledge to deduce what to do
4. To understand the notion of planning in AI and some techniques in the classical planning system
5. To understand the notion of uncertainty and some of probabilistic reasoning methods to deduce inferences under uncertainty
6. To understand some of those mechanisms by which an AI system can improve it's behavior through its experience

UNIT I:

Introduction to AI Problems: AI technique, Criteria for success. Problems; Problem Space and Search: Defining the problem as a state space search, Production as a systems, Problem characteristics, Production system characteristics (6 Hours)

Unit II: (6 Hours)

Heuristic Search Techniques: Generate and Test, Hill climbing, Best first search, Problem reduction, Constraint satisfaction, Means ends analysis.

UNIT III **(12 Hours)**

Knowledge Representation: Representation and mappings, Approaches to knowledge representation; Issues in knowledge representation. Using Predicate Logic: Representing simple facts in logic, Representing instance and IS-A relationships, Computable functions and predicates, Resolution, Natural deduction, Forward vs. Backward reasoning.

UNIT IV: (6 Hours)

Different Knowledge Representation Schemes: Semantic nets, Frames, Conceptual dependency, Scripts

UNIT V: (9 Hours)

Natural Language Processing: Overview of linguistics, Grammars and languages, Basic parsing techniques, Transitional networks, Semantic analysis and representation structures, Brief introduction on discourse and pragmatic processing;

UNIT VI: **(6 Hours)**

Expert System Architecture: Characteristic features of expert systems, History, Applications, Rule based system architecture. General Concepts in Knowledge Acquisition: Types of learning, General learning model, Performance measures.

Text Books:

- Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw-Hill, 2009.
- Dan W. Patterson, "Introduction to Artificial Intelligence & Expert Systems", PHI, 1990.

References:

1. Stuart Russel and Peter Norvid, " Artificial Intelligence : A Modern Approach", Pearson Education, 3rd Edition

Year & Sem: E3 & SEM2	Course Code: EG3283	Course Name: ENGLISH LANGUAGE COMMUNICATION SKILLS LAB-III	L – T -P: 0 – 0 – 3	Credits 1.5

Course objectives:

1. To improve interpersonal skills of the students
2. To help the students to write professional letters and reports
3. To practice the etiquettes to be used at workplace
4. To reward hands on experience on managing meetings
5. To imbibe leadership qualities in the students

COURSE CONTENT

UNIT-I: **(06 Contact Hours)**

Professional Presentation - Collecting & Reading the materials to be presented - Analyzing the main points - Summarizing & concluding - Developing PPT - Delivery of the Presentation

UNIT-II: **(06 Contact Hours)**

Report Writing & Writing Professional Emails & Applications – Routine Reports – Investigative Reports - Professional Emails - Formal Letters and Applications

UNIT-III: **(06 Contact Hours)**

Agenda, Meetings, & Minutes - Setting the agenda for a meeting - Managing a meeting - Keynote address & vote of thanks - Publishing the minutes

UNIT-IV: **(06 Contact Hours)**

People skills and small talks (2 minutes) - Talking to professional executives - Talking to colleagues - Talking to the boss - Talking to your team - Talking to the media delegates

UNIT-V: **(06 Contact Hours)**

Corporate Etiquettes - How to introduce & greet - How to raise a question - How to clarify a doubt - How to say "yes" or "no" - Rapport building - Dining & winning - Counseling somebody - How to influence & motivate

UNIT-VI: **(06 Contact Hours)**

Life Skills - Leadership communication - Interpersonal communication - Stress management - Time Management

References:

1. *Business Communication Today*, 12th Edition, Courtland L Bovee & John Thill, Pearson
2. British Council Material on communication
3. Training in Interpersonal Skills: Tips f: Tips for Managing People at Work by Robbins and Hunsaker
4. Soft Skills for Everyone, with CD Paperback –by Jeff Butterfield
5. Communication for business by Shirley Taylor, Pearson

Course code	Course name	Course Category	L-T-P	Credits
20CS3203	Career Development Course	MC	2: 0: 0	0

Course Learning Objectives:

1. To enable the students for their competitive exams
2. To enhance their capability in aptitude and reasoning & programming.
3. To develop their reasoning skill.
4. To prepare them for all type of competitive exams

Course Contents:

Unit I: **(1.5 hours)**

Number system: Base System, Exponents, Factorials, LCM & HCF, Properties of Numbers, Remainders, Successive Divisions

Sequence & Series: Arithmetic Progression, Harmonic Progression, Geometric Progression

Programming in C

Unit II: **(8 hours)**

Arithmetic: Averages, Clocks & Calendars, Simple Interest & Compoud Interest, Mixture & Alligations, Percentages, Profit, Loss & Discounts, Ratio & Proportion, Speed, Time & Distance, Time & Work

Programming in JAVA

Algebra: Binomial Theorem, Complex Numbers, Functions, Higher Degree Equations, Inequalities , Linear Equations, Logarithm, Quadratic Equations

Programming in Phython

Unit III: **(6 hours)**

Geometry: Mensuration, Lines & Angles, Circles, Polygons, Triangles, Co-ordinate Geometry, Trigonometry

Probability & Statistics: Mean, Median & Mode, Permutation & Combination, Probability Set Theory & Venn Diagram

Programming in C++

Unit IV: **(7 hours)**

Logical Reasoning: Logical Sequence, Premise, Assumption & Conclusion, Binary Logic, Blood Relations, Linear & Matrix Arrangement, Seating Arrangement, Coding & Decoding, Statements & Assumptions Puzzles

Analytical Reasoning: Course of Action Fact, Inference & Judgement, Logical Deduction, Statement & Assumption, Strong & Weak Arguments, Syllogism

Unit V: **(4.5 hours)**

Data Interpretation: Charts (Column, Pie & Bar), Tables Graphs (Line & Area), Venn Diagram, Data Sufficiency. Reading Comprehension

Unit VI: **(3 hours)**

Verbal Ability: Cloze Test Error Spotting, Fill in the blanks, Sentence Correction, Word Usage, Para jumbles, Paragraph Completion, Paragraph Summary

Learning resources

Text book:

1. Sarvesh K Verma, *'Quantitative Aptitude Quantum CAT'*, arihant publications
2. Arun Sharma, Meenakshi Upadhyay, *' Verbal Ability and Reading Comprehension'* , McGraw Hill publications
3. Arun Sharma, *'Data Interpretation'*, McGraw Hill publications
4. Arun Sharma, *'Logical Reasoning'*, McGraw Hill publications

Reference books:

1. Nishit K Sinha, 'Logical Reasoning and Data Interpretation', Pearson publications
2. Arun Sharma, *'Quantitative Aptitude'*, McGraw Hill publications

Course Code	Course Name	Course Category	L-T-P	Credits
20CS3221	OBJECT ORIENTED ANALYSIS & DESIGN(OOAD)	PEC	3-0-0	3

Course Learning Objectives:

1. Master the implementation of different Models
2. Be familiar with models,relationships,roles,types and interfaces
3. Demonstrate understanding the abstractions of various system models
4. Demonstrate understanding of various common modeling techniques
5. Implement various object models designing in more than one manner.
6. Choose the appropriate model for a specified application and different mechanisms

Course Content:

UNIT I : Introduction to UML **(6 Contact hours)**
Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.
UNIT II : Basic Structural Modeling **(9 Contact hours)**
Classes Relationships, Common Mechanisms, and diagrams.
Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.
UNIT III: Class & Object Diagrams **(7 Contact hours)**
Terms, concepts, modeling techniques for class & object diagrams
UNIT IV : Basic Behavioral Modeling **(7 Contact hours)**
Interactions, Interaction diagrams, Use cases, Use case diagrams, Activity Diagrams.
UNIT V : Advanced Behavioral Modeling **(8 Contact hours)**
Events and signals, state machines, processes and threads, time and space, state chart diagrams.
UNIT VI :Architectural Modeling **(8 Contact hours)**
Component, Deployment, Component diagrams and Deployment diagrams and case study.

Learning resources:
Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: *'The Unified Modeling Language User Guide'*, Pearson Education.

Course Code	Course Name	Course Category	L-T-P	Credits
20CSXX75	Digital Image Processing	PEC	3-0-0	3

Course Objectives:

1. To describe the image fundamentals and mathematical transforms necessary for image processing.
2. To explain the image enhancement techniques
3. To analyze images in the frequency domain using various transforms.
4. To explain image restoration procedures.
5. To describe Image Compression and Segmentation used in digital image processing.
6. To describe image feature extraction methods.

Course Outcomes:

1. Be able to apply, design and implement solutions for digital image processing problems.
2. Be able to discuss the strengths and limitations of DIP applications in solving problems with both professional peers and lay clients.

Course content:

UNIT I **(8 Content hours)**

Digital image fundamentals – Electromagnetic spectrum and imaging, Image acquisition, image formation. Digitization-sampling and quantization, Resolution-pixel, gray scale, spatial, basic relationship between pixels, Distance measure, Mathematical operations on image, Geometrical and spatial transformation.

UNIT II **(8 Content hours)**

Intensity transformation and spatial filtering: Image enhancement, log transformation, Gamma transformation, Histogram processing, Histogram matching, Special filtering- spatial correlation and convolution, generating spatial filter mask, mage smoothing, Image sharpening-Laplacian filter, Highboost filter. Edge detection- gradient filter, Morphological image processing-erosion, Dilation, opening and closing operations, Boundary extraction, Hole Filling, Extraction of connected components, Thinning, and thickening.

UNIT III **(7 Content hours)**

Image Restoration-Noise model, Restoration-Mean filter, Geometric filter, median filter, adaptive filter, band pass filter, Notch filter, least mean square filters. Color fundamental-RGB color model, CMY color model, HSI color model. Converting RGB to HSI and vice-versa.

UNIT IV **(7 Content hours)**

Filtering in Frequency domain-Preliminary concept: Fourier series, Fourier transform, convolution, Sampling, DFT, Enhancement in frequency domain, low pass filter, high pass filter. Computing IDFT from DFT.

UNIT V **(8 Content hours)**

Image compression fundamental, coding, temporal and spatial redundancy, Error-free (Lossless) and Lossy compression. Image segmentation, Point-line-edge detection. Image gradients operator, canny edge detection, Edge linking and boundary detection, local processing, thresholding, variable thresholding, Region Growing, Texture Segmentation; Region oriented segmentation.

UNIT VI **(8 Content hours)**

Feature Extraction: Edges – Canny, Sobel; Line detectors, Corners - Harris, Orientation Histogram, SIFT, SURF, Scale-Space Analysis- Image Pyramids, Haar transform. Decision-theoretic and structure descriptors.

Textbooks:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 3rd edition.
2. D. A. Forsyth, J. Ponce, Computer Vision: A Modern Approach, PHI Learning 2009.
3. Milan Soanka, Vaclav Hlavac and Roger Boyle, Digital Image Processing and Computer Vision, Cengage Learning.

Course Code	Course Name	Course Category	L-T-P	Credits
20CS3232	Software Testing	PEC	3-0-0	3

Course Learning Objectives:

1. To understand the basic concepts of software engineering, life cycle models
2. To understand in detail about the requirement analysis and requirement engineering processes and testing methods.
3. To understand the concepts and principles involved in software design .
4. To understand the concepts and various types of software testing and project implementation techniques.
5. To understand the techniques involved in software project management and Risk management.
6. To understand the scope of test automation and tools for testing.

Course Content:

UNIT – I **(8 Contact hours)**

Introduction to software testing: testing as an engineering activity, testing as a process, testing axioms, basic definitions, software testing principles, tester's role in a software development organization.

UNIT-II **(8 Contact hours)**

Introduction to software defects: origin of defects, costs of defects, defect classes, defect repository and test design, defect examples, developer/tester support for developing a defect repository, defect prevention techniques.

UNIT-III **(12 Contact hours)**

test case design : test case design strategies: black box approach to test design, random testing, requirements based testing, boundary value analysis, equivalence class partitioning, state-based testing, cause-effect graph, compatibility testing, user documentation testing, domain testing, using white box approach to test design: test adequacy criteria, static testing vs. structural testing, code functional testing, coverage and control-flow graph, covering-code logic, paths, code-complexity testing, evaluating test-adequacy criteria.

UNIT – IV **(12 Contact hours)**

Levels of testing: need of levels of testing, unit testing,designing the unit tests, the test harness, running the unit tests and recording results, integration tests, designing integration tests, integration test planning,defect bash elimination system testing, acceptance testing, performance testing, regression testing, ad-hoc testing, alpha-beta tests, testing Object Oriented systems-usability and accessibility testing, configuration testing, compatibility testing, testing the documentation, website testing.

UNIT – V **(10 Contact hours)**

Test management: People and organizational issues in testing, organization structure for testing teams, testing services,test plan components, test plan attachments, locating test items, test management, test process, reporting test results, the role of three groups in test planning and policy development-introducing test specialist, skills needed by test specialist, building a testing group.

UNIT – VI **(10 Contact hours)**

Test Automation: software test automation, skills needed for automation, scope of automation, design and architecture for automation, requirements for a test tool, challenges in automation, test metrics and measurements, project progress and productivity metrics.

Learning resources:

Text books:

1. SrinivasanDesikan and gopalaswamyramesh, "Software testing-principles and practices", Pearson Education, 2006
2. Ron Patton, "Software testing", Second Edition, Sams Publishing, Pearson education, 2007

References:

1. Ilene Burnstein, "Practical software testing", Springer International Edition, 2003
2. Edward Kit, "Software testing in real world- improving the process", Pearson Education, 1995
3. Boris Beizer, "Software testing techniques", Second Edition,
4. AdityaP.Mathur, "Foundations of software testing-fundamental algorithms and techniques", Pearson Education, 2008