INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

Course Structure for 4th Year B.Tech COMPUTER SCIENCE & ENGINEERING

(Admission Batch: 2018-19 Onwards)

Seventh Semester

Theory

Course Code	Course Name	L-T-P (Periods/ Week)	Credits
	Programme Core Subject		
PCCS4411	Software Engineering	3-0-0	3
PCCS4412	Artificial Intelligence and Expert Systems	3-0-0	3
(Any One) PECS5407/ PECS5408/ PECS5409/	***Programme Elective III*** Parallel and Distributed System/ Fault Tolerant Systems/ Statistical Natural Language Processing	3-0-0	3
(Any One) PECS5410/ PECS5411/ PECS5412	***Programme Elective IV*** Computer Graphics/ Digital Image Processing/ Data Analytics	3-0-0	3
(Any One)	***Open Elective IV*** Refer List of Open Electives	3-0-0	3
	Total (Theory)	**15**	**15**
	Honours/ Minor	3-1-0	4
HNCS0405	Software Development for Portable Devices		
MNCS0405	Operating System		
	Practical/ Sessional		
PJCS8402	Minor Project	0-0-6	3
PJCS8403	Seminar and Technical Paper Writing	0-0-3	2
	Total (Practical/ Sessional)	**9**	**5**
	TOTAL	**24**	**20**

TOTAL SEMESTER CREDITS: 20

TOTAL CUMULATIVE CREDITS: 145

Eighth Semester

(A) *For students who carry out Major Project in the Institute*

Theory

Course Code	Course Name	L-T-P (Periods/ Week)	Credits
(Any One) PECS5413/ PECS5414/ PECS5415	***Programme Elective V*** Internet and Web Technology/ Social Network Analysis/ Semantic and Text Processing	3-0-0	3
(Any One) PECS5416/ PECS5417/ PECS5418	***Programme Elective VI*** Software Project Management/ Bioinformatics/ Real Time Systems	3-0-0	3
	Total (Theory)	**6**	**6**
	Practical/ Sessional		
PJCS8405	Major Project	0-0-12	6
PJCS8406	Comprehensive Viva Voce	0-0-3	1
PJCS8404	Internship	0-0-3	2
	Total (Practical/ Sessional)	**18**	**9**
	TOTAL	**24**	**15**

OR

(B) *For students who carry out Internship based Major Project*

Practical/ Sessional

PJCS8407	Internship based Major Project	---	12
PJCS8406	Comprehensive Viva Voce	---	1
PJCS8404	Internship	---	2
	Total (Practical/ Sessional)		**15**
	TOTAL		**15**

TOTAL SEMESTER CREDITS: 15

TOTAL CUMULATIVE CREDITS: 160

OPEN ELECTIVE SUBJECTS

OPEN ELECTIVE-IV (OE-IV) 7th Semester						
Sl. No.	**Subject Code**	**Subject Name**	**Contact Hours**	**Credits**	**Departments to Teach the Subject**	**Students to whom Option is Open**
1	OECH6432	Mineral Processing	3-0-0	3	Chemical Engg.	All branches
2	OECH6433	Colloid and Interfacial Engineering	3-0-0	3	Chemical Engg.	All branches
3	OECE6434	Finite Element Analysis	3-0-0	3	Civil Engg.	All branches
4	OECS6435	Research Methods in Computer Science	3-0-0	3	CSE	All branches
5	OEEE6323	Analog & Digital Communication Systems	3-0-0	3	Electrical Engg.	All branches
6	OEEE6436	Internet of Things	3-0-0	3	Electrical Engg.	All branches
7	OEEC6437	Soft Computing	3-0-0	3	ETC, CSE, Electrical Engg.	All branches
8	OEME6438	Reliability Engineering	3-0-0	3	Mech. Engg.	All branches
9	OEME6439	Robotics	3-0-0	3	Mech. Engg.	All branches
10	OEMT6440	Nanocomposites	3-0-0	3	MME	All branches
11	OEPD6441	Industrial Management	3-0-0	3	Prod. Engg.	All branches

CE:	Civil Engineering	CS, CSE:	Computer Science and Engineering
EE:	Electrical Engineering	EC, ETC:	Electronics and Telecommunication Engineering
ME:	Mechanical Engineering	MT, MME:	Metallurgical and Materials Engineering
CH:	Chemical Engineering	PD, Prod.:	Production Engineering
HM:	Humanities	MA:	Mathematics

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

B.TECH SYLLABUS for COMPUTER SCIENCE & ENGINEERING

(Admission Batch: 2018-19 Onwards)

7th Semester

PCCS4411 Software Engineering 3-0-0 Credit- 3

Module I **(10 Hours)**

Software Process Models:

Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, RAD model.

Module II **(10 Hours)**

Requirement analysis and specification, Requirement Gathering and Analysis, Requirement specification, Software Requirement Specification (SRS), Functional Requirements, functional r Non-functional requirements and goal of Implementation, IEEE 830 guidelines, Decision tables and trees.

Module III **(10 Hours)**

Structured Analysis & Design:

Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces. Coding and Software Testing Techniques: Code Review, Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Module 4 **(10 Hours)**

Software Reliability and Software Maintenance:

Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, PHI, 2014.
2. Software Engineering, A Practitioner‟s Approach, Roger S. Pressman, TMG Hill.

Reference Books:

1. Software Engineering, I. Somerville, 9th Ed. , Pearson Education.

PCCS4412 Artificial Intelligence and Expert systems 3-0-0 Credit-3

Module 1 **12Hrs**

Introduction, Intelligent Agents: Agents & Environments, Concept of Rationality, Nature & Structure of Agents, 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

Module 2 **10Hrs**

Knowledge Representation: Representations and Mappings, Approaches to Knowledge Representation, Uncertain Knowledge and Reasoning: Probabilistic Reasoning **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.

Module 3 **10Hrs**

Game Playing: The Mini max Search Procedure, Adding Alpha-beta Cut offs, 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.

Module 4 **8Hrs**

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**: Introduction, Design of Expert systems.

Text Book:

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

References:

1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011
3. Stuart **Russell** and Peter **Norvig**, "Artificial Intelligence: A Modern Approach", Third Edition, 2010, Pearson Education, New Delhi.

PECS5407 Parallel and Distributed System 3-0-0 Credit -3

Module – I **8 Hrs.**

Introduction to parallel computing. Parallel programming platforms: Trends in microprocessor Architectures, Limitations of memory system performance, Dichotomy of parallel computing platforms, physical organization of parallel platforms, communication costs in parallel machines, Routing mechanisms for interconnection network, Impact of process processors mapping and mapping techniques.

Module – II **10 Hrs.**

Principles of parallel algorithm design: Preliminaries, Decomposition techniques, Characteristics of tasks and interactions, Mapping techniques for load balancing, Methods for containing. Interactions overheads, Parallel algorithm models. Basic communication operations: One-to-All Broadcast and All-to-One Reduction, All-to-All broadcast and reduction All-Reduce and prefix sum operations, scatter and gather, All-to-All personalized communication, circular shift, Improving the speed of some communication operation.

Module – III **12 Hrs**.

Analytical modeling of parallel programs: Performance metrics for parallel systems, Effect of granularity of performance, scalability of parallel system, Minimum execution time and minimum cost-optimal execution time, Asymptotic analysis of parallel programs, other scalability metrics.

Module – IV **10 Hrs**.

Programming using the message passing paradigm: Principle of message – Passing programming, Send and receive operations, The message passing interface, Topologies and embedding, Overlapping communication with computation, collective communication and computation operations, Groups and communicators. Dense matrix algorithm: Matrix-vector multiplication, Matrix-matrix algorithm, Solving a system of linear equations.

Text Books:

1. Introduction to Parallel Computing, Second Edition, Ananth Gram, Anshul Gupta, George Karypis, Vipin Kumar Person Education.
2. Parallel computing Theory and Practice, Second Edition, Michael J. Quinn, TMH.

PECS5408 Fault Tolerant Systems 3-0-0 Credit-3

Module–I [10Hrs]

FAULT TOLERANT DESIGN Basic Concepts: Reliability Concepts, Failure & Faults, Reliability and Failure rate, Relation between Reliability and Meantime between failure, Maintainability and Availability, Reliability of series, parallel and Parallel –Series combinational circuits. Fault Tolerant Design: Basic Concepts –Static, dynamic, hybrid Triple Modular Redundant System, Self purging redundancy, Sift out redundancy (SMR), 5 MR Re-Configuration techniques, Use of error correcting code. Time redundancy and software redundancy

Module-II [10Hrs]

SELF CHECKING CIRCUITS & FAIL SAFE DESIGN Self Checking circuits: Basic concepts of self checking circuits, Design of Totally self checking checker, checkers using m out of n codes, Berger code, Low Cost residue code. Fail Safe Design: Strongly fault secure circuits, fail safe design of sequential circuits using partition theory and Berger code, Totally self checking PLA Design.

Module-III [10Hrs]

ATPG FUNDAMENTALS & DESIGN FOR TESTABILITY FOR COMBINATIONAL CIRCUIT Introduction to ATPG, ATPG Process –Testability and Fault analysis methods –Fault masking –Transition delay fault ATPG, Path delay, fault ATPG Design for Testability for Combinational Circuits: Basic concepts of Testability, Controllability and Observability, The Reed Muller's expansion technique, OR-AND-OR Design, Use of control and Syndrome Testable Designs.

Module-IV [10Hrs]

SCAN ARCHITECTURES & TECHNIQUES Introduction to Scan Based testing, Functional testing, The Scan effective Circuit, The MUX-D Stule Scan flip-flops, The Scan shift register, scan cell operation Scan test sequencing, scan testing timing, partial scan, multiple scan chains, scan based design rules (LSSD) At-speed scan testing and Architecture, multiple clock and scan domain operation, critical paths for At speed scan test. BUILT IN SELF TEST (BIST)BIST concepts, Tests Pattern generation for BIST exhaustive testing, Pseudorandom testing, pseudo exhaustive testing, constant weight patterns, Generic offline BIST architecture, Memory Test architecture.

Text Books:

1. Fault Tolerant & Fault Testable Hardware Design –Parag K. Lala, 1984, PHI
2. Design for Test for Digital IC's and Embedded Core Systems –Alfred L. Crouch 2008, Pearson Education.

Reference Books:

1. Digital Systems Testing and testable Design –Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman, Jaico Books
2. Essentials of Electronic Testing –Bushnell & Vishwani D. Agarwal, Springers.

PECS5409 Statistical Natural Language Processing 3-0-0 Credit-3

Course Objectives:

To understand the importance of statistical approach for processing and availing meaningful information from large text corpora and online-text in internet, social network and WWW.To learn key concepts in probability theory, statistics, information theory, and linguistics required for quantitative approaches to corpus based language processing. To apply these methods and techniques for Text alignment, Machine translation, text clustering, Information Retrieval, and Text categorization.

MODULE I (10 Hours)

Introduction: NLP approaches: Rationalist and Empiricist, why NLP difficult**,** ambiguity, Word frequency and relevance, Zip's Law, Collocations and co-occurrences. **Mathematical Foundations:** conditional Probability, Joint and conditional distributions, Standard distributions, Bayes' theorem, Bayesian statistics. Entropy, joint and conditional entropy, Mutual information, noisy channel model, Relative entropy or Kullback-Leibler divergence, relation to language: Cross entropy. **Linguistic Essentials:** Parts of Speech and Morphology, Noun, Verb, other parts of speech, Phrase structure, Dependency: Arguments and adjuncts, X' theory, Phrase structure ambiguity, Semantics and Pragmatics. **Corpus-Based Work:** words, tokenisation, Morphology, Sentences, Marked-up Data: Markup schemes, Grammatical tagging

MODULE II (10 Hours)

Collocations: Frequency, Mean and Variance, Hypothesis Testing –t-test, chi-square, likelihood ratios; mutual information, Notion of Collocation**. Statistical Inference: n -gram Models over Sparse Data:** Reliability vs. discrimination, builing n-gram models, Statistical Estimators, Maximum Likelihood Estimation (MLE), Laplace's law, Lidstone's law and the Jeffreys-Perks law. Combining Estimators, Linear Interpolation, Katz's backing-off; Language models. **Word Sense Disambiguation**: Supervised and unsupervised learning, Supervised Disambiguation: Bayesian and information-theoretic approaches. Dictionary-Based Disambiguation, Unsupervised

Disambiguation. **Lexical Acquisition:** Evaluation Measures, Verb Sub categorization, Attachment Ambiguity, Selectional Preferences, Semantic Similarity, The Role of Lexical Acquisition in Statistical NLP.

MODULE III (10 Hours)

Markov Models: Markov Models, Hidden Markov Models: Implementation, properties and variants. **Part-of-Speech Tagging:** The Information Sources in Tagging, Markov Model Taggers, Hidden Markov Model Taggers, Transformation-Based Learning of Tags, Tagging Accuracy and Uses of Taggers. **Probabilistic Context Free Grammars:** Features of PCFGs, issues with PCFGs, probability of a string, inside and outside probabilities, Training a PCFG for most likely parse of a sentence, Problems with the Inside-Outside Algorithm. **Probabilistic Parsing:** Parsing for disambiguation, Treebanks, Parsing models vs. language models, Tree probabilities and derivational probabilities; Phrase structure grammars and dependency grammars, Evaluation, Equivalent models, Building parsers: search methods; Non-lexicalized Treebank grammars, Lexicalized models using derivational histories, Dependency-based models

MODULE IV (10 Hours)

Statistical Alignment and Machine Translation: Text Alignment, Word Alignment, Statistical Machine Translation. **Clustering:** Hierarchical Clustering: Single-link and complete-link clustering, Group-average agglomerative clustering, Top-down clustering; Non-Hierarchical Clustering: K-means, The EM algorithm. **Information Retrieval:** Common design features of IR systems, Evaluation measures, probability ranking principle, Vector Space Model. Term weighting, Term Distribution Models, Inverse document frequency, Latent Semantic Indexing, Discourse Segmentation. **Text Categorization:** Decision Trees, Maximum Entropy Modeling, Perceptions', k Nearest Neighbor Classification

Text Books:

1. Christopher D. Manning, Hinrich Schutze, "Foundations of Statistical Natural Language Processing", The MIT Press, 2000.

Reference Books:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing.

PECS5410 Computer Graphics 3-0-0 Credit-3

Module 1 (10 Hours)

An Introduction Graphics System : Computer Graphics and Its Types, Application of computer graphics, Graphics Systems : Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software.

Module 2 (10 Hours)

Output Primitives and Attributes of Output Primitives : Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Attributes of Output Primitives : Line Attributes, Color and Gray scale Levels, Area fill Attributes, Character Attributes, Bundled Attributes, Antialiasing.

Module 3 (10 Hours)

Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing : The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping Three-Dimensional Concepts : Three Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

Module 4 (10 Hours)

Visible Surface Detection Methods: Back-Face Detection, Depth Buffer, A- Buffer, Scan- Line Algorithm, Painters Algorithm. Illumination Models: Basic Models, Displaying Light Intensities. Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading, Phong Shading.

Textbook:

1. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education.

Reference Books:

1. Computer Graphics, S. Bhattacharya, Oxford University Press.
2. Computer Graphics Principle and Practice, J.D. Foley, A. Dam, S.K. Feiner, Addison Wesley.
3. Computer Graphics: Algorithms and Implementations, D.P Mukherjee, D. Jana, PHI.
4. Computer Graphics, Z. Xiang, R. A. Plastock, Schaum's Outlines, McGraw Hill.

PECS5411 DIGITAL IMAGE PROCESSING 3-0-0 Credit-3

MODULE-I [10Hrs]

Fundamentals – Steps in digital image processing, sampling and quantization, relationship between pixels, imaging geometry Image Transforms – Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Discrete Cosine Transform, Walsh Transform, Hadamard Transform, Hotelling Transform.

MODULE-II **[10Hrs]**

Image Enhancement – Point processing, spatial filtering (smoothing and sharpening filters),enhancement in frequency domain Filtering in the Frequency Domain: preliminary concepts, 2D DFT and its properties, basic filtering in the frequency domain, image smoothing and sharpening.

MODULE-III **[10Hrs]**

Image Restoration and Reconstruction: Image restoration/degradation model, noise models, restoration in the presence of noise only, estimating the degradation function. Color Image Processing: Color models, Color transformation.

MODULE-IV **[10Hrs]**

Wavelets and Multi-resolution Processing: multi resolution expansions, wavelet transforms in one and two dimension. Image Compression: Fundamentals, Some basic compression methods, Morphological Image Processing: Erosion and Dilation, opening and closing.

Text books

1. Digital Image Processing, R.C. Gonzalez, R.E. Woods, Pearson Education , 3rd Edition, 2007
2. Digital Image Processing, S. Sridhar, Oxford University Press,2011
3. Digital Image Processing And Analysis, B. Chanda, Dutta D. Majumder,PHI

Reference Books:

1. Digital Image Processing using MATLAB, Rafael C. Gonzalez, Richard E. Woods Pearson Education, Inc., Seventh Edition, 2004.
2. Digital Image Processing, William K. Pratt, John Wiley, New York, 2002

PECS5412 Data Analytics 3-0-0 Credit-3

Module-I

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 Dis-criminant Analysis , Logistic regression, Perceptron learning algorithm.

Module-II

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 –Neighbour classifiers(Image Scene Classification).

Module-III

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

Components, Random forests and analysis.

Module-IV

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

Text Books

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-DataS 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 ofIndia,2010.

Reference Books:

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

HONOURS

HNCS0405 Software Development for Portable Devices 3-1-0 Credit-4

Course Objective: Understanding of Mobile Technology and challenges in developing for a ubiquitous environment, Learn an application development platform for portable devices and use it, Understand mobile application architecture and its components

Module: I [10Hrs]

Portable Devices Overview: Introduction to SW development for portable devices, Overview of Portable Devices, HW & SW for Portable Devices, Applications of Portable Devices, Portable devices - Understanding HW platforms: HW Platforms (Processors, Peripheral devices, Sensors etc.), HW Platforms – (Mobile Phones + Wireless, HW Platforms – Internet of things (IoT) + Wireless, Example - Rasberry Pi, Sensors in Portable devices, Generic HW platforms.

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Module: II [10Hrs]

Overview of SW Platforms & Development:

Mobile OS: Architecture and Framework of different mobile platforms, Development platforms and development tools, Programming languages, Simulator and emulator, SDK and Development Environments, Development Life Cycle of Application, **CREATING APPLICATIONS AND ACTIVITIES**: Introducing the Application Manifest File, Creating Applications and Activities,

Architecture Patterns (MVC), Review of other Architecture and Design patterns, The Android Application Lifecycle, **User Interface Design; Intents and Broadcasts:** Fundamental Android UI Design, Introducing Layouts, Introducing Fragments, Introducing Intents, Creating Intent Filters and Broadcast Receivers, **Background Services and Using Internet Resources:** Introducing Services, Using Background Threads, Parsing Internet Resources, Using the Download Manager, Using Internet Services, Connecting to Google App Engine, Best Practices for Downloading Data Without Draining the Battery.

Module: III [10Hrs]

Files, Saving States and Preferences: Shared Preferences, Introducing the Preference Framework and the Preference Activity, Static Files as Resources, Working with the File System, **Database and Content Providers:** Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Creating Content Providers, Using Content Providers, Case Study: Native Android Content Providers.

Module: IV [10Hrs]

Location Based Services, Telephony and SMS: Using Location-Based Services, Using the Emulator with Location-Based Services, Selecting a Location Provider, Using Proximity Alerts, Using the Geocoder, example: Map-based activity, Hardware Support for Telephony, Using Telephony, Introducing SMS and MMS.

Hardware Support and Devices (AUDIO, VIDEO, AND USING THE CAMERA): Using Sensors and the Sensor Manager, Monitoring a Device's Movement and Orientation, Introducing the Environmental Sensors, Playing Audio and Video, Using Audio Effects, Using the Camera, Recording Video.

Text Books:

1. Professional Android 4 Application Development, by Reto Meier, WROX Press, Wiley Publishing
2. Hello Android, Introducing Google's Mobile Development Platform, 3rd Edition, by Ed Burnette, Pragmatic Programmers.
3. Android Application Development, Programming with the Google SDK, by, Rick Rogers, John Lombardo, Zigurd Mednieks, Blake Meike, SPD, Oreilly.

MINOR

MNCS0405 Operating System 3-1-0 4

MODULE I (10 Hours)

Introduction to OS: Definition, Evolution and Types of Operating System, user's view & System view of Operating system, Hardware protection: Dual mode operation, I/O protection, Memory Protection, CPU protection. System components of operating system, operating system services, Understanding System calls with examples.

MODULE II (10 Hours)

Process Management: Process Identification & its state, PCB, Process Scheduling: scheduling criteria, different types of scheduler: long term, short term, medium term, Types of scheduling: Pre-emptive, Non-pre-emptive, FCFS,SJF, SRTF, Round Robin, Priory scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, Real time scheduling, context switching, Process creation, Inter Process Communication. Process Synchronization: Cooperating process, Critical Section problem and solution for two processes and multiple process. Semaphore. Classical synchronization Problems: Producer-Consumer, Reader-Writer, Dining philosopher. Deadlock: Necessary condition, RAG, methods to handle deadlock: Prevention, detection and avoidance algorithms, Recovery from deadlock. Introduction to Threading.

MODULE III (10 Hours)

Memory Management: Address binding, Logical-vs-physical address space, Swapping, Contiguous memory allocation, Fragmentation, Non-contiguous memory allocation: paging, segmentation, H/W support for Paging & Segmentation, Protection and sharing in paging & segmentation .Virtual Memory: demand paging, Page replacement policy: FIFO, LRU, Optimal, Belady's anamoly, allocation of frames, thrashing

MODULE IV (10 Hours)

File Management: File attribute, File operations, file access method, File protection, File system structure, directory implementation, Allocation methods. Disk Management: Disk Structure, Disk scheduling.

Text Books:

1. Operating System Concepts-Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley

OPEN ELECTIVE-IV (OE-IV) 7th Semester

OECH6432	Mineral Processing	3L-0T-0P	3 Credits

Objectives of the Course:

1. This course will brief about how most of the ores undergo after mining in order to provide a more concentrated material for the procedures of extractive metallurgy.
2. It gives the preliminary idea about the primary operations such as comminution and concentration.
3. This course will also provide the information about a modern mineral processing plant, including sizing, sampling and bulk material handling.

Module-I: **(4 weeks/12 Hours)**

Unit I: Comminution: Fundamentals of Rock Breakage, Energy Estimations, Liberation, Reduction Ratio, Primary Crushers, Secondary Crushers, Circuits, Selection Criterion. Grinding Mills, Critical Speed, Recent Developments & Mass Balancing (Importance, Techniques, Numerical Examples and their Relevance

Unit II: Industrial Screening: Applications, Basic Design Features, Types of Screens, Performance Evaluation and Factors Affecting Performance. Movement of Solids in Fluids: Equation of Motion, Drag Curve, Free & Hindered Terminal Settling Velocities in Gravitational and Centrifugal Force Fields, Applications & Classifiers (Various Types and Their Applications).

Module-II: **(4 weeks/12 Hours)**

Unit III: Hydrocyclone: Principles of Operation, Design Variables, Operating Variables, Performance Evaluation of Hydrocyclone, Control of Cyclone Operation, Recent Developments.

Unit IV: Gravity Concentration: Fundamentals, Flowing Film Type, Static Bath Type, Jigging, Centrifugal & Enhanced Gravity Type Concentrators.

Module-III: **(4 weeks/12 Hours)**

Unit V: Flotation: Fundamentals, Role of Reagents, Flotation Machines, and Applications.

Unit VI: Bulk Material Storage and Handling: Properties of Bulk Solids, Measurements, Storage, Flow Modes, Silos, Bins and Hopper Design, Common Problems.

Module-IV: **(2 weeks/6 Hours)**

Unit VII: Slurry Transportation: Pipe Line Flow, Mixture properties, Design perspective, Influence of several factors, Basic calculations, Case studies.

Books for Reference:

1. Mineral Processing Technology by B.A.Wills and Tim Napier-Munn.
2. Principal of Mineral Dressing by A.M. Gaudin – McGraw Hill Company, 1971.
3. Jain, S.K., Ore Processing, Oxford – IBH Publishing, 1984.
4. Taggart, A.F., Handbook of Mineral Dressing, John Wiley and Sons, New York, 1990.

5. Wills, B.A. Mineral Processing Technology, Pergamon Press, 1985.
6. Vijayendra, H.G., Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd. 1995.

Course Outcomes:

At the end of the course, the students should be able to

1. Solve problem related to changes in size and shape of the mineral.
2. Understand briefly about the operation of a mineral plant
3. Can handle problem related to material transportation, material handling and storage.

OECH6433	Colloid and Interfacial Engineering	3L-0T-0P	3 Credits

Objective of the course: To provide comprehensive knowledge on concepts and principles of colloids, interfaces and their applications.

Module-I **(12 Hours/4 Weeks)**

Unit – 1 (6 Hours/2 Weeks) General introduction of colloids, interfaces, surfactants, and micellization. Intermolecular forces, van der Waals' forces (Keesom, Debye, and London interactions).

Unit – 2 (6 Hours/2 Weeks) Colloidal systems and colloidal stability (van der Waals' attraction and potential energy curves). Brownian motion and Brownian flocculation.

Module-II **(12 Hours/4 Weeks)**

Unit – 3 (6 Hours/2 Weeks) Surface and interfacial tension and surface free energy. Surface tension for curved interfaces.

Unit – 4 (6 Hours/2 Weeks) Surface excess and Gibbs equation. Theory of surface tension, contact angle, and wetting.

Module-III **(12 Hours/4 Weeks)**

Unit – 5 (6 Hours/2 Weeks) Thermodynamics of interfaces, thermodynamics of micelle and mixed micellar formation.

Unit – 6 (6 Hours/2 Weeks) Electrical phenomena at interfaces (Electro kinetic phenomena, Electrical double layer). Emulsion and micro emulsion, General applications.

Module-IV **(6 Hours/2 Weeks)**

Unit –7 (6 Hours/2 Weeks) Enhanced petroleum recovery, super hydrophobic and self-cleaning surfaces. Novel fabrication of nano-structured particles. Measurement techniques of surface tension, Contact angle, Zeta potential, Particle size.

Text Books

1. Principles of Colloid and Surface Chemistry, 3rd ed. by P CHiemenz and R Rajagopalan, Mercel Dekker.

2. Introduction to Colloid & Surface Chemistry, 4th ed. by D J Shaw, Butterworth Heinemann.
3. Colloid and Surface Chemistry by P. Somasundaran, Create Space Independent Publishing Platform.
4. Introduction to Applied Colloid and Surface Chemistry by G. M. Kontogeorgis and S. Kiil, John Wiley & Sons.

Course Outcomes:

At the end of the course, the student should be able to

1. Understand the colloidal science engineering fundamentals.
2. Characterize interfaces and surface phenomena.

OECE6434	Finite Element Analysis	(3-0-0)	Credit-03

Module I:

Introduction: The Continuum, Equations of Equilibrium, Boundary Conditions, Strain displacement relations, Stress strain Relations, Plane stress and plane Strain problems, Different methods of structural analysis including numerical methods. Basics of finite element method (FEM), different steps involved in FEM, Different approaches of FEM, Direct method, Energy approach, Weighted residual Method.

Module II:

One and Two Dimensional Problems: Detail formulation including shape functions. stress strain relations, strain displacement relations and derivation of stiffness matrices using energy approach, Assembling of element matrices, application of displacement boundary conditions, Numerical solution of one dimensional problems using bar, truss, beam elements and frames. Derivation of shape function using Lagrange's interpolation, Pascal's triangle, Convergence criteria.

Module III:

Finite Element modeling of two dimensional problems using Constant strain Triangle (CST) elements, Stress strain relations for isotropic and orthotropic materials, Four nodded rectangular elements, axisymmetric solids subjected to axisymmetric loading.

Isoparametric Elements: Natural coordinates, isoparametric elements, four node, eight node elements. Numerical integration, order of integration.

Module IV:

Plate Bending: Bending of plates, rectangular elements, triangular elements and quadrilateral elements, Concept of 3D modeling.

Text Books:

1. C. S. Krishnamoorthy, Finite Element analysis-Theory and Programming, TMH
2. Finite Element Method, R. Dhanraj and K. P. Nair, Oxford University Press

3. Finite Element Methods for Engineers by U.S. Dixit, Cengage Learning

Reference Books:

1. R. D. Cook., Concepts and Applications of Finite Element Analysis, Wiley.
2. M. Mukhopadhyay-Matrix and Finite Element Analysis of Structures
3. O. C Zienkiewicz .and R. L. Taylor, Finite Element Method, McGraw Hill
4. Introduction to Finite Elements in Engineering, T.P. Chandrupatla and A.D. Belegundu
5. Finite Element Analysis in Engineering Design, S. Rajasekharan.

OECS6435	Research Methods in Computer Science	(3-0-0)	Credit-03

Prerequisites:

The course does not have any formal prerequisites. You must have a research project in sufficient maturity so you can finish a meaningful portion of your research and a complete paper by the end of the semester. The research topic can be a portion of your B.Tech, MCA, MS, M.Tech or PhD thesis project, a significant extension of course projects from the past, or something you are passionate about. This course is most appropriate for graduate students who are interested in research but do not have extensive prior research experience.

Course Objectives:

1. To introduce research and research methodologies in CS to students going to peruse research in CS.
2. To understand the strengths and weakness of each of these methods.
3. How to choose suitable method(s) for the investigations?
4. How to carry out investigations using these methods?
5. What are the threats associated with these methods and how to deal with them.
6. Reporting the results of these investigations. Writing technical articles/research papers.
7. Understanding roles of authors, reviewers. How to review research articles?

Module I: **10 Hrs.**

Introduction to Research, Research Methods in Computer Science, Analytical vs. Empirical Methods, Surveys, Case Studies, Controlled Experiments, Ethnography and Action Research, Quantitative, Qualitative, and Mixed Methods, Choosing research methods, Validity threats, Meaning of Research Problem, Data collection methods - primary and secondary sources, Types of data analysis methods, Analysis and Interpretation of Quantitative Data, Descriptive Statistics, Sampling, sampling distribution, Parameter Estimation, Statistical Inference, confidence interval and Hypothesis Testing using normal distribution, Tests of significance, test of difference of mean and proportions, t-tests, ANOVA, Chi-square Tests, correlation and regression, Review Process, Review guidelines, Validity threats, Review decisions, Research Qualitative Methods, Study Designs, Elements, and Methods, The nature and types of qualitative research, Study Designs, Elements, and Methods, The nature and types of qualitative research, problem definition, Sources of research problem, Scope and objectives of research problem, Criteria characteristics of a good research problem, Errors in selecting a

research problem, Approaches of solutions for research problem, Necessary Instrumentation, use of SPSS package.

Module II: **10 Hrs.**

Survey Research, Sampling Methods, Survey Study Designs, Case Studies, Introduction to Mixed Methods Research, Study Designs and Method, An Empirical Research Framework, Research Problems, Literature Reviews, Study Designs, Controlled Experiments, Elements and Methods Example Experiments Effective literature studies approach, Analysis, Plagiarism, Research Ethics, Effective technical writing, How to write report, paper, Developing a research proposal, Format of research Proposal, A presentation and assessment by a review committee, IEEE guidelines for writing abstract, journal papers, power point presentation, thesis and project report, Writing research papers, purpose, nature and evaluation, content and format, Research Presentations, The Art of Scientific and Technical Writing.

Module III: **10 Hrs.**

Nature of Intellectual property, Patents, Design, Trade and copy right, Process of patenting and development, Technological research, innovation, patenting, development, International scenarios: International cooperation on intellectual property, Procedure for grants of patents, Patenting under PCT, use of **Turnitin** service.

Module IV: **10 Hrs.**

Patent rights: Scope of patent rights, Licensing and transfer of technology, Patent information and databases, Geographical Administrations, New Developments in IPR, Administration of patent system, New Development in IPR: IPR of biological system, software etc., Traditional knowledge case studies, IPR and IITs, case studies

Text Book:

There is no text book for the course. A teacher may use lecture notes and videos, read research papers and Web Pages, which will be freely available on internet websites.

Reference books:

1. Research Design. Qualitative, Quantitative, and Mixed Methods Approaches. By John W. Creswell, Fourth Edition. SAGE Publication, 2014
2. The Craft of Research, By Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, Joseph Bizup, William T. FitzGerald, Third Edition, The University of Chicago Press, 2008
3. The Elements of Style. William Strunk Jr. and E. B. White, Forth Edition, Pearson, 1999
4. Research Methodology By Panneerselvam R, 2nd Edition, PHI, 2014
5. Statistical Design and Analysis of Experiments With Applications to Engineering and Science, Robert L. Mason, Second Edition, Wiley Inter Science.[Good for Data Analysis and Hypothesis Testing]
6. THE DESIGN OF DESIGN: ESSAYS FROM A COMPUTER CIENTIST, Frederick P. Brooks Jr., Addison-Wesley Professional, 2010.

OEEE6323	Analog and Digital Communication Systems	3-0-0	Credit-3

Course Objectives:

1. Introduction to analog and digital communication systems.
2. Analysis of signal in frequency domain.
3. Study of analog modulation schemes.
4. Study of digital modulation techniques

Module I **(12 Hours)**

Elements of Communication System-Analogue System, Digital System, Distinguishing features. Electromagnetic Spectrum, Bandwidth. Comparison between Analog & Digital Communication Systems. Frequency domain analysis of signals and systems: Fourier series, Fourier Transforms, Power and Energy, Sampling and Band limited signals, Band pass signals.

Module II **(12 Hours)**

Introduction to modulation, Amplitude Modulation (AM),Depth of Modulation, Modulated Waveform, Powers in Carrier, and Sidebands, Generation of DSBC and SSB, Balanced Modulator, AM Demodulators. Frequency Modulation (FM) - Frequency Deviation, Frequency Modulated Waveform, Spectrum. Narrow Band FM and Wideband FM. Generation of FM; Narrow Band FM Modulator, Wideband FM Modulator, FM Discriminator, Angle Modulation.

Module III **(12 Hours)**

Pulse modulation systems: Pulse amplitude modulation, Pulse Time Modulation. Pulse code modulation: PCM system, Inter symbol interference, Time Division Multiplexing of PCM signals, Line codes, Bandwidth of PCM system, Noise in PCM systems, Delta Modulation (DM), Limitations of DM, Adaptive Delta Modulation, Noise in Delta Modulation, Comparison between PCM and DM, Delta or Differential PCM (DPCM), S-Ary System.

Module IV **(6 Hours)**

Digital Modulation Techniques. Phase Shift Keying (PSK), Frequency Shift Keying (FSK) – their Basic Principle, Waveform, Generation and Detection. Ideal low pass, Band pass and Band rejection filters – their impulse response (no mathematical derivation).

Program Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyse signals in frequency domain.
2. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
3. Analyze different digital modulation schemes.
4. Investigate pulsed modulation system and analyze their system performance.

TEXT BOOKS:

1. John G.Proakis, M. Salehi, COMMUNICATION SYSTEMS ENGINEERING, 2nd ed. New Delhi, India: PHI Learning Private Limited, 2009.
2. R.P Singh and S.D Sapre, COMMUNICATION SYSTEMS Analog & Digital, 2nd ed. New Delhi, India: Tata McGraw Hill Education Private Limited, 2009.
3. Martin S. Roden, "Analog and Digital Communication Systems", SPD Publisher.

REFERENCE BOOKS:

1. H.Taub and D. L. Shilling, "Principle of Communication System", TMH Publisher.
2. Modern Digital and Analog Communication Systems, by B.P. Lathi, Oxford.

OEEE6436	Internet of Things	3-0-0	3 Credits

Course Objectives:

1. To understand the design of IOT relevant applications in various domain.
2. To understand the concepts of Raspberry Pi, interfaces and applications in IoT domain.
3. To understand the importance of cloud computing and its applications.
4. To understand specific security and data protection issues in IoT

MODULE-I **(12 Hours)**

Unit 1

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

Unit 2

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style. Smart Lighting, Intrusion Detection, Smoke/Gas Detectors, Cities-Smart Parking, Smart Lighting, Smart Roads, Environment-Weather Monitoring, Air pollution Monitoring, Forest Fire Detection, Energy-Smart Grids, Logistics-Route Generation & Scheduling, Agriculture Smart Irrigation, Health & Fitness Monitoring.

MODULE-II **(12 Hours)**

Unit 3

M2M: M2M, Difference between IOT and M2M.

Unit 4

IOT Physical Devices & Endpoints: What is an IOT Device, Linux on Raspberry Pi, Interfaces,

Programming: Installing python. Data types and data structures, Flow, Functions, Modules, File Handling, Date/ Time Operations, Classes, Python Packages.

MODULE-III (12 Hours)

Unit 5

Design steps of IoT

Design steps of IoT**,** Raspberry Pi, About the Board, Linux on Raspberry Pi.

Unit 6

Raspberry Pi Interfaces – Serial, SPI, I2C, Programming Raspberry Pi with Python-Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

MODULE-IV (8 Hours)

Unit 7

Privacy and Security threats on internet of Things: Specific security and data protection issues, IoT privacy and security issues in smart cities.

Text Book:

1. Arshdeep Bahga and Vijay Audisetti, "Internet of Things, A Hands on Approach", University Press, 1st edition, 2016.

Reference Books:

1. Sébastien Ziegler, "Internet of Things Security and Data Protection", Springer Publisher, 1st edition, 2019.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 1st edition, 2015.
3. Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes and Smart Cities are Changing the World", Pearson, 1stedition, 2015.

Course Outcomes:

1. To analyse applications of IOT in various domain.
2. To realize the revolution of Internet in Mobile Devices, Cloud &Sensor Networks
3. To understand the importance of cloud computing and Embedded system.
4. To understand the challenges and limitations of internet of things.

OEEC6437	Soft Computing	3-0-0	Credits 3

COURSE OBJECTIVES

1. To familiarize with soft computing concepts.
2. To introduce the fuzzy logic concepts, fuzzy principles and relations.
3. To know the basics of ANN and Learning Algorithms.
4. To analyze Ann as function approximation.
5. To know Genetic Algorithm and its applications to soft computing.
6. To analyze Hybrid system usage, application and optimization

MODULE-I (10 Hours)

Unit-1

Introduction

What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

Unit-2

Fuzzy Systems

Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

MODULE-II (12 Hours)

Unit-3

Neural Networks

What is Neural Network, Learning rules and various activation functions, Single layer Perceptron, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network.

Unit-4

Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

MODULE-III (10 Hours)

Unit-5

Genetic Algorithm

History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function.

Unit-6

GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

MODULE-IV (10 Hours)

Unit-7

Hybrid Systems

Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

GA based Backpropagation Networks

GA based Weight Determination, K - factor determination in Columns.

Fuzzy Backpropagation Networks

LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks.

Text Books:

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.
2. F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design – Theory, Tools and Applications", Pearson Education.

Reference Books:

1. J. S. R. Jang. C. T. SUN and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd., New Delhi.
2. Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.
3. S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India.
4. V. Keeman, "Learning and Soft computing", Pearson Education, India.
5. R. C. Eberhart and Y. Shi, "Computational Intelligence Concepts to Implementation". Morgan Kaufmann Publishers (Indian Reprint).
6. David E. Goldberg, "Genetic Algorithms in search, optimization, and machine learning", Addison-Wesley Publishing Company, Inc, 1989.

Course Outcomes:

1. To analyze the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.
2. To understand the concepts and meta-cognitive of soft computing.
3. To Apply Soft computing techniques the solve character recognition, pattern classification, regression and similar problems.
4. To identify process/procedures to handle real world problems using soft computing.
5. To apply various techniques of soft computing to defend the best working solutions.
6. To Design hybrid system to revise the principles of soft computing in various applications.

OEME6438	Reliability Engineering	3-0-0	Credit-3

OBJECTIVES:

To stress the importance of reliability in Engineering and products also the concept of maintainability, failure modes and testing methods.

UNIT I: CONCEPTS OF RELIABILITY, SYSTEM AND MODELS [12 Hours]

Definition of reliability – reliability Vs quality-reliability function-MTTF – hazard rate function- bathtub curve – derivation of the reliability function-constant failure rate model – time dependent failure models. Weibull distribution – normal distribution – the lognormal distribution. Serial configuration – parallel configuration – combined series parallel systems – system structure function, minimal cuts and minimal paths – Markov analysis – load sharing systems, standby system, degraded systems, three state devices – covariate models, static models, dynamic models, physics of failure models.

UNIT II : DESIGN FOR RELIABILITY AND MAINTAINABILITY [12 Hours]

Reliability design process – system effectiveness – economic analysis and life cycle cost – reliability allocation – optimal, Arinc, Agree, – Design methods – parts and material selection, derating, stress- strength analysis – failure analysis – identification of failure mode – determination of causes –assessment of effects – classification of seventy – computation of critically index – corrective action – system safety and FTA. Analysis of downtime – the repair time distribution – stochastic point processes – system repair time – reliability under preventive maintenance – state dependent systems with repair – MTTR-mean system downtime – MTR – MH/OH – cost model – fault isolation and self-diagnostics – repair Vs replacement – replacement model – proactive, preventive, predictive

Maintenance – maintenance and spares provisioning – maintainability prediction and demonstration – concepts and definition of availability.

UNIT III: OPTIMIZATION OF SYSTEM RELIABILITY [7 Hours]

Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming.

TEXT BOOKS:

1. Charles E. Ebling, "An introduction to Reliability and Maintainability Engg", Tata McGraw-Hill, 2000.

REFERENCES:

1. Patrick D T O'Connor, "Practical Reliability Engineering", John-Wiley and Sons inc, 2002.
2. David J Smith, "Reliability, Maintainability and Risk: Practical Methods for Engineers", Butterworth, 2002
3. Way kuo, Rajendra Prasad V, Frank A and Tillman, ching- lai Hwang "Optimal Reliability Design and Applications", Cambridge University Press P ltd., 2001.

4. Srinath I.S, Engineering Design and Reliability, ISTE, 1999.
5. Oleg Vinogradov, "Introduction to Mechanical Reliability: A Designers Approach, Hemisphere Publications, 1991.

OUTCOMES

The Student must apply and optimize reliability for time independent and time dependent failure models through various testing methods for various manufacturing amnesty process

OEME6439	Robotics	3-0-0	Credit-3

Course objective:

To expose students to the automation, robot kinematics and robot arm dynamics. To acquire knowledge on Classification and structure of robotic system, robot programming and its applications.

Module I **(13 Hours)**

Introduction, Automation and Robotics, brief history, Social and economic aspects, Advantages overview of robots and future application; Classification & structure of robotic system: Classification, Configuration, wrist, end effectors, Links, Joints, Drive system; Control System: Basic control system concepts, model, transformation and block diagrams, controllers ON & OFF, transient response.

Module II **(11 Hours)**

Robot Kinematics: Direct & inverse kinematics, rotation matrix, composite rotation matrix, homogenous transformations, links, joints D-H representation, Geometrical approach of direct & reverse kinematics; Robot Arm dynamics: Joint velocities, KE, PE & motion equation of manipulating trajectory planning, joint interpolated trajectory

Module III **(9 Hours)**

Robot Programming: Languages, Graphics, Storing & operating, Task programs; Sensors: State and external state sensors, tactile and non-tactile sensors, force – torque sensors, Image processing & analysis, Computer vision.

Essential Reading:

1. Groover, Industrial Robot, PHI. 2. Y. Korem, Robotics, Mc Graw-Hill.

Course Outcomes:

1. Complete knowledge of robotic system
2. Idea about robot kinematics and robot arm dynamics
3. Learning of robot languages and the use of sensors

OEMT6440	Nanocomposites	3-0-0	Credits 3

Objectives of the Course:
To become familiar with nanocomposite processing, properties and their applications in the engineering.

Module-I: (12 hours)
Introduction to nanocomposites, composite materials, mechanical properties of nanocomposite materials, stress strain relationship, toughness, strength, plasticity, Ceramic matrix nanocomposites, Different types, Synthesis (Conventional powder method; Polymer precursor route; Spray pyrolysis; Vapour techniques (CVD and PVD) and Chemical methods, which include the sol-gel process, colloidal and precipitation approaches and the template synthesis). Structure, Properties and New Application

Module-II: (10 hours)
Metal matrix nanocomposites, Different types, Synthesis (Spray pyrolysis; Liquid metal infiltration; Rapid solidification; Vapour techniques (PVD, CVD); Electro deposition and Chemical methods, which include colloidal and sol-gel processes), Structure, Properties and New Application, ceramic-metal nanocomposites, Different types, Synthesis, Structure, Properties and New Application

Module-III: (10 hours)
Polymer Matrix nanocomposites (PMNC): Different types synthesis (Intercalation / Prepolymer from Solution In-situ Intercalative Polymerization, In situ polymerization Mixing, Melt Intercalation), structure, Properties and New Application

Module-IV: (10 hours)
Carbon nanotubes Nanocomposites: Different types, Synthesis, Structure, Properties and New Application, Natural nano-biocomposites, bio-mimetic nanocomposites and biologically inspired nanocomposites: Different types, Synthesis, Structure, Properties and New Application

Suggested Reference Books:
1. P. M. Ajayan, L. S. Schadler and P. V. Braun, Nanocomposite Science and Technology, Wiley-VCH, 2003.
2. C. P. Poole and F. J. Owens, Introduction to Nanotechnology, Wiley Interscience 2003.
3. H. S. Nalwa, Encyclopedia of Nanotechnology, 2004.
4. Chung; Deborah D. L., Composite Materials: Science and Applications, Spinger International Edition, Springer-Verlag, London (2004)-Indian Edition 2006.

Course Outcomes:
1. Students will be able to identify nanocomposites for a given application
2. Understanding properties of a nanocomposite by relating them to its structure
3. Identifying a suitable nanocomposite process for a given application
4. Applying nanocomposite fundamentals in real life situations

OEPD6441	INDUSTRIAL MANAGEMENT	3L-0T-0P	3 Credits

Course Objective

The objective of this course is to produce graduates who Contribute to the success of companies through effective problem solving. Design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and environments.

Module I **[12]**

Basic Management Theory: Evolution of Management Thought, Scientific Management, Organization as a System, Function of Management, Principles of Management, Planning, Decision Making, Organizing Principle, Delegation of Authority, Line and Staff Function, Leadership, Motivation, Communication, Controlling.

Module II **[10]**

Personnel Management: Organization as Social System, Motivation and Behaviour, Role of Personnel Management, Recruitment, Selection, Training, Performance Appraisal, Job Evaluation and Merit Rating, Wage Policy, Incentives, Group Dynamics, Job Satisfaction and Morale.

Materials Management: Purchasing, Selection of Vendor, Learning Curve Concept, MRP.

Module III **[10]**

Marketing Management: Selling and Marketing Concept, Role of Marketing Management in the Process of Marketing Management, Product Life Cycle, New Product Development Strategy, Market Research, Consumer Behaviour, Sales Promotion Advertising, Pricing Strategy, Break even analysis, Channel of Distribution.

Module IV **[08]**

Financial Management: Scope, Time Value of Money, Depreciation cost of a product, Financial Statement Analysis, Ratio Analysis, Working Capital, Sources of Finance.

Industrial Relation: Trade Union, Industrial Dispute, Workers Participation In Management, Industrial Legislation, Labour Law, Factory Act.

Text Books:

1. Industrial Engineering & Production Management, M. Mahajan, Dhanpat Rai Publication.
2. Industrial Engineering & Management Science, T. R. Banga, N. K. Agarwal, S. C. Sharma, Khanna Publication.

Reference Books:

1. Personnel Management, A. Mannappa, M. S. Saiyadain.
2. Fundamentals of Financial Management, Prasanna Chandra, TMH.

Course Outcomes:

Upon successful completion of the course, student will able to:

1. Understand the theories and principles of modern management.
2. Apply the concepts to the management of organisations in private and public sector
3. Understand how managers can effectively plan in today's dynamic environment.
4. Be familiar with the design of organisation structure.
5. Describe how environmental uncertainty affects organisation design

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

B.TECH SYLLABUS for COMPUTER SCIENCE &ENGINEERING

(Admission Batch: 2018-19 Onwards)

8th Semester

PECS5413 INTERNET AND WEB TECHNOLOGY 3-0-0 Credit-3

Module I (10 hours)

INTRODUCTION TO INTERNET: Introduction, Evolution of Internet, WEB2.0 and Evolution of WWW. Internet Protocol -TCP/IP, UDP, HTTP, Secure Http(https) Internet Addressing Scheme – Ipv4 & IPv6,Domain Name Server and IP Addresses-Mapping. Building Web Sites: Planning for designing Web pages, site navigation, model and structure of a Website, Web Servers, Web Browsers, Two Tier and Three Tier Web Based Architecture. **HTML:** Introduction, SGML, DTD (Document Type Definition). Basic HTML using images links, Lists, Tables and Forms, Frames for designing a good interactive website.HTML Standards, Issues in HTML. **HTML5:** Migration, New Elements, Semantics, Canvas, SVG, Google Maps, Multimedia, APIs.

Module II (10 hours)

CSS: Syntax, Class Selector, Id Selector. External and Internal Style Sheets, Inline Style, and The class selector, div & span tags. Change the properties like background images, colors, and manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS.**CSS3:** Rounded Corners, Border Images, Gradients, Shadows, 2D and 3D Transforms, Transitions, Animations, object-fit, Multiple Columns, Box Sizing, Flexbox. **Java Script** Java Script Object Model, Data Types, Variables, Constant, Expressions, Operators, Flow Control, Popup Boxes, Try Catch Statement, Throw Statement, and Objects of JavaScript: Date object, array object, Boolean object, Math object, Functions & Objects, events and event handlers, Accessing HTML form elements. Email and password validations.**XML:** Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents & Data, Defining Attributes & Entities in the DTD ,Defining Parameter Entities & conditional Sections, Designing an XML data structure, XML Normalization.

Module III (8 hours)

INTERNET SECURITY & FIREWALLS: Security Threats From Mobile Codes, Types of Viruses, Client Server Security Threats, Data & Message Security, Various electronic payment systems, Introduction to EDI, Challenges–Response System, Encrypted Documents and Emails, **Firewalls:** Hardened Firewall Hosts, Ip- Packet Screening, Proxy Application Gateways, Aaa (Authentication, Authorization And Accounting).

Module IV **(12 hours)**

Approaches to Dynamic Pages: CGI, Java Applets, Plug Ins, Active X controls, Java Applet: Introduction to Java, Writing Java Applets, Life cycle of applet, Design a login page using applets. Designing of applications using applet. **PHP:** Introduction, data types, variables, operators, decision making and looping, Arrays, function and forms. **Advance PHP**: File Upload, Cookies, Sessions, Filters, Error Handling, Exception, HTML form handling. **Mysql Database :** Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP-my admin and database bugs.

Text book:-

1. Web Technologies, Uttam K. Roy, Oxford University Press.

Reference Book:

1. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications.
2. K. Laxmi Narayan, "Internet and web technology", SCITECH Publication
3. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGraw Hill, 2007.

PECS5414 Social Network Analysis 3-0-0 Credit-3

Module-I: **[10Hrs]**

Introduction to Social Network Mining, Graph Models and Node Metrics. Introduction to social network mining. Illustration of various social network mining tasks with real-world examples. Data characteristics unique to these settings and potential biases due to them. Social Networks as Graphs. Random graph models/ graph generators (Erd¨os-R´enyi, power law, preferential attachment, small world, stochastic block models, kronecker graphs), degree distributions. Models of evolving networks. Node based metrics, ranking algorithms (Pagerank). Gephi graph visualization and exploration software – practice.

Module-II: **[10Hrs]**

Social-Network Graph Analysis. Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy (outlier detection and centrality), partitioning of graphs. SNAP system for large networks analysis and manipulation.

Module-III: **[10Hrs]**

Social-Network Graph Analysis and Properties. Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighbourhood properties of graphs. Pregel paradigm and Apache Giraph graph processing system.

Module-IV: **[10Hrs]**

Information Diffusion in Social Networks. Strategic network formation: game theoretic models for network creation/ user behavior in social networks. Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection. Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation. Dynamic Social Networks, Applications and Research Trends Dynamic social networks, Link prediction, Social learning on networks. Special issues in Information and Biological networks. Important applications of social network mining.

Books:

1. David Easley and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010.
2. Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman, Mining of massive datasets, Cambridge University Press, 2014

PECS5415 Semantic and Text Processing 3-0-0 Credit-3

Course Objectives:

To understand the functions and design of various units of digital computers to store and process the information, fundamental concepts of processing units, concepts of various memory systems, input/output, Interrupts.

MODULE- I: **(10 Hours)**

NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field. **N-gram Language Models:** The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

MODULE-II: **(10 Hours)**

Part Of Speech Tagging and Sequence Labeling: Lexical syntax. Markov Models, Hidden Markov Models (Forward and Viterbi algorithms and EM training). The Information Sources in Tagging, Transformation-Based Learning of Tags, Tagging Accuracy and Uses of Taggers.

Introduction to Neural networks, perceptron and back propagation**,** Long and Short Term Memory (LSTM) **Recurrent Neural Networks**

MODULE III: (10 Hours)

Syntactic Parsing: Grammar formalisms and treebanks. Efficient parsing for context-free grammars (CFGs).Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Neural shift-reduce dependency parsing. **Semantic Analysis:** Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing

MODULE IV: (10Hours)

Information Extraction (IE)

Named entity recognition and relation extraction.IE using sequence labeling. **Machine Translation (MT).**Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

Text Books:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing

Reference Books:

1. Christopher D. Manning, Hinrich Schutze, "Foundations of Statistical Natural Language Processing", The MIT Press, 2000

Course Outcomes:

1. Know about the stages of NLP, issues of NLP and role of Machine learning, N-gram language models
2. Know about Markov Models and Neural Network methods and technique for text processing
3. Know the grammar formalisms CFG, PCFG and use them for text parsing
4. Apply the techniques for semantic parsing, analysis and extraction

PECS5416 Software Project Management 3-0-0 Credit-3

Module I - BASIC CONCEPTS (9 hours)

Product Process and project—Definition—Product life Cycle: Prototype Development Phase, Alpha Phase, Beta Phase, Production &Maintenance Phase—Project Life Cycle Models: Water fall Model, Prototype Model, RAD & Spiral Model—Process Models

Module II- UMBRELLA ACTIVITIES (9 hours)

Metrics—Software Configuration Management: Process and activities, Configuration audit, Metrics in SCM, Tools & automation –Software Quality Assurance: Quality Control & Quality Assurance,

Tools, Measures of SQA Success–Risk Management: Risk Management Cycle, Risk Identification, Quantification, Monitoring, Mitigation, Metrics in Risk Management.

Module III - PROJECT MANAGEMENT PROCESS AND ACTIVITIES (9 hours)

In-Stream activities - Project initiation: activities, Outputs, Quality Records, completion criteria – Project Planning and Tracking: Components, activities specific to Project tracking—Project Closure: Effective closure Process issues, Metrics for Project Closure.

Module IV–ENGINEERING ACTIVITIES IN PROJECT LIFE CYCLE (9 hours)

Software requirement Gathering: Inputs and start criteria, Dimensions, steps, Output & Quality records, Skill sets, Challenges, Metrics for Requirement Phase – Estimation : Phases of Estimation, Methodology, Models for size estimation, Challenges, Metrics for Estimation Process —Design and Development Phases-Project Management in Testing & Maintenance Phase. **EMERGING TRENDS IN PROJECT MANAGEMENT:** Globalization Issues in Project management: Evolution, Challenges, Models – Impact of the internet on Project Management: Effect of internet on Project Management, managing project for internet, Project management activities – People Focused Process Models: People centric models, P-CMM, other people focused Models.

TEXT BOOKS

1. Ramesh Gopalaswamy, "Managing and global Software Projects", Tata McGraw Hill. Tenth Reprint 2011.**(Revised)**

REFERENCES

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", 7th Edition McGraw Hill, 2010.(Revised).
2. Humphery Watts, "Managing the Software Process", Addision Wesley, 1989**.**(Revised).
3. Wheelwright and Clark: "Revolutionizing product development", The Free Press, 1993

PECS5417 Bioinformatics 3-0-0 Credit-3

Module-I: [8hrs]

Biological Data Acquisition: The form of biological information. Retrieval methods for DNA sequence, protein sequence and protein structure information; Databases – Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary sequence databases, protein sequence and structure databases;

Module-II: **[8hrs]**

Organism specific database; Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data;

Module-III: **[8hrs]**

Sequence Similarity Searches: Local versus global. Distance metrics. Similarity and homology. Scoring matrices. Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA, BLAST and PSI BLAST. Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment;

Module-IV: **[8hrs]**

Genome Analysis: Whole genome analysis, existing software tools; Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis Comparative genomics, orthologs, paralogs. Methods of phylogenetic analysis: UPGMA, WPGMA, neighbor joining method, Fitch/ Margoliash method, Character Based Methods.

Text Books:

1. Bioinformatics: Databases and Systems, by Stanley I. Letovsky.
2. Bioinformatics Databases: Design, Implementation, and Usage (Chapman & Hall/ CRC Mathematical Biology & Medicine), by Sorin Draghici.
3. Data base annotation in molecular biology, principles and practices, Arthur M.Lesk
4. Current topics in computational molecular biology, Tao, Jiang, Ying Xu, Michael Q.Zang

PECS5418 REAL TIME SYSTEMS 3-0-0 Credit-3

MODULE-1 **14 Hrs.**

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 Real-Time Task Scheduling: Some 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.

MODULE-2 **14 Hrs.**

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. 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. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization.

MODULE-3 **12 Hrs.**

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-RT, A survey of contemporary Real-time operating systems. Benchmarking real-time systems.

MODULE-4 **10 Hrs.**

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. Realtime. Communication: Basic concepts, Examples of applications, Real-time communication in a LAN and Real-time communication over packet switched networks.

Text Book:

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