

**REGULATION 2018**

**COURSE STRUCTURE**

**SYLLABUS**



**2 Years M.Tech Degree Programme**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022**

**(Affiliated to Biju Patnaik University of Technology, Rourkela)**

Accredited by NAAC with 'A' Grade with a CGPA of 3.28/4.00

Accredited by NBA

**Regulation 2018**



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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**M.TECH - 2018 (R-2018)**

**I SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PC	MCSPC1010	Mathematical Foundation of Computer Science	3	0	0	3
2	PC	MCSPC1020	Advanced Data Structures	3	0	0	3
3	PE	MCSPE1031	Machine Learning	3	0	0	3
		MCSPE1032	Wireless Sensor Networks				
		MCSPE1033	Introduction to Intelligent System				
4	PE	MCSPE1041	Data Science	3	0	0	3
		MCSPE1042	Distributed Systems				
		MCSPE1043	Advanced Wireless and Mobile Networks				
5	AU	MCSAU1050	Research Methodology and IPR	2	0	0	2
6		MCSAU1051	Audit Course	2	0	0	0
<b>PRACTICAL / SESSIONAL</b>							
7	PC	MCSPC1160	Advanced Data Structures Lab	0	0	4	2
8	PE	MCSPE1170	Machine Learning Lab	0	0	4	2
<b>TOTAL</b>				<b>16</b>	<b>0</b>	<b>4</b>	<b>18</b>



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**II SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PC	MCSPC2010	Advance Algorithms	3	0	0	3
2	PC	MCSPC2020	Soft Computing	3	0	0	3
3	PE	MCSPE2031	Data Preparation and Analysis	3	0	0	3
		MCSPE2032	Secure Software Design and Enterprise Computing				
		MCSPE2033	Computer Vision				
4	PE	MCSPE2041	Human and Computer Interaction	3	0	0	3
		MCSPE2042	GPU Computing				
		MCSPE2043	Digital Forensics				
5	AU	MCSAU2050	Audit Course	2	0	0	0
<b>PRACTICAL / SESSIONAL</b>							
6	PC	MCSPC2160	Soft Computing Lab	0	0	4	2
7	PE	MCSPE2170	Data Preparation and Analysis Lab	0	0	4	2
8	PC	MCSPC2180	Mini Project with Seminar	2	0	0	2
<b>TOTAL</b>				<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>



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**III SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PE	MCSPE3011	Mobile Applications and Services	3	0	0	3
		MCSPE3012	Compiler for HPC				
		MCSPE3013	Optimization Techniques				
2	OE	MCSOE3021	Business Analytics	3	0	0	3
		MCSOE3022	Industrial Safety				
		MCSOE3023	Operations Research				
		MCSOE3024	Cost Management of Engineering Projects				
		MCSOE3025	Composite Materials				
MCSOE3026	Waste to Energy						
<b>PRACTICAL / SESSIONAL</b>							
3	ES	MCSES3130	Dissertation-I/ Industrial Training	0	0	20	10
<b>TOTAL</b>				<b>6</b>	<b>0</b>	<b>12</b>	<b>16</b>

**IV SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PC	MCSPC4110	Dissertation-I	0	0	32	16
<b>TOTAL</b>							<b>16</b>



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**SCHEME OF INSTRUCTION SUMMARY**

SL. NO.	COURSE WORK - SUBJECTS AREA	CREDITS / SEMESTER				TOTAL CREDITS	%
		I	II	III	IV		
1	Professional Core (PC)	8	10			18	26
2	Professional Electives (PE)	8	8	3		19	28
3	Open Electives (OE)			3		3	4
4	Audit Course(AU), Thesis Work , Seminar and VIVA-VOICE	2		10	16	28	41
	<b>TOTAL</b>	<b>18</b>	<b>18</b>	<b>16</b>	<b>16</b>	<b>68</b>	<b>100</b>



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**I SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PC	MCSPC1010	Mathematical Foundation of Computer Science	3	0	0	3
2	PC	MCSPC1020	Advanced Data Structures	3	0	0	3
3	PE	MCSPE1031	Machine Learning	3	0	0	3
		MCSPE1032	Wireless Sensor Networks				
		MCSPE1033	Introduction to Intelligent System				
4	PE	MCSPE1041	Data Science	3	0	0	3
		MCSPE1042	Distributed Systems				
		MCSPE1043	Advanced Wireless and Mobile Networks				
5	AU	MCSAU1050	Research Methodology and IPR	2	0	0	2
6	AU	MCSAU1051	Audit Course	2	0	0	0
<b>PRACTICAL / SESSIONAL</b>							
7	PC	MCSPC1160	Advanced Data Structures Lab	0	0	4	2
8	PE	MCSPE1170	Machine Learning Lab	0	0	4	2
<b>TOTAL</b>				<b>16</b>	<b>0</b>	<b>4</b>	<b>18</b>



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Subject Code	Subject Name	L	T	P	C
MCSPC1010	Mathematical Foundation of Computer Science	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit – I</b> Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, Conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains					
<b>Unit - II</b> Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood					
<b>Unit – III</b> Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal Components analysis, The problem of overfitting model assessment.					
<b>Unit – IV</b> Graph Theory: Isomorphism, Planar graphs, graph Colouring, hamilton circuits and euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve Combinatorial enumeration problems					
<b>Unit – V</b> <b>Computer science and engineering applications</b> Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.					
<b>Unit – VI</b> Recent Trends in various distribution functions in mathematical field of Computer science for varying fields like bioinformatics, soft Computing, and Computer vision					
Teaching Methods: Chalk & Board/ PPT/Video Lectures/Lecture by Industry Expert					
<b>Text Book:</b> <ol style="list-style-type: none"><li>1. John Vince, Foundation Mathematics for Computer Science, Springer.</li><li>2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.</li><li>3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.</li><li>4. Alan Tucker, Applied Combinatorics, Wiley</li></ol>					



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Subject Code	Subject Name	L	T	P	C
MCSPC1020	Advanced Data Structures	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1</b> <b>Dictionaries:</b> Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. <b>Hashing:</b> Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.					
<b>Unit 2</b> <b>Skip Lists:</b> Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists					
<b>Unit 3</b> <b>Trees:</b> Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees					
<b>Unit 4</b> <b>Text Processing:</b> String Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.					
<b>Unit 5</b> <b>Computational Geometry:</b> One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.					
<b>Unit 6</b> Recent Trends in Hashing, Trees, and various Computational geometry methods for efficiently solving the new evolving problem					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Book:</b> 1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004. 2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.					





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Subject Code	Subject Name	L	T	P	C
MCSPE1031	Machine learning	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> <b>Supervised Learning (Regression/Classification)</b> Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes . Linear models: Linear Regression, Logistic Regression, Generalized Linear Models. Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking					
<b>Unit 2:</b> <b>Unsupervised Learning</b> Clustering: K-means/Kernel K-means, dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)					
<b>Unit 3</b> Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)					
<b>Unit 4</b> Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning					
<b>Unit 5</b> Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference					
<b>Unit 6:</b> Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Book:</b> 1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012 2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online) 3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.					



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Subject Code	Subject Name	L	T	P	C
MCSPE1032	Wireless Sensor Networks	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> <b>Introduction to Wireless Sensor Networks:</b> Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors <b>Network Architecture:</b> Traditional layered stack, Cross-layer designs, Sensor Network Architecture <b>Hardware Platforms:</b> Motes, Hardware parameters					
<b>Unit 2:</b> <b>Introduction to ns-3:</b> Introduction to Network Simulator 3 (ns-3), Description of the ns-3 Core module and simulation example.					
<b>Unit 3:</b> <b>Medium Access Control Protocol design:</b> Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled <b>Introduction to Markov Chain:</b> Discrete time Markov Chain definition, properties, classification and analysis <b>MAC Protocol Analysis:</b> Asynchronous duty-cycled. X-MAC Analysis (Markov Chain)					
<b>Unit 4:</b> <b>Security:</b> Possible attacks, Countermeasures, SPINS, Static and dynamic key Distribution					
<b>Unit 5:</b> <b>Routing protocols:</b> Introduction, MANET protocols <b>Routing protocols for WSN:</b> Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast <b>Opportunistic Routing Analysis:</b> Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.					
<b>Unit 6:</b> <b>ADVANCED TOPICS</b> Recent development in WSN standards, software applications					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. W. Dargie and C. Poellabauer, "Fundamentals of Wireless Sensor Networks –Theory and Practice", Wiley 2010</li> <li>2. KazemSohraby, Daniel Minoli and TaiebZnati, "wireless sensor networks - Technology, Protocols, and Applications", Wiley Interscience 2007</li> <li>3. Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, "Wireless Sensor Network Technologies for the Information Explosion Era", springer 2010</li> </ol>					



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Subject Code	Subject Name	L	T	P	C
MCSPE1033	Introduction to Intelligent System	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Biological foundations to intelligent systems I: Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks.					
<b>Unit 2:</b> Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.					
<b>Unit 3:</b> Search Methods Basic Concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimization and search such as stochastic annealing and genetic algorithm.					
<b>Unit 4:</b> Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and Conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic Components. Ideas of Blackboard architectures.					
<b>Unit 5:</b> Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.					
<b>Unit 6:</b> Recent trends in Fuzzy logic, Knowledge Representation					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b> <ol style="list-style-type: none"><li>Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6<sup>th</sup> edition.</li><li>Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3<sup>rd</sup> edition.</li></ol>					



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Subject Code	Subject Name	L	T	P	C
MCSPE1041	Data Science	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Introduction to Core Concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.					
<b>Unit 2:</b> Data Collection and management: Introduction, Sources of data, Data Collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources					
<b>Unit 3:</b> Data analysis: Introduction, Terminology and Concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.					
<b>Unit 4:</b> Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.					
<b>Unit 5:</b> Applications of Data Science, Technologies for visualization, Bokeh (Python)					
<b>Unit 6:</b> Recent trends in various data Collection and analysis techniques, various visualization techniques, application development methods of used in data science.					
Teaching Methods: Chalk& Board/ PPT					
<b>Text Books:</b> 1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.					



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Subject Code	Subject Name	L	T	P	C
MCSPE1042	Distributed Systems	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> <b>INTRODUCTION</b> Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and Computer network Concepts <b>DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE</b> Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues					
<b>Unit 2:</b> <b>DISTRIBUTED DATABASE DESIGN</b> Alternative design strategies; Distributed design issues; Fragmentation; Data allocation <b>SEMANTICS DATA CONTROL</b> View management; Data security; Semantic Integrity Control <b>QUERY PROCESSING ISSUES</b> Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data					
<b>Unit 3:</b> <b>DISTRIBUTED QUERY OPTIMIZATION</b> Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms <b>TRANSACTION MANAGEMENT</b> The transaction Concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models <b>CONCURRENCY CONTROL</b> Concurrency Control in centralized database systems; Concurrency Control in DDBSs; Distributed Concurrency Control algorithms; Deadlock management					
<b>Unit 4:</b> <b>RELIABILITY</b> Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols					
<b>Unit 5:</b> <b>PARALLEL DATABASE SYSTEMS</b> Parallel architectures; parallel query processing and optimization; load balancing					
<b>Unit 6:</b> <b>ADVANCED TOPICS</b> Mobile Databases, Distributed Object Management, Multi-databases Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books &amp;Reference Books :</b> 1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991. 2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992..					



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MCSPE1043	Advanced Wireless and Mobile Networks	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> <b>INTRODUCTION:</b> Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc. <b>WIRELESS LOCAL AREA NETWORKS:</b> IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF& PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues					
<b>Unit 2:</b> <b>WIRELESS CELLULAR NETWORKS:</b> 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving Coverage and capacity in cellular systems, Spread spectrum Technologies.					
<b>Unit 3:</b> WiMAX (Physical layer, Media access Control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview <b>WIRELESS SENSOR NETWORKS</b> Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.					
<b>Unit 4:</b> <b>WIRELESS PANs</b> Bluetooth AND ZigBee, Introduction to Wireless Sensors,.					
<b>Unit 5:</b> <b>SECURITY</b> Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless Communication.					
<b>Unit 6:</b> <b>ADVANCED TOPICS</b> IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Book:</b> 1. Schiller J., Mobile Communications, Addison Wesley 2000					



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2. Stallings W., Wireless Communications and Networks, Pearson Education 2005
3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200





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Subject Code	Subject Name	L	T	P	C
MCSPE1050	Research Methodology and IPR	2	0	0	2
<b>SYLLABUS</b>					
<b>Unit 1:</b> Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data Collection, analysis, interpretation, Necessary instrumentations					
<b>Unit 2:</b> Effective literature studies approaches, analysis Plagiarism, Research ethics,					
<b>Unit 3:</b> Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review Committee					
<b>Unit 4:</b> Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International Cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.					
<b>Unit 5:</b> Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent Information and databases. Geographical Indications.					
<b>Unit 6:</b> New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b> <ol style="list-style-type: none"><li>1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science &amp; engineering students"</li><li>2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"</li><li>3. Ranjit Kumar, 2<sup>nd</sup> Edition, "Research Methodology: A Step by Step Guide for beginners"</li><li>4. Halbert, "Resisting Intellectual Property", Taylor &amp; Francis Ltd, 2007.</li><li>5. Mayall, "Industrial Design", McGraw Hill, 1992.</li><li>6. Niebel, "Product Design", McGraw Hill, 1974.</li><li>7. Asimov, "Introduction to Design", Prentice Hall, 1962.</li><li>8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.</li><li>9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008</li></ol>					





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**M.TECH - 2018 (R-2018)**

Subject Code	Subject Name	L	T	P	C
MCSPE1051	English for Research Paper Writing	2	0	0	2
<b>SYLLABUS</b>					
<b>Unit 1:</b> Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness					
<b>Unit 2:</b> Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction					
<b>Unit 3:</b> Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.					
<b>Unit 4:</b> key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature					
<b>Unit 5</b> skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.					
<b>Unit 6:</b> useful phrases, how to ensure paper is as good as it could possibly be the first- time submission					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b> <ol style="list-style-type: none"><li>1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)</li><li>2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press</li><li>3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM.</li><li>4. Highman'sbook. 4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011</li></ol>					



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**II SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PC	MCSPC2010	Advance Algorithms	3	0	0	3
2	PC	MCSPC2020	Soft Computing	3	0	0	3
3	PE	MCSPE2031	Data Preparation and Analysis	3	0	0	3
		MCSPE2032	Secure Software Design and Enterprise Computing				
		MCSPE2033	Computer Vision				
4	PE	MCSPE2041	Human and Computer Interaction	3	0	0	3
		MCSPE2042	GPU Computing				
		MCSPE2043	Digital Forensics				
5	AU	MCSAU2050	Audit Course	2	0	0	0
<b>PRACTICAL / SESSIONAL</b>							
6	PC	MCSPC2160	Soft Computing Lab	0	0	4	2
7	PE	MCSPE2170	Data Preparation and Analysis Lab	0	0	4	2
8	PC	MCSPC2180	Mini Project with Seminar	2	0	0	2
<b>TOTAL</b>				<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>



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Subject Code	Subject Name	L	T	P	C
MCSPC2010	Advance Algorithms	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Sorting: Review of various sorting algorithms, topological sorting Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.					
<b>Unit 2:</b> Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.					
<b>Unit 3:</b> Flow-Networks: Maxflow-minicut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.					
<b>Unit 4:</b> Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm					
<b>Unit 5</b> Linear Programming: Geometry of the feasibility region and Simplex algorithm NP-completeness: Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm					
<b>Unit 6:</b> Recent Trands in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b> <ol style="list-style-type: none"><li>1. "Introduction to Algorithms" byCormen, Leiserson, Rivest, Stein.</li><li>2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman. \</li><li>3. "Algorithm Design" by Kleinberg and Tardos</li></ol>					



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Subject Code	Subject Name	L	T	P	C
MCSPC2020	Soft computing	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1</b> <b>INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS:</b> Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics					
<b>Unit 2</b> <b>FUZZY LOGIC:</b> Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.					
<b>Unit 3</b> <b>NEURAL NETWORKS:</b> Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks					
<b>Unit 4</b> <b>GENETIC ALGORITHMS:</b> Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.					
<b>Unit 5</b> <b>Matlab/Python Lib:</b> Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic					
<b>Unit 6</b> Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b>					
<ol style="list-style-type: none"> <li>1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003.</li> <li>2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall,1995.</li> <li>3. MATLAB Toolkit Manual</li> </ol>					



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Subject Code	Subject Name	L	T	P	C
MCSPE2031	Data Preparation and Analysis	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit1:</b> <b>Data Gathering and Preparation:</b> Data formats, parsing and transformation, Scalability and real-time issues					
<b>Unit2:</b> <b>Data Cleaning:</b> Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation					
<b>Unit3:</b> <b>Exploratory Analysis:</b> Descriptive and comparative statistics, Clustering and association, Hypothesis Generation					
<b>Unit4:</b> <b>Visualization:</b> Designing visualizations, Time series, Reallocated data, Correlations and connections, Hierarchies and networks, interactivity					
Teaching Methods: Chalk & Board/ PPT/Video Lectures					
<b>Text Books:</b> 1. Making sense of Data : A practical Guide to Exploratory Data Analysis and Data Mining, by Glenn J. Myatt					



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Subject Code	Subject Name	L	T	P	C
MCSPE2032	Secure Software Design and Enterprise Computing	3	0	0	3

**SYLLABUS**

**Unit 1:**

**Secure Software Design**

Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

**Unit 2:**

**Enterprise Application Development**

Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.

**Unit 3:**

**Enterprise Systems Administration**

Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

**Unit 4:**

Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to go about managing them.

**Unit 5:**

Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.

**Unit 6:**

Case study of DNS server, DHCP configuration and SQL injection attack.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**Text Book:**

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.



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Subject Code	Subject Name	L	T	P	C
MCSPE2033	Computer Vision	3	0	0	
<b>SYLLABUS</b>					
<b>Unit 1:</b> Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis					
<b>Unit 2:</b> Edge detection, Edge detection performance, Hough transform, corner detection					
<b>Unit 3:</b> Segmentation, Morphological filtering, Fourier transform					
<b>Unit 4:</b> Feature extraction, shape, histogram, color, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing					
<b>Unit 5:</b> Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.					
<b>Unit 6:</b> Recent trends in Activity Recognition, computational photography, Biometrics.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Book:</b> 1. Computer Vision: Algorithms and Applications by Richard Szeliski. 2. Deep Learning, by Goodfellow, Bengio, and Courville. 3. Dictionary of Computer Vision and Image Processing, by Fisher et al.					



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Subject Code	Subject Name	L	T	P	C
MCSPE2041	Human and Computer Interaction	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.					
<b>Unit 2:</b> Interactive Design basics – process – scenarios – navigation – screen design –Iteration and prototyping. HCI in software process – software life cycle –usability engineering – Prototyping in practice – design rationale. Design rules– principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.					
<b>Unit 3:</b> Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.					
<b>Unit 4:</b> Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture,Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.					
<b>Unit 5:</b> Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.					
<b>Unit 6:</b> Recent Trends: Speech Recognition and Translation, Multimodal System					
Teaching Methods: Chalk& Board/ PPT					
<b>Text Book:</b> 1. Alan Dix, Janet Finlay, Gregory Avowed, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I , II & III) 2. Brian Fling, “Mobile Design and Development”, First Edition , O’Reilly Media Inc., 2009 (UNIT – IV) 3.Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly, 2009.(UNIT-V)					





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Subject Code	Subject Name	L	T	P	C
MCSPE2042	GPU Computing	.3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> <b>Introduction:</b> History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA OpenCL / OpenACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps / Wavefronts, Thread blocks / Workgroups, Streaming multiprocessors, 1D / 2D / 3D thread mapping, Device properties, Simple Programs					
<b>Unit 2:</b> <b>Memory:</b> Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories					
<b>Unit 3:</b> <b>Synchronization:</b> Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU <b>Functions:</b> Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.					
<b>Unit 4:</b> <b>Support:</b> Debugging GPU Programs. Profiling, Profile tools, Performance aspects <b>Streams:</b> Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.					
<b>Unit 5:</b> <b>Case Studies:</b> Image Processing, Graph algorithms, Simulations, Deep Learning					
<b>Unit 6:</b> <b>Advanced topics:</b> Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing					
Teaching Methods: Chalk & Board/ PPT/Video Lectures					
<b>Text Books :</b> 1. Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-mei Hwu; Morgan Kaufman; 2010 (ISBN: 978-0123814722) 2. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012 (ISBN: 978-0124159334)					



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Subject Code	Subject Name	L	T	P	C
MCSPE2043	Digital Forensics	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> <b>Digital Forensics Science:</b> Forensics science, computer forensics, and digital forensics. <b>Computer Crime:</b> Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics					
<b>Unit 2:</b> <b>Cyber Crime Scene Analysis:</b> Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.					
<b>Unit 3:</b> <b>Evidence Management &amp; Presentation:</b> Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.					
<b>Unit 4:</b> <b>Computer Forensics:</b> Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, <b>Network Forensics:</b> open-source security tools for network forensic analysis, requirements for preservation of network data.					
<b>Unit 5:</b> <b>Mobile Forensics:</b> mobile forensics techniques, mobile forensics tools. <b>Legal Aspects of Digital Forensics:</b> IT Act 2000, amendment of IT Act 2008.					
<b>Unit 6:</b> Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Book:</b> 1. John Sammons, The Basics of Digital Forensics, Elsevier 2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications					



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Subject Code	Subject Name	L	T	P	C
MCSAU2050	Disaster Management	2	0	0	2
<b>SYLLABUS</b>					
<b>Unit 1:</b> Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.					
<b>Unit 2:</b> <b>Repercussions Of Disasters And Hazards:</b> Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.					
<b>Unit 3:</b> <b>Disaster Prone Areas In India</b> Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics					
<b>Unit 4:</b> <b>Disaster Preparedness And Management</b> Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.					
<b>Unit 5:</b> <b>Risk Assessment</b> Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co- Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.					
<b>Unit 6:</b> <b>Disaster Mitigation</b> Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India. Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>SUGGESTED READINGS:</b> <ol style="list-style-type: none"><li>1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company.</li><li>2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.</li><li>3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep</li></ol>					



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**III SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PE	MCSPE3011	Mobile Applications and Services	3	0	0	3
		MCSPE3012	Compiler for HPC				
		MCSPE3013	Optimization Techniques				
2	OE	MCSOE3021	Business Analytics	3	0	0	3
		MCSOE3022	Industrial Safety				
		MCSOE3023	Operations Research				
		MCSOE3024	Cost Management of Engineering Projects				
		MCSOE3025	Composite Materials				
		MCSOE3026	Waste to Energy				
<b>PRACTICAL / SESSIONAL</b>							
3	ES	MCSES3130	Dissertation-I/ Industrial Training	0	0	20	10
<b>TOTAL</b>				<b>6</b>	<b>0</b>	<b>12</b>	<b>16</b>



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Subject Code	Subject Name	L	T	P	C
MCSPE3011	Mobile Applications and Services	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User					
<b>Unit 2:</b> More on UIs: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider					
<b>Unit 3:</b> Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony, Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics					
<b>Unit 4:</b> Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia					
<b>Unit 5:</b> Platforms and Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android					
<b>Unit 6:</b> Recent trends inCommunication protocols for IOT nodes, mobile computing techniques in IOT, agents based communications in IOT					
<b>Ref. Books</b>					
1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons					



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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**M.TECH - 2018 (R-2018)**

Subject Code	Subject Name	L	T	P	C
MCSPE3012	Compiler for HPC	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit1:</b> <b>High Performance Systems</b> , Structure of a Compiler, Programming Language Features, Languages for High Performance.					
<b>Unit2:</b> <b>Data Dependence:</b> Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph. <b>Scalar Analysis with Factored Use-Def Chains:</b> Constructing Factored Use-Def Chains, FUD Chains for Arrays, Induction Variables Using FUD Chains, Constant Propagation with FUD Chains, Data Dependence for Scalars. Data Dependence Analysis for Arrays.					
<b>Unit3:</b> Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls, Inter-procedural Analysis. <b>Loop Restructuring:</b> Simple Transformations, Loop Fusion, Loop Fission, Loop Reversal, Loop Interchanging, Loop Skewing, Linear Loop Transformations, Strip-Mining, Loop Tiling, Other Loop Transformations, and Inter-procedural Transformations. <b>Optimizing for Locality:</b> Single Reference to Each Array, Multiple References, General Tiling, Fission and Fusion for Locality.					
<b>Unit4:</b> <b>Concurrency Analysis:</b> Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers. <b>Vector Analysis:</b> Vector Code, Vector Code from Sequential Loops, Vector Code from For all Loops, Nested Loops, Round off Error, Exceptions, and Debuggers, Multi-vector Computers.					
<b>Unit5:</b> <b>Message-Passing Machines:</b> SIMD Machines, MIMD Machines, Data Layout, Parallel Code for Array Assignment, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics. <b>Scalable Shared-Memory Machines:</b> Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines.					
<b>Unit 6:</b> Recent trends in compiler design for high performance computing and message passing machines and scalable shared memory machine.					
Teaching Methods: Chalk & Board/ PPT/ Video Lectures					
<b>Ref. Books</b>					
1. Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson					



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Subject Code	Subject Name	L	T	P	C
MCSPE3013	Optimization Techniques	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Engineering application of Optimization, Formulation of design problems as mathematical programming problems.					
<b>Unit 2:</b> General Structure of Optimization Algorithms, Constraints, The Feasible Region.					
<b>Unit 3:</b> Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.					
<b>Unit 4:</b> Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.					
<b>Unit 5:</b> Real life Problems and their mathematical formulation as standard programming problems.					
<b>Unit 6:</b> Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.					
Teaching Methods: Chalk & Board/ PPT/ Video Lectures					
<b>Text Books</b>					
1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.					
2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.					
3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.					
4. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.					
5. John K. Karlof (2006). Integer programming: theory and practice. CRC Press. ISBN 978-0-8493-1914-3.					
6. H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.					
7. Michael Jünger; Thomas M. Lieblich; Denis Naddef; George Nemhauser; William R. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A. Wolsey, eds. (2009). 50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the-Art. Springer. ISBN 978-3-540-68274-5.					
8. Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN 978-0-470-37306-4.					





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Subject Code	Subject Name	L	T	P	C
MCSOE3021	Business Analytics	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.					
<b>Unit 2:</b> Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.					
<b>Unit 3:</b> Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.					
<b>Unit 4:</b> Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.					
<b>Unit 5:</b> Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.					
<b>Unit 6:</b> Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.					
Teaching Methods: Chalk & Board/ PPT/Video Lectures					
<b>Text Books</b> 1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press. 2. Business Analytics by James Evans, persons Education.					





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Subject Code	Subject Name	L	T	P	C
MC SOE3022	Industrial Safety	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit-I:</b> Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.					
<b>Unit-II:</b> Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.					
<b>Unit-III:</b> Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.					
<b>Unit-IV:</b> Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.					
<b>Unit-V:</b> Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance					
Teaching Methods: Chalk & Board/ PPT/Video Lectures					
<b>Text Books:</b> 1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services. 2. Maintenance Engineering, H. P. Garg, S. Chand and Company. 3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication. 4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.					



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Subject Code	Subject Name	L	T	P	C
MCSOE3023	Operations Research	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models					
<b>Unit 2</b> Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming					
<b>Unit 3:</b> Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT					
<b>Unit 4</b> Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming					
<b>Unit 5</b> Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation					
Teaching Methods: Chalk& Board/ PPT					
<b>Text Books:</b> 1. H.A. Taha, Operations Research, An Introduction, PHI, 2008 2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982. 3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008 4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009 5. Pannerselvam, Operations Research: Prentice Hall of India 2010 6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010					



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Subject Code	Subject Name	L	T	P	C
MCSOE3024	Cost Management of Engineering Projects	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit 1:</b> Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.					
<b>Unit 2</b> Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process					
<b>Unit 3:</b> Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis.					
<b>Unit 4</b> Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis					
<b>Unit 5</b> Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.					
<b>Unit 6</b> Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.					
Teaching Methods: Chalk & Board/ PPT					
<b>Text Books:</b> 1. H.A. Taha, Operations Research, An Introduction, PHI, 2008 2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982. 3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008 4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009 5. Pannerselvam, Operations Research: Prentice Hall of India 2010 6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010					



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Subject Code	Subject Name	L	T	P	C
MCSOE3025	Composite Materials	3	0	0	3
<b>SYLLABUS</b>					
<b>UNIT-I:</b> INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.					
<b>UNIT – II: REINFORCEMENTS:</b> Preparation-layup, curing, properties and applications of glassfibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.					
<b>UNIT – III:</b> Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.					
<b>UNIT-IV:</b> Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.					
<b>UNIT – V:</b> Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b>					
1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany. 2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.					
<b>Text Books:</b>					
1. Hand Book of Composite Materials-ed-Lubin. 2. Composite Materials – K.K.Chawla. 3. Composite Materials Science and Applications – Deborah D.L. Chung. 4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.					



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Subject Code	Subject Name	L	T	P	C
MCSOE3026	Waste to Energy	3	0	0	3
<b>SYLLABUS</b>					
<b>Unit-I:</b> Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors					
<b>Unit-II:</b> Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.					
<b>Unit-III:</b> Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.					
<b>Unit-IV:</b> Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.					
<b>Unit-V:</b> Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures					
<b>Text Books:</b> 1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990. 2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983. 3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991. 4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.					



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**IV SEMESTER**

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
<b>THEORY</b>							
1	PC	MCSPC4110	Dissertation-I	0	0	32	16
<b>TOTAL</b>							<b>16</b>