PROPOSED SYLLABUS OF COMPUTER SCIENCE AND ENGINEERING

RTM NAGPUR UNIVERSITY, NAGPUR

FOR VII AND VIII SEMESTER

ACADEMIC SESSION: 2015 - 2016

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: SEVENTH (C.B.S.)

BRANCH: COMPUTER SCIENCE & ENGINEERING

Sr. No.	Subject	Workload				Credit				Marks				
										Theory		Practical		Total Marks
		L	P	T	Total	L	P	T	Total	Sess.	Univ.	Sess.	Uni .	
1 BECSE401T	Data Warehousing & Mining	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECSE401P	Data Warehousing & Mining Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
3 BECSE402T	Language Processor	4	-	1	5	4	-	1	5	20	80	-	-	100
4 BECSE402P	Language Processor Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5 BECSE403T	ELECTIVE-I	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECSE404T	ELECTIVE-II	4	-	1	5	4	-	1	5	20	80	-	-	100
7 BECSE405P	Project and Seminar	-	3	-	3	-	3	-	3	-	-	25	25	50
	Total	16	7	4	27	16	5	4	25	80	320	75	75	550

Elective I: TCP and IP, Advanced Co mputer Architecture, Big Data Analysis & Business Intelligence , Parallel and Network Algorithm.

Elective II: Computational Geometry , Mobile Computing, Real Time Operating System, Software Architecture , Mainframe Technologies .

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: EIGHTH (C.B.S.)

BRANCH: COMPUTER SCIENCE & ENGINEER ING

Sr. No.	Subject	Workload				Credit				Marks				
		L	P	T	Total	L	P	T	Total	Theory		Practical		Total Marks
										Sess.	Univ.	Sess.	Uni .	
1 BECSE406T	Distributed Operating system	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECSE406P	Distributed Operating system Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
3 BECSE407T	Information & Cyber Security	4	-	1	5	4	-	1	5	20	80	-	-	100
4 BECSE407P	Information & Cyber Security Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5 BECSE408T	ELECTIVE- III	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECSE409T	ELECTIVE- IV	4	-	1	5	4	-	1	5	20	80	-	-	100
7 BECSE410P	Project & Seminar	-	5	-	5	-	5	-	5	-	-	75	75	150
	Total	16	9	4	29	16	7	4	27	80	320	125	125	650

Elective III: Pattern Recognition, Soft Computing Techniques, Optimization Techniques, Cluster ing & Cloud Computing .

Elective IV: Advance Wireless Sensor Network, Digital Image Processing, Natural Language Processing, Digital Forensic.

BECSE401T : Data Warehousing & Mining

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issue s in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Unit II : Data Warehouse and OLAP Technology for Data Mining : Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data C ube Computation, Further Development of Data Cube and OLAP Technology, Attribute -Oriented Induction.

Unit III: Mining Frequent Patterns, Associations and Correlations : Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining variou s kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint -Based Association Mining

Unit IV: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifie r or a Predictor, Ensemble Methods

Unit V: Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density -Based Methods, Grid -Based Methods, Model -Based C lustering Methods, Clustering High -Dimensional Data, Constraint -Based Cluster Analysis, Outlier Analysis.

Unit VI: Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time - Series Data, Mining Sequence Patterns in Transactional Datab ases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multirelational Data Mining.

Text Book:

1. Data Mining ï Concepts and Techniques , Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2nd Edition, 2 006.

Reference B ooks:

1. Data Mining Techniques , Arun K Pujari, 3rd edition, Orient Blackswan/ Universities Press , 2013.
2. Data Warehousing Fundamentals , Paulraj Ponnaiah , John Wiley & Sons, 2001 .

BECSE401P : Data Warehousing & Mining Lab

Load	Credit	Total m arks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

Practical based on the syllabus for the course BECSE401T.

BECSE402T: Language Processor

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Introduction to compilers, compilers and translators, Cross Compiler, Phases of compilation and overview.

Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, scanner generator (lex, fle x).

Unit II: Syntax Analysis: Syntax specification of programming languages, Design of top -down & bottom -up parsing technique, Design of LL(1) parser. LR parsing: Design of SLR, CLR, LALR parsers. Dealing with ambiguity of the grammar, Parser generator (y acc, bison)

Unit III: Syntax directed definitions, implementation of SDTS, Intermediate code representations (postfix, syntax tree, TAC), Intermediate code generation using syntax directed translation schemes for translation of controls structures, declar ations, procedure calls, and Array reference.

Unit IV: Table Management: Storage allocation and run time storage administration, symbol table management.

Error detection and recovery: Error recovery in LR parsing, Error recovery in LL parsing, automatic error recovery in YACC.

Unit V: Code optimization: Sources of optimization, loop optimization, control flow analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available expressions, Live variables, Induction Var iable, Common sub expression elimination.

Unit VI: Code generation: Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Text B ooks:

1. Aho, Sethi, and Ullman; Compilers ï Principles , Techniques and Tools; Second Edition, Pearson E ducation, 2008.
2. Alfred V. Aho and Jeffery D. Ullman; Principles of Compiler Design; Narosa Pub lishing House, 1977.
3. Vinu V. Das; Compiler Design using Flex and Yacc; PHI Publication, 2008.

Refer ence B ooks:

1. Compiler Design, O. G. Kakde , Laxmi Publications, 2006.
2. Principles of Compiler Design, V. Raghavan, Tata McGraw Hill , 2009 .

BECSE402P : Language Processor Lab

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practica l)	1	50	25	25	50

Practical based on the syllabus for the course BECSE402T.

BECSE403T : Elective I: TCP & IP

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Network architecture - Stan dards, TCP/IP Model Overview, Networking Technologies: LANS, WANS, Connecting Devices. Internetworking concep t, Internet Backbones, NAP, ISPs, RFC s and Internet Standards.

Unit II: Classful Internet address, CIDR - Subnetting and Supernetting, ARP, RARP, OOTP, DHCP.

Unit III: IP Datagram - IP Package - IP forwarding and routing algorithms, computing paths, RIPOSPF, ICMP, IGMP.

Unit IV: TCP header, services, Connection establishment and termination, Interactive data flow, Bulk data flow, Flow control and Retr ansmission, TCP timers, Urgent Data processing, Congestion control, Extension headers.

Unit V: Switching technology, MPLS fundamentals, signaling protocols, LDP, IP traffic engineering, ECMP, SBR, Routing extensions for traffic engineering, Traffic engine ering limitations and future developments .

Unit VI: IP security protocol - IPv6 addresses, Packet format, Multicast, Anycast, ICMPv6, Interoperation between IPv4 and IPv6 - QoS, Auto configuration.

Text Books:

1. TCP/IP Network Administration, Craig Haut, 3rd Edition, Shroff Publications , 2002.
2. Internetworking with TCP/IP - Principl es, Protocols, and Architecture, Douglas E. Comer, 5th edition Volume - 1, Prentice Hall, 2006.
3. The Internet and its Pr otocols - A Comparative approach, Adrian Farrel, Morgan Kaufmann, 2 004.

4. TCP/IP Illustrated - the Protocols, W. Richard Stevens, Volume I, Pearson Education, 2003.
5. TCP/IP Protocol Suite, Behrouz A. Forouzan, 3rd edition , Tata McGraw Hill, 2006.

Reference Books:

1. IPv6 Theory, Pro tocol and Practice, Pete Loshin, 2nd edition, Morgan Kaufmann, 2003.
2. Int ernetworking TCP/IP, Comer D.E and Stevens D.L, Volume III , Prentice Hall of India , 1997 .

BECSE403T : Elective I: Advanced Computer Architecture

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (theory) 1 hr (tutorial)	5	100	20	80	100

Unit I: Fundamentals o f Computer Design: Defining computer architecture, trends in technology, trends in power in integrated circuits, trends in cost, dependability, and measuring, reporting and summarizing performance.

Unit II: Instruction -Level Parallelism: Concepts and challenges in ILP, basic compiler techniques for Exposing ILP ï reducing branch costs with prediction, overcoming data hazards with dynamic scheduling, hardware -based speculation, exploiting ILP using static and dynamic scheduling, limitations of ILP, using ILP support to exploit thread -level parallelism.

Unit III: Vector architecture: SIMD instruction set, extensions for multimedia, graphics processing units, detecting and enhancing loop -level parallelism , centralized shared -memory architectures, performance of shared -memory, multiprocessors, distributed shared memory, directory based coherence, basics of synchronization, models of memory consistency.

Unit IV: Memory Hierarchy Design : Cache performance: Eleven advanced cache optimizations, Protection via virtual memory and virtual machine, I mpact of virtual machines on virtual memory and I/O, memory hierarchies, design of memory hierarchies.

Unit V: Introduction to Message passing Arch itecture: Routing in message passing architecture, message passing programming model, processor support for message passing, message passing ver sus shared memory architecture.

Unit VI: Storage Systems: Advanced topics in disk storage, definition and exam ples of real faults and failures, i/o performance, reliability measures and benchmarks ï designin g and evaluating an i/o system.

Text Books:

1. Computer Organization and Architecture - Designing for Performance, William Stallings, 8th Edition , Prentice Hall , 2010.
2. Advanced Computer Architecture , Kai Hwang, 2nd Edition, Tata McGraw - Hill, 2011.
3. Advanced Computer Architecture and Parallel Processing, Hesham El - Rewini and Mostafa Abd - El- Barr , Wiley , 2005.

Reference Books:

1. Parallel C omputing architecture: A har dware / software approach , David E. Culler and Jaswinder Pal Singh, Morgan Kaufmann , 1998.
2. Computer Architecture and Organization , 3rd Edition, J. P. Hayes , McGraw Hill, 1999.

BECSE409T : Elective I: Big Data Analytics and Business Intelligence

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Introduction to Big Data Analytics : Big Data Overview, State of the Practice in Analytics, Data Analytics Lifecycle , data analytics problems. Understanding features of R language, Understanding different Hadoop modes , Understanding Hadoop features, The HDFS and MapReduce architecture.

Unit II: Understanding the basics of MapReduce, The Hadoop MapReduce, The Hadoop Map Reduce fundamentals, writing a Hadoop MapReduce example, learning the different ways to write MapReduce in R. Integrating R and Hadoop ï with the RHIPE architecture and RHadoop.

Unit III: Learning Data Analytics with R and Hadoop ï The data analytics project cycle, the data analytics problems (web page categorization, stock market change), supervised and unsupervised machine - learning algorithms .

Unit IV: Introduction to Business Intelligence : evolution of BI, BI value chain, introduction to business analytics, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components ï BI Process, BI Technology, BI Roles & Responsibilities

Unit V: Basics of Data Integration: Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, data integration technologies, Introduction to data quality, data profiling concepts and applications , the multidimensional data model , star and snowflake schema .

Unit VI: BI Project Lifecycle: Typical BI Project Lifecycle, Requirements Gathering and Analysis - Functional and Non - Functional Requirements, Testing in a BI Project, BI Project Deployment , Post Production Support .

Text Books:

1. Big Data Analytics with R and Hadoop , Vignesh Prajapati, PACKT Publishing , 2013.
2. Fundamentals of Business Analytics, R N Prasad and S Acharya, Wiley India , 2011
3. Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph ; David Loshin , Morgan Kaufmann , 2013.

Reference Books:

1. Business Intelligence - A Managerial Approach , 2nd Edition , Efraim Turban , Ramesh Sharda , Dursun Delen and David King , Prentice Hall, 2010 .
2. Business Intelligence for Dummies, Swain Scheps , Wiley Publishing , 2007.

BECSE403T: Elective I: Parallel and Netw ork Algorithm

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Introduction: Parallel computation models, Parallel architectures and topologies, Notion of space and time complexity in parallel and interconnect network environment.

Unit II: Dependence Concept: Single Loop, Double Loop and Perfect Loop Nest. Loop carried and Loop independence dependence, Preliminary loop transformation techniques.

Unit III : Parallel Algorithms and Tech niques 1: Parallel Searching and Sorting Techniques. Hyper quick sort.

Unit IV : Parallel Algorithms and Techniques 2: Parallel solutions to linear system of equations, finding roots of non -linear equations, Parallel discrete Fourier transforms .

Unit V : G raph and Network Theory 1: Introduction, Shortest Paths, Spanning Trees, Connected Components .

Unit VI: Graph and Network Theory 2: Parallel Breadth First Search and Depth First Search, Greedy Algorithms and matroids, Coloring and Matching, Network Flow .

Text Books:

1. Graphs, Networks, and Algorithms, Dieter Jungnickel, Third Edition, Springer, 2010.
2. The Design and Analysis of Parallel Algorithms, S.G.Akl, PHI, 1989.
3. Int roduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar , Second edition, Addison Wesley, 2003.

Reference B ooks:

1. An Introduction to Parallel Algorithms , J. JaJa, Addison Wesley, 1992 .
2. Parallel Progr amming in C with MPI and OpenMP, M.J.Quinn, McGraw Hill , 2003.

BECSE404T: Elective II: Computational G eometry

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

Unit I: Introduction to Computational Geometry; Line Segment Intersection ï The Doubly -Connected Edge List, Computing Overlay of Two Su bdivisions, Boolean Operations; Polygon Triangulation ï Guarding and triangulations, Partitioning a polygon into monotone pieces, triangulating a monotone polygon.

Unit II: Linear Programming ï The geometry of casting, Half -plane intersection, Incremental and Randomized linear programming; Orthogonal range Searching ï One Dimensional range searching, kd -trees, Range trees, higher dimensional range trees.

Unit III: Point location ï Point location and trapezoidal maps, a Randomized incremental algorithm, de aling with degenerate cases; Voronoi Diagrams ï Definition and basic properties, computing the V oronoi diagram; Arrangemnets and Duality ï Computing the discrepancy, duality, arrangements of lines, levels and discrepancy.

Unit IV: Delaunay Triangulations ï Triangulations of planar point sets, the Delaunay triangulation, computing the Delaunay triangulation, the analysis; Geometric Data Structures ï Interval trees, priority search trees, segment trees.

Unit V: Convex Hulls ï The complexity of convex hulls in 3 -space, computing convex hulls in 3 -space, the analysis, convex hulls and half -space intersection; Binary Space Partitions ï t h e d e f i n i t i o n o f B S P t r e e s , B S P t algorithm, constructing a BSP tree, the size of BSP tree in 3 -space.

Unit VI: Quadtrees ï Uniform and non -uniform meshes, quadtrees for point sets, from quadtree to meshes; Simplex Range Searching ï Partition trees, multi -level partition trees, cutting trees.

Text Books:

1. Computational Geometry ï Algorithms and Application s, Second Revised Edition, Mark de Berg, et al. , Springer , 1998.
2. Discrete and Computational Geometry, Satyan L. Devadoss and Joseph O ô R o u r k e , P r i n c e t o n U n i v e r s i t y P r e s s , 2 0 1 1 .

Reference Books:

1. Computational Geometry ï an Introduction, Franco Preparata and Michael Shamos, Springer - Verlag, 1985.

BECSE404T: Elective II: Mobile Computing

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

Unit I: History of Wireless Communication, Applications of Wireless Communication, A simplified Reference Model, A second generation 2G services systems, radio link, channel types, antennas and its types. Advantages of Wireless Network over Wired Network.

Unit II: Introduction to Cellular system,(Wireless) Medium Access Control: Motivation for a specialized MAC Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Comparison of SDMA/FDMA/TDMA/CDMA.

Unit III: Introduction to GSM system, GSM background, GSM operational and technical requirements. cell layout and frequency planning, mobile station, base station systems, switching sub systems, home locations register(HLR), Visiting Location Register (VLR), equipment identity register, echo canceller. GSM network structure, Protocols, Localization and calling, Handovers,

Unit IV: Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol (DHCP). TCP over Wireless Networks ï Traditional TCP, Indirect TCP, Snooping TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit V: Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, multicast routing, security in MANETs.

Unit VI: Protocols and Tools: Wireless Application Protocol -WAP; Introduction, protocol architecture, and treatment of protocols of all layers ; Bluetooth ï User scenarios, physical layer, MAC layer, networking, security, link management ; Wireless LAN and J2ME.

Text Books:

1. Mobile Computing for beginners , Raksha Shende, Arizona Business Alliance, 2012.
2. Mobile Communications, Jochen Schiller , Second edition, Addison - Wesley , 2004.
3. Handbook of Wireless Networks and Mobile Computing , Stojmenovic and Cacute, Wiley, 2002.

Reference Books:

1. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML , Reza Behravanfar, Cambridge University Press, 2004.
2. Fundamentals of Mobile and Pervasive Computing, Adelstein, Frank, Gupta and Sandeep KS , McGraw - Hill , 200 5.
3. Principles of Mobile Computing, Hansmann, Merk and Nicklous, Stober, Springer, Second E dition, 2003.
4. Mobile and Wireless Design Essentials, Martyn Mallick, Wiley DreamTech, 2003.