JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)
Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
Scheme of Study and Examination (w.e.f. July 2010)

B.E. Fourth Year **Branch: Information Technology** **SEM: Seventh**

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
		L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
					TA	CT	TOTAL			
IT-22	Machine Learning	3	1	-	10	20	30	70	100	4
IT-24	Embedded System	3	1	-	10	20	30	70	100	4
IT-26	Wireless & Mobile Computing	3	1	-	10	20	30	70	100	4
IT-27	Simulation & Modeling	3	1	-	10	20	30	70	100	4
Refer Table	Elective-I	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
IT-23L	Machine Learning Lab	-	-	2	20	-	20	30	50	2
IT-25L	Embedded System Lab	-	-	2	20	-	20	30	50	2
IT-28L	Simulation & Modeling Lab	-	-	2	20	-	20	30	50	2
IT-30L	Major project planning	-	-	4	40	-	40	60	100	4
IT-31L	Industrial Training-II*	-	-	2	50	-	50	-	50	2
		15	5	12	200	100	300	500	800	32

*Students will go for Industrial Training after VI semester in the summer vacations and will be assessed in VII semester.

T.A. = Teachers Assessment, CT= Class Test, ESE= End Semester Examination

Total Marks= 800, Total Periods= 32, Total Credits= 32

Elective-I					
IT-029A	1. Distributed System	IT-029B	2. Advanced Data Base Management System	IT-029C	2.Advanced Computer Architecture

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**MACHINE LEARNING**	IT-22	Min "D"	Min "D"	5.0

MACHINE LEARNING

Unit I- mathematical foundations of machine learning**,** random variables and probabilities**,** probability distributions**,** high-dimensional spaces**,** overview of machine learning, supervised, semi-supervised, unsupervised learning**,** inductive and transductive frameworks

Unit-II- Classification:-Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules..**Cluster Analysis:-** Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods:- Partitional Methods, Hierarchical Methods, Density-Based Methods,. Quality and Validity of Cluster Analysis Methods. Classification algorithms: linear and non-linear algorithms**,** perceptrons**,** logistic regression**,** naive Bayes**,** decision trees**,** neural networks**,** support vector machines**,** regression algorithms, least squares linear regression**,** neural networks**,** relevance vector machines

Unit-III- kernel methods**,** dual representations, RBF networks**,** graphical models**,** Bayesian networks**,** Markov random fields**,** inference**,** ensemble methods**,** bagging**,** boosting**,** random forests

Unit IV- practical aspects in machine learning, data preprocessing, overfitting, accuracy estimation, parameter and model selection.

Unit V- special topics, PAC learning**,** sample selection bias**,** learning from graph data**,** learning from sequential data

Reference Books:

- *Machine Learning*: A Multistrategy Approach by **Ryszard Spencer Michalski, Ryszard Stanislaw Michalski, George Tecuci.**
- Introduction to *Machine Learning by* Ethem Alpaydin.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**EMBEDDED SYSTEM**	IT-24	Min "D"	Min "D"	5.0

EMBEDDED SYSTEM

Unit I: Introduction to Embedded System, Categories, Requirements, Applications, Challenges and Issues. Core of Embedded system, Memory, Sensors and Actuators, communication interface, embedded firmware, system components.

Unit II: Architecture of 8051 microcontroller, memory organization, registers, interrupts, addressing modes, instruction sets. Interfacing methods parallel I/O interface, Parallel Port interfaces, Memory Interfacing, High Speed I/o Interfacing, Interrupts, interrupt service routing, features of interrupts, Interrupt vector and Priority, timing generation and measurements,

Unit III: Fundamental issues of hardware software co-design, computational models in embedded design. **Embedded firmware design approaches**- Embedded firmware development languages- Assembly language based, high level language based, mixed. Programming in embedded C.

Unit IV: Embedded System Development Environment: KEIL Integrated Development Environment (IDE), Types of files Generated on Cross-Compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging

Unit V: Real Time Operating Systems: Task and Task States, tasks and data, semaphores and shared Data Operating system Services, Message queues, Timer Function, Events, Memory Management, Interrupt Routines in an RTOS environment, Basic design using RTOS.

References:-

1. Shibu K V, "Introduction to Embedded System", TMH.
2. David E Simon, "An Embedded Software Primer", Pearson education Asia, 2001
3. Steven F. Barett, Daniel J. Pack, "Embedded Systems" Pearson education, First Impression 2008.
4. Vahid Frank, Tony Givargis, "Embedded System Design", John Wiley and Sons, Inc.
5. Dream Tech Software Team, "Programming for Embedded Systems" Wiley Publishing house Inc.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**WIRELESS & MOBILE COMPUTING**	IT-26	Min "D"	-	5.0

WIRELESS & MOBILE COMPUTING

Unit 1 : Introduction of Wireless Networks, Different Generations of Wireless Networks. Characteristics of the Wireless Medium: Radio Propagation Mechanisms, Path Loss Modelling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modelling Techniques.

Unit II : Introduction to cellular mobile system A basic cellular system, performance criteria, Uniquences of Mobile Radio Environment, Operation of cellular systems, Planning and cellular system, Analog and digital cellular systems.

Elements of cellular radio system design: General description of the problem, Concept of frequency channels, Co channel interface reduction factor, Cell splitting, Consideration of the components of cellular systems.

Unit III : **Cell coverage for signal and traffic:** General introduction, obtaining the mobile point-to-point mode propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point-to-point prediction model-characteristics, cell site, antenna heights and signal coverage cells, mobile-to-mobile propagation.

Unit IV : Introduction to Wireless LAN, Evolution of WLAN, Wireless Home Networking, Technologies for Home Area Network (HAN), Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless ATM, HIPERLAN.

Unit V : IEEE 802.15 WPAN, HomeRF, Bluetooth, Interference between Bluetooth and 802.11, Adhoc Networks, Introduction to 2.5 G and 3 G Networks.

References:

1. Kaveh Pahlavan, Prashant Krishnamurthy "principles of Wireless Networks", PHI.
2. Qing- An Zeng, Dharma Prakash Agrawal "Introduction to Wireless and Mobile Systems" CENGAGE Learning.
3. Sumit Kasera, Nishit Narang, A P Priyanka "2.5 G Mobile Networks: GPRS and EDGE", TMH
4. Dr. KAMILO FEHER "Wireless Digital Communications" , PHI
5. Jochen Schiller " Mobile Communications", PEARSON
6.Cellular and Mobile Communication by Lee (McGraw Hill)
7.Wireless Digital Communication by Dr. Kamilo Faher (PHI)

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**SIMULATION & MODELING**	IT-27	Min "D"	Min "D"	

SIMULATION & MODELING

Unit-I : Introduction to Modeling and Simulation: Nature of Simulation, Systems , Models and Simulation, Continuous and Discrete Systems, system modeling, Principles used in modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models, concept of simulation, Components of a simulation study. Introduction to Static and Dynamic System simulation, continuous and discrete time simulation. Advantages, Disadvantages and pitfalls of Simulation.

Unit-II : PROBABILITY CONCEPTS IN SIMULATION: Stochastic variables, discrete and continuous probability functions, Distributed Random numbers, generation of random numbers-Uniform and Non Uniform Random numbers, variance reduction techniques-Introduction, Common Random numbers- Rationale, Applicability and Synchronization.

Unit-III : Introduction to Queuing Theory: Characteristics of queuing system, Poisson's formula, berth-death system, equilibrium of queuing system, Queuing Disciplines, Simulation of single and two server queue. Analysis of M/M/1 queues. Application of queuing theory in computer system like operating systems, computer networks etc.

Unit-IV : Discrete-Event Simulation: Components and Organization of a Discrete-Event Simulation Model, Determining the Events and Variables, approaches for time advance. Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times.

Unit-V : Introduction to Simulation languages: GPSS: Action times, Succession of events, Choice of paths, Conditional transfers, program control statements. SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements.

References:

- Gorden G., System simulation, Printice Hall.
- Law .,Simulation Modeling And Analysis, McGraw Hill
- Payer T., Introduction to system simulation, McGraw Hill.
- Spriet, Computer Aided Modeling and Simulation, W.I.A.
- Sushil, System Dynamics, Wiley Eastern Ltd.
- Shannon R.E., System simulation, Prentice Hall.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**DISTRIBUTED SYSTEM**	IT-029A	Min "D"	-	5.0

DISTRIBUTED SYSTEM

Unit–I : Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. **System Models:** Architectural models, Fundamental Models **Theoretical Foundation for Distributed System**: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.
Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Unit–II : Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms. **Agreement Protocols**: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Unit–III : Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. **Security**: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent. **Distributed File Systems**: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit–IV : Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. **Distributed Transactions**: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault tolerant services, highly available services, Transactions with replicated data

Unit –V : Distributed Algorithms: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm.**CORBA Case Study**: CORBA RMI, CORBA services

Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design",Pearson Ed.
3. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
6. Tenanuanbaum, Steen," Distributed Systems", PHI
7. Gerald Tel, "Distributed Algorithms", Cambridge University Pres Gerald Tel, "Distributed Algorithms", Cambridge University Press

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**ADVANCED DATA BASE MANAGEMENT SYSTEM**	IT-029B	Min "D"	-	5.0

ADVANCED DATA BASE MANAGEMENT SYSTEM

Unit I: An overview of database, The Extended Entity Relationship Model and Object Model: The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.

Unit II: Query Processing, Optimization & Database Tuning: Algorithms For Executing Query Operations. Heuristics For Query Optimizations, Estimations of Query Processing Cost, Join Strategies for Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue in RDBMS.

Unit III: Distributed Database System: Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Distributed Query Processing In R * System, Concurrency Control In Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection and Resolution, Commit Protocols.

Unit IV: Enhanced Data Model For Advanced Applications: Database Operating System, Introduction to Temporal Database Concepts, Spatial And Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues in Real Time Database Design.

Unit V: Accessing databases from Web, JavaScript, JDBC, Java Servlets , database technology to Web related areas such as semi-structured databases and data integration, XML, XQuery, XPath, XML Schemas, distributed database design, distributed database transactions, and distributed query processing

References:-

1. Majumdar & Bhattacharya, "Database Management System", TMH.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley.
3. Korth, Silbertz, Sudarshan, " Database Concepts", McGraw Hill.
4. David M. Croenke and David J. Auer "Database Processing" Eleventh Edition, PHI
5. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill.
6. Peter Rob and Coronel, "Database Systems, Design, Implementation and Management", C engage

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**ADVANCED COMPUTER ARCHITECTURE**	IT-029C	Min "D"	-	5.0

ADVANCED COMPUTER ARCHITECTURE

Unit-I : Evolution of Computer Architecture, System Attributes to performance, Multiprocessor and Multi computers, Data and resource dependencies, Hardware & Software Parallelism, Program Partitioning and scheduling, Grain sizes and latency, Grain packing & Scheduling, Static Multiprocessor scheduling, Program flow Mechanisms, Control flow and Data flow, Demand- driven mechanism, Back plane Bus systems, Bus specification, Arbitration, Transaction and interrupt, IEEE future bus + Standards.

Unit-II : Cache Memory organization, Cache performance issues, Interleaved Memory organizations, Bandwidth and fault tolerance, Memory allocation Schemes. Linear pipeline processors, asynchronous and synchronous Nudels, Speedup, Efficiency and through put. Non-linear pipeline processors, Reservation and latency analysis, Collision free scheduling. Braches handling and Hazard avoidance, Dynamic instruction scheduling, Arithmetic pipeline design, super scalar and super pipeline design.

Unit-III : Vector computers, Vector instruction types, Vector access Memory schemes, Multi vector Multi processors, Compound vector processing, Static and dynamic Interconnection networks. Cache coherence, Snoopy bus protocols, Directory protocols, Hardware synchronization mechanisms, Message passing mechanisms, Message routing schemes, Deadlock and Virtual channels, Flow control strategies, Multicast reacting algorithms.

Unit-IV : Principles of scalable performance, Performance metrics and measures, Parallelism profile in programs, Harmonic mean performance, Efficiency, Utilization and quality, Standard performance measures, Application models of parallel computers. Speedup performance laws, Amdahls law for fixed workload, Memory bounded speedup model, Scalability analysis and approaches, Scalability matrix and goals.

Unit-V : Introduction to parallel programming and parallel programming models, Parallel languages and compilers, dependence analysis of data arrays, Code optimization and scheduling, Loop parallization and pipelining, Parallel program development and environments, Synchronization, Shared variable program structures.

References:

- Kai Hwang, Advance Computer Architecture, McGraw Hill.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**MACHINE LEARNING LAB**	IT-23L	Min "D"	Min "D"	5.0

MACHINE LEARNING LAB

List of experiments (please expand it):

1. Design implementation and evaluation of algorithms for semi supervised learning.
2. Study of perceptron update rules and perceptron conversion.
3. Study kernel regression & linear Regression.
4. Study of Bayesian Network.
5. Design of neural network using classification approach.
6. Study of Decision tree.
7. Study of split algorithm based on the Gini/ index.
8. Study of practical aspect of machine learning.
9. Study of PAC learning algorithm.
10. Study of loyistic regression.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**EMBEDDED SYSTEM LAB**	IT-25L	Min "D"	Min "D"	5.0

EMBEDDED SYSTEM LAB

List of experiments (please expand it):

Using 89S52 Microcontroller

1. Read input from switches and display on LEDs
2. Make LEDs blink
3. Write a program for serial communication to communicate with PC
4. Different types of Encryption and Decryption schemes
5. Read data from temperature sensor and display values in PC
6. Simulate an elevator movement
7. Display message in LCD display
8. Set time in RTC and display on LCD
9. Read input from switches
10. Read data from temperature sensor and display values in PC

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**SIMULATION & MODELING LAB**	IT-28L	Min "D"	Min "D"	5.0

SIMULATION & MODELING LAB

1. Single server system.
2. Simulate multiserver system.
3. Develop a model of mn inventory system.
4. Stimulate dump truck problem .
5. Develop job shop model.
6. Stimulate manufacturing system.
7. Develop a cafetaria model.
8. Stimulate telecommunication system working.
9. Study of uniformity testing .
10. Study of indefence testing.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**MAJOR PROJECT PLANNING**	IT-30L	-	Min "D"	5.0

MAJOR PROJECT PLANNING

The Major Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which should be selected from some real life problem as far as possible, which may involve fabrication, design or investigation of a technical problem. The project work involves sufficient work so that students get acquainted with different aspects of manufacturing, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the major project in this semester. It is possible that a work, which involves greater efforts and time, may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and also evaluated internally. At the end of semester, all students are required to submit a synopsis.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**INDUSTRIAL TRAINING-II***	IT-31L	-	Min "D"	5.0

INDUSTRIAL TRAINING

SCHEME OF STUDIES

Duration: 4 weeks after the VI semester in the summer break, Assessment in VII semester.

1.1 OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.

1.2 LEARNING THROUGH INDUSTRIAL TRAINING

During industrial training students must observe following to enrich their learning: - Industrial environment and work culture. - Organizational structure and inter personal communication. - Machines/ equipment/ instruments - their working and specifications. - Product development procedures and phases. - Project planning, monitoring and control. - Quality control and assurance. - Maintenance system. - Costing system. - Stores and purchase systems. - Layout of Computer/ EDP/MIS centers. - Roles and responsibilities of different categories of personnel. - Customer services. - Problems related to various areas of Work etc. Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work). Students are supposed to acquire the knowledge on above by -

1. Observation,
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.