

**CBCS SCHEME OF INSTRUCTION AND EXAMINATION of BCA COURSE**  
**FACULTY OF INFORMATION TECHNOLOGY**  
**Osmania University**

**MSc(S) I Year I - SEMESTER**

**TOTAL CREDITS : 80**

S.NO	COURSE CODE	COURSE TITLE	Scheme of Examination		L	T	P / Dg	CONTACT Hrs/Wk	Credits
			CIE	SEE					
<b>THEORY</b>									
1	IS 101	Advanced Algorithms	30	70	4		0	4	4
2	IS 102	Artificial Intelligence	30	70	4		0	4	4
3	IS 103	Advanced Operating Systems	30	70	4		0	4	4
4	IS 104	Software Project Management	30	70	4		0	4	4
5	IS 105	Financial & Managerial Accounting	30	70	4		0	4	4
6	IS 106	Communication course-I	30	70	4		0	4	4
<b>PRACTICALS</b>									
7	IS 121	Algorithms Lab	25	50	0		4	4	2
8	IS 122	Mini Project Lab	25	50	0		4	4	2
		<b>TOTAL</b>	<b>230</b>	<b>520</b>	<b>24</b>		<b>8</b>	<b>32</b>	<b>28</b>

## IS 101-ADVANCED ALGORITHMS

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### Unit-I

Algorithms – Anal sizing algorithms, designing algorithms  
Sorting and order statistics – Heap sort, quick sorting in linear time, medians and order statistics

### Unit-II

Data Structures – Elementary data structures, Hash tables. Binary search trees. Red-Black trees.  
Augmenting Data Structures

### Unit-III

Advanced Data Structures – B-trees, binomial heaps, Fibonacci heaps. Data structures for disjoint sets

### Unit-IV

Advanced design and analysis techniques – Dynamic programming, greedy algorithms. Amortized analysis  
Graph algorithms- Elementary graph algorithms. Minimal spanning tree. Single source shortest paths. All pair shortest paths

### Unit-V

String Matching. Number Theoretic algorithms. Computational geometry

### Suggested Reading:

1. Thomas H.Cormen.Charles E.Leiserson. Ronald L. Rivest – Introduction to algorithms. PHI 2001.
2. Michael T Goodrich. Roberto Tamassia – Algorithm Design. John Wiley 2001
3. Horowitz – Fundamentals of Computer Algorithms. Galgotia 1995.

## IS 102-ARTIFICIAL INTELLIGENCE

Instruction per week: 3Hrs  
Duration of Examination: 3 Hrs

Sessionals: 20  
Univ.Exam:80

### Unit- I

Artificial Intelligence – introduction. Foundations. History  
Intelligent Agents – introduction. Structure, environments  
Solving problems by searching – problem – Solving agents. Formulating problems. Searching for solutions. Search Strategies. Avoiding repetitions. Constraint satisfaction  
Informed search methods – Best – first. Heuristic functions , memory Boundary search. Iterative improvement.

### Unit-II

Agents that reason logically – Knowledge based agent. Representation. Reasoning and logic. Propositional logic  
First-Order logic – Syntax and semantics. Extensions and Notational variations. Using first-order logic. Simple reflex agents. Representing change. Deducing hidden properties. Preferences  
Inference in first-order logic – Generalized modus Ponens. Forward and backward chaining. Completeness. Resolution

### Unit-III

Languages for AI – LISP, PROLOG

### Unit-IV

Uncertain Knowledge and reasoning – Uncertainty, Basic Probability notations. Axioms of probabilities. Baye's rule and its use  
Probabilistic reasoning systems – Representation. Belief Networks – Semantics. Inference: Multiply connected belief networks. Knowledge engineering. Other approaches to uncertain reasoning  
Making complex decisions- Sequential decision problems. Value iteration. Policy iteration. Decision theoretic agent design, dynamic networks.

### Unit – V

Learning from observations – General model of learning agents. Inductive learning. Learning decision trees. Learning general logical descriptions. Computational learning theory.  
Learning in neural and belief networks – Neural networks. Perceptrons. Multi- layer feed forward. Applications. Bayesian methods for learning belief networks  
Reinforcement learning – Passive learning. Active learning. Exploration. Action – value function. Generalization in reinforcement learning  
Knowledge in learning – examples, Explanation – based learning, Learning using relevance information. Inductive logic programming

**Suggested Reading:**

1. Stuart Russel. Peter Norvig. Artificial Intelligence – a modern approach. PH 1995
2. George F Luger – Artificial Intelligence – Structures and strategies for complex problem solving. 4<sup>th</sup> Edition. Pearson 2002
3. Elaine Rich. Kevin Knight – Artificial Intelligence – 2<sup>nd</sup> Edition. McGraw 1993 Clarsin , Mellish – Programming in prolog, Narosa 1987.
4. Patrick H. Winston. Berthold K. P. Horn – LISP, Addison 1984.

## IS 103-ADVANCED OPERATING SYSTEMS

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### Unit-I

Computer System Overview – Basic Elements, registers, instruction execution, interrupts, memory hierarchy ,cache memory ,I/O communication techniques.

Operating System Overview – objectives and functions, major achievements, characteristics of modern OS, WINDOWS 2000 overview, UNIX system overview process description and control – states, description, control, UNIX process management , process and threads, symmetric multiprocessing, Micro Kernels. Windows 2000 thread and SMP management. Solaris thread

and SMP management. Linux process and thread management.

### Unit – II

Concurrency : principles, Mutual Exclusion, semaphores, monitors, message passing, principles of deadlock. Unix concurrency mechanism. Solaris Thread Synchronization primitives, windows 2000 concurrency Mechanisms.

Memory management- requirements, portioning, paging, segmentation

Virtual Memory – Hardware and control, OS software. UNIX and Solaris memory management,

Linux memory management, windows 2000 memory management.

### Unit – III

Scheduling – Types, Algorithms, UNIX scheduling, multiprocessor scheduling, Real – Time Scheduling, Linux Scheduling, windows 2000 scheduling.

I/O management and disk scheduling – I/O devices, Organization, design issues, I/O buffering, disk scheduling, RAID, Disk Cache, UNIX I/O, windows 2000 I/O.

File Management – overview, organization, directories, sharing, record blocking, secondary storage management, UNIX file management, windows 2000 file systems.

### Unit – IV

Multimedia Operating Systems – Multimedia Files, compression, process scheduling, file system paradigms, file replacement, caching, disk scheduling.

Distributed Processing – Client/ Server computing, Distributed message passing, RPCs clusters, windows2000 cluster server, sun cluster, Linux Clusters

Process Migration, Distributed global states, Distributed Mutual Exclusion.

### Unit –V

Distributed Systems – network services and protocols, Middleware – document based file system based , shared object based, coordination based;

Computer security – Environment, Cryptography, user authentication, attacks from inside, attacks from outside, protection mechanisms, Trusted Systems, windows 2000 security

### Suggested Reading:

1. William Stallings – Operating Systems – 4<sup>th</sup> Edition, PH 2001.
2. Andrew S. Tanenbaum – Modern Operating Systems, 2<sup>nd</sup> Edition, Pearson 2001

## IS 104 - SOFTWARE PROJECT MANAGEMENT

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### Unit- I

Introduction to software Project management  
Overview of Project Planning  
Project evaluation  
Selection of an appropriate Project approach  
Activity Planning

### Unit-II

Risk management  
Resource allocation  
Monitoring contracts  
Managing people and organizing teams  
Software quality

### Unit-III

UML-introduction  
Structural Modeling- Classes, Relationships, common mechanics. Diagrams, class diagrams, advanced classes. Advanced relationships. Interfaces. Types and roles. Packages, instances, object diagrams  
Behavioral Modeling – interactions. Use cases. Use case diagrams. Interaction diagrams. Activity diagrams. Events and signals. State Machines. Processes and threads. Time and space.  
State chart diagrams.  
Architectural Modeling – Components. Deployment. Collaborations. Patterns and frameworks.  
Component diagrams. Deployment diagrams. Systems and Models

### Unit- IV

Unified Software Process – Fundamentals. Structure. Organizing along time and content. Role, activity, workflow, content  
Core workflows – Business modeling, environment. Project management. Requirements

### Unit – V

Unified Process – Analysis and design. Test. Implementation. Deployment. Configuration and change management

### Suggested Reading:

1. Bob Hughes. Mike Cotterell – Software Project Management. Second edition. McGraw 1999
2. Ivar Jacobson. Grady Booch and James Rumbaugh – The Unified Software Development Process, Addison 1999
3. Grady Booch. James Rumbaugh, Ivar Jacobson – The Unified Modeling Language – user guide. Addison 1999

## **IS 105 FINANCIAL & MANAGERIAL ACCOUNTING**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### **Unit- I**

Meaning and scope of accounting. Accounting Principles, Journalising Transactions. Ledger posting and trail balance. Sub-division of journal, negotiable instruments

### **Unit-II**

Bank reconciliation statement. Capital and revenue, final accounts, rectification of errors

### **Unit-III**

Introduction to managerial accounting, Manufacturing costs and job-order costing systems, Process costing.

### **Unit – IV**

Cost-Volume-Profit analysis, Cost allocation. Activity based costing, use of cost information and management decisions

### **Unit – V**

Capital budgeting decisions. Budgetary planning and control. Standard costs and variance analysis. Decentralization and performance evaluation

### **Suggested reading:**

1. S.N.Maheswari. – Financial Accounting. Third edition. Vikas 2000
2. James Jiambalvo – Managerial Accounting, John Wiley 2001

## **IS 106 COMMUNICATION COURSE - I**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### **UNIT I: Language Skills**

- Listening
- Speaking
- Writing
- Reading

### **UNIT – II: Communication Skills**

- Importance of Communication Skills
- Verbal Communication Skills
- Non-verbal Communication Skills

### **UNIT – III: Learning Skills**

- Critical Thinking
- Creative thinking
- Communicating
- Collaborating

### **UNIT – IV: Leadership and Team Management**

- Qualities of a Good Leader
- Leadership Styles
- Decision Making
- Problem Solving
- Negotiation Skills

### **UNIT – V:**

- Resume Preparation Procedure
- Group Discussion
- Business and Social Etiquette



## IS 121-ALGORITHMS LAB

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:25  
Univ.Exam:50

Develop Programs for the following (C++ or Java)

1. Sorting algorithms
2. Implementation of Stacks. Queues. Linked Lists and rooted trees
3. Hash Table and binary tree implementation for spell checkers
4. Huffman codes
5. Optimal polygon triangulation
6. B-trees
7. Disjoint sets
8. Kruskal and Prims algorithms for minimal spanning trees
9. Single source shortest path algorithms
10. Ford – Fulkerson Method of finding maximum flows
11. RSA public-key cryptosystem
12. String Matching algorithms
13. Computational geometry problems
14. Search Space problems In AI
15. Resolution using LISP
16. Problem Solving using PROLOG
17. Multi threaded programming in windows
18. Inter Process Communications in UNIX and Windows
19. Simulation of scheduling algorithms
20. Simulation of Neural Network

## **IS 122-MINI PROJECT LAB- I**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:25  
Univ.Exam:50

Visit one of the business organization and develop an information system or E-commerce application using Visual Modeler from Rational Rose. The student is expected to follow unified process and develop a documentation covering all the stages of the unified process.

## II - SEMESTER

S.NO	COURSE CODE	COURSE TITLE	Scheme of Examination		L	T	P / Dg	CONTACT Hrs/Wk	Credits
			CIE	SEE					
<b>THEORY</b>									
1	IS 151	Network Security	30	70	4		0	4	4
2	IS 152	Design Patterns	30	70	4		0	4	4
3	IS 153	Data Warehousing and Data Mining	30	70	4		0	4	4
4	IS 154	Information System Audit Control	30	70	4		0	4	4
5	IS 155	Communication Course -II	30	70	4		0	4	4
<b>ELECTIVE - I (ANY ONE)</b>									
6	IS 459	Customer Relation Management	30	70	4		0	4	4
7	IS 461	Supply Chain management & Logistics	30	70	4		0	4	4
8	IS 462	Knowledge Management	30	70	4		0	4	4
<b>PRACTICALS</b>									
9	IS 463	Data Mining Lab using WEKA	25	50	0		4	4	2
10	IS 464	Mini Project	25	50	0		4	4	2
			<b>230</b>	<b>520</b>	<b>24</b>		<b>8</b>	<b>32</b>	<b>28</b>

## IS 151-NETWORK SECURITY

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### UNIT-I

Cryptography Terminology, Stenography, Subscription ciphers, onetime pads, Cryptographic Protocols-Introduction using Symmetric Cryptography, one-way Hash Functions, communication using public-key cryptography and hybrid cryptosystems, Digital Signatures, Digital Signatures with encryption, Random and pseudo random sequence generation, Basic protocols- key Exchange, authentication and key exchange, formal analysis, secret splitting, secret sharing, cryptographic protection of databases.

### UNIT-II

Intermediate protocols-Time stamping, subliminal channel, Signatures, Bit commitment, fair coin flips, mental poker, key Escrow. Advanced Protocols-Zero Knowledge proofs, Blind signatures, identity based Public-key cryptography oblivious transfer, simultaneous contract signing, Digital certified mail, simultaneous exchange of secrets. Esoteric Protocols-Secret Elections, secure multiparty computation, anonymous Message Broadcast Digital cash.

### UNIT-III

Key Length-symmetric key length, public key length  
Key Management Generation transfer, verification use, Store Backup, life time, destruction, public key management.  
Algorithm types and modes-Electronic codebook, Block replay, Cipher Block chaining, Stream Ciphers, self synchronizing, cipher-feedback, synchronous stream, output feedback, counter mode, choosing cipher mode, comparison  
Using Algorithms-choosing an algorithm, public key versus symmetric encrypting and communication channels. Encrypting data for storage hardware encryption versus software Encryption

### UNIT-IV

Information theory, complexity theory, number theory, factoring, prime number generation  
DES –Background, Description, security of DES, Differential and linear crypto analysis, DES  
vacancy, pseudo random sequence generators, linear congruential, Linear feedback shift register  
stream ciphers, Design and analysis, Stream Cipher using LFSRs

### UNIT-V

One way hash functions, Background, MD5, SHA  
Public-key Algorithms-Backgrounds  
Digital Signature Algorithm  
Diffie-Hellman algorithm for key exchange  
Implementation Examples-IBM, ISDN, Kerberos, ISO authentication framework, PBM PKC  
DEPS

### Suggested Reading:

1. Bruce Schneier-Applied Cryptography, Wiley 2001.

2. William Stallings –Cryptography and Network Security, PH

### **IS 152- DESIGN PATTERNS**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

#### **UNIT-I**

Design Patterns – Introduction,  
Creational patterns- Factory method, abstract factory, singleton, builder ,prototype.

#### **UNIT-II**

Structural Patterns- Adapters, bridge, composite, decorator, façade, flyweight, proxy.

#### **UNIT-III**

Behavioral Patterns – Chain of responsibility, command, interpreter , Iterator, mediator, memento, observer, state, strategy, template, visitor,

#### **UNIT-IV**

Other design patterns- Whole part, master- slave, view handler, forwarder- receiver, client – dispatcher- server, publisher – subscriber.

#### **UNIT-V**

Architectural patterns – Layers, pipes and filters, black board, broker ,model - view controller ,presentation- abstraction – control, micro kernel, reflection.

#### **Suggested Reading:**

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides – Design Patterns- Addison, 1995, Pearson Education.
2. Frank Buschmann etc. – Pattern Oriented Software Architecture – Volume 1, Wiley 1996.  
James W Cooper – Java Design Patterns, a tutorial, Addison 2000, Pearson Education

### **IS 153-DATA WAREHOUSING AND DATA MINING**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

### **Unit- I**

Data Warehousing – Introduction, Definition, multidimensional Data model, OLAP operations,  
Schema, Architecture, Data Marts, Meta Data, OLAP Engine, backend process.  
Data Mining – Definitions, KDD, DM Techniques, Problems, Issues and challenges, Applications.  
Association Rules – Introduction, methods, A priori, Partition Pincer – Search algorithm, Dynamic Itemset Counting. FP – tree Growth algorithms, incremental algorithm.

### **Unit – II**

Clustering Techniques – Introduction, Partitioning algorithms, Hierarchical algorithms, Categorical clustering  
Decision Trees – introduction, tree construction principle, Best split, Construction algorithms, construction with presorting

### **Unit – III**

Neural Networks. Genetic algorithms  
Web Mining – content mining. Structure mining, usage mining, text mining, text clustering  
Temporal data mining- introduction, temporal association rules, sequence mining. GSP, SPADE.  
Episode discovery. Event-prediction, time-series, spatial mining.

### **Unit – IV**

Data warehouse applications – grocery store, warehouse, shipments, value-chain, and their combination, financial services. Subscription business, insurance, voyage business.

### **Unit – V**

Factless fact tables. Building a dimensional data warehouse, aggregates, back room operations.  
Front room operations. Front end applications, future trends.

### **Suggested Reading:**

1. Arun K Pujari. Data Mining Techniques, universities press 2001
2. Ralph Kimball – the data ware house tool kit, john wiley 1996.
3. Jake Sturm- Data warehousing with SQL server 7.0 Technical reference, PHI 2000
4. Michael J.A. Berry, Gordon S. Linoff, Mastering Data Mining, Wiley 2001

## **IS 154 - INFORMATION SYSTEM AUDIT AND CONTROL**

Instruction per week : 3Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

### **Unit- I**

Information system Auditing Overview- Need, Effect of computers on internal controls and auditing

Conducting an information system Audit – Introduction, Dealing with complexity, Audit risks,

Types of audit procedures. Steps in an audit.

Data Resource Management Controls – motivation, Functions of DA and DBA, organizational

issues. Data repository system, control over DA and DBA.

Security Management Controls – Conducting a security program, Major security threats and remedial measures. Controls resorts

## **Unit-II**

Operational Management Controls – Computer operations, Network operations. Data preparation

and entry production controls file library. Documentation, capacity planning management of outsourced operations.

Boundary Controls – Introduction, Cryptographic controls, Access Controls. PINs, Digital Signatures, plastic cards. Audit trail Control

Input Control – Data input methods. Source document design, Data- Entry Screen design, Data

Code controls. Check digits, batch controls. Validation of data input, Instruction input Validation, Audit Trail Controls.

## **Unit-III**

Communication Controls – Communication Subsystem, Physical Component controls. Line error

controls. Flow controls. Link controls. Topological Controls. Channel Access controls. Control

over subversive threats. Internetworking controls, Communication Architectures and control. Audit trail

Processing Controls – Processor controls, Real Memory controls, Virtual memory controls Operating system integrity. Application software controls. Audit trails

Data base controls – Access, Integrity, Application Program, Concurrency cryptography, file handling. Audit trail. Existence.

## **Unit-IV**

Output Controls – Inference. Batch output production and distribution. Batch report design, online output production and distribution, Audit trails

Audit Software – Generalized Audit Software, Utility software, Specialized Audit Software. Code Review. Test Data. Code compression

Concurrent Audit Techniques – Need, types. Implementation, Strengths / Limitations.

Performance measurement – Introduction, characteristics, Performance measurement and data

integrity.

Presenting performance measurement results, performance measurement and data integrity.

## **Unit –V**

Evaluating Asset Safeguarding and Data Integrity – Measures nature. Determinants of Judgement Performance, Audit technology to assist, Cost-effective considerations

Evaluating system Effectiveness – Introduction, model, Evaluating System quality, information

quality, Usefulness. Perceived case of use, self efficacy, IS use, Individual impact, IS models.

System models.

**Suggested Readings:**

1. Rob Weber – Information System Control and Audit. Prentoe hal 1999

**IS 155- COMMUNICATION COURSE-II**

Instruction per week : 4Hrs

Sessionals:30

Duration of Examination : 3 Hrs

Univ.Exam:70

**Unit-1**

**Presentation Skills**

- Planning and Preparation



- Thinking about Audience
- Academic Presentations and Business Presentations
- Delivering Presentations
- Mock Presentations

## **Unit-2**

### **Goal Setting**

- Immediate, Short term, Long term
- Smart Goals
- Strategies to Achieve goals

## **Unit-3**

### **Time Management**

- Types of Time
- Identifying Time Wasters
- Time Management Skills
- Advantage of Time Management

## **Unit-4**

### **Leadership and Team Management**

- Qualities of a Good Leader
- Leadership Styles
- Decision Making
- Problem Solving
- Negotiation Skills

## **Unit-5**

### **Techniques in Personality Development**

- Effective Planning
- Social Skills
- Body Language
- Stress Management
- Conflict Management

## **References**

1. Singh, Prakash and Meenakshi Raman. *Business Communication*. New Delhi, OUP, 2006.
2. Baily, Edward P. *Writing and Speaking at Work. A Practical Guide for Business Communication*. Pennsylvania, Prentice Hall, 2007.
3. Pease, Allen and Peas Barbara. *The Definitive Book of Body Language*. New York, Random House, 2006.

## **ELECTIVE – I**

### **IS 156 -CUSTOMER RELATIONSHIP MANAGEMENT**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

#### **Unit- I**

Distinctive aspects of service management- services in modern economy, marketing services versus goods. Integrated approach. Environment of services  
Customer involvement in services – services differentiation, service as a process.  
Management challenges  
Customer and service operation. Service as a system, managing service encounters, customer misbehavior, customer as coproducer

#### **Unit –II**

Customer behavior- Nature of service consumption, customer needs and expectations.  
Customer evaluation of performance. Strategic responses. Purchasing process. Service offering evaluation.  
Selecting customer, valued relationships. Customer loyalty  
Consumer compliment behavior. Service recovery, service guarantees.

#### **Unit – III**

Positioning a service in the market place, search for competitive advantage, creating a competitive position. Steps in developing a position strategy, positioning maps  
Pricing strategies for services- Customer perspective, Service pricing, monetary pricing objectives. Pricing strategy, pricing and demand  
Customer education and service promotion – marketing communications, implications for communication strategy. Communication objectives. Marketing communications mix.  
Internet for market communications.

#### **Unit – IV**

Scenarios for service delivery. Options for service delivery, place and time decisions.  
Services scape. Role of intermediaries  
Balancing demand and capacity – ups and downs of demand. Measuring and managing capacity  
patterns and determinants of demand, strategies for managing demand.  
Managing customer waiting lines and reservations – universality of waiting, minimizing perceived length of wall. Calculating wait times. Reservations.

#### **Unit- V**

CRM Marketing initiatives. CRM and customer service, sales force automation, CRM in EBusiness.  
Analytical CRM.

#### **Suggested Reading:**

1. Christopher Lovelock – Services Marketing – people technology, strategy, ph 2001
2. Jill Dyche – The CRM hand book, pearson 2002

### **IS 157 -SUPPLY CHAIN MANAGEMENT AND LOGISTICS**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:30  
Univ.Exam:70

#### **Unit- I**

Supply chain- introduction decision phases. Process view. Importance  
Competitive and supply chain strategies, strategic fit, expanding strategic scope  
Supply chain drivers – introduction, frame work, inventory, transportation, facilities ,  
information obstacles.  
Demand forecasting – role, characteristics, components, forecasting methods – Basic  
approach,  
time series, measures of forecast errors

#### **Unit-II**

Aggregate planning – role, problem, strategies, aggregate planning using linear programming  
and EXCEL, implementation.  
Predictable variability, managing supply and demand, implementation solutions, role of cycle  
inventory, scale to exploit fixed costs and quantity discounts, short- term discounting,  
estimating  
cycle inventory

#### **Unit – III**

Role of safety inventory, determination of appropriate level, impact of supply uncertainty,  
safety  
inventory and replenishment policies, estimation of safety inventory  
Level of product availability – importance, factors, managerial levers to improve profitability,  
SC contracts and their impact, setting optimal levels of product.

#### **Unit – IV**

Transportation – role , factors, mode of transportation and their characteristics, design options  
for  
transportation network. Trade-off, tailored transportation, routing and scheduling, making  
decisions.  
Information technology in supply chain – role , importance, use, IT as information enabler

## **Unit – V**

Coordination in supply chain – Bullwhip effect on performance . obstacles. Managerial levers.

Building strategic partnership and trust. Coordination in practice.

e-business and supply chain – role impact, value, setting of e-business

financial evaluation – impact of financial factors, discounted cash flow analysis, representation

of uncertainty, evaluation using decision trees.

### **Suggested Reading:**

1. Sunil Chopra, Peter Meindil – Supply chain management, person 2001

2. David simichi-levi etc – Designing and managing supply chain, concepts, strategies and case studies. Mc Graw 2000

3. Joseph S.Martinich – Production and operations management, an applied modern approach, wiley 1997.

4. Lee J. Krajewski. Larry P.Ritzman – Operations management – Strategy and analysis. Addison 1999.

## **IS 158 – KNOWLEDGE MANAGEMENT**

Instruction per week : 4Hrs

Duration of Examination : 3 Hrs

Sessionals:30

Univ.Exam:70

### **UNIT –I**

Parameters of Knowledge Management

Knowledge based Economy

Paradigms for knowledge Management

Knowledge Management Principles

Case Studies of knowledge Management in work places

### **UNIT-II**

Knowledge Measurement and Value

Measuring return on Knowledge

Electronic Tools for knowledge Management

Implementation of knowledge Management

Future Models Components

### **UNIT –III**

Value of Knowledge

Knowledge Engineering Basics

Task and its organizational Contest

Knowledge Model Components

### **UNIT –IV**

Template Knowledge Models

Knowledge Model Construction

Knowledge Elicitation Techniques

### **UNIT –V**

Modeling Communication Aspects

Designing Knowledge Systems

Knowledge System Implementation

Advanced Knowledge Modeling

**Suggested Reading:(25)**

1. Thomas Housel, Arthur H. Bell, Measuring and Managing Knowledge, McGraw 2001.
2. Guess Schreiber etc, Knowledge Engineering and Management, MIT Press 2001, (University Press 2001).

## **PRACTICALS**

### **IS 181-DATA MINING LABORATORY USING WEKA**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:25  
Univ.Exam:50

1. Creating an arff file
2. Preprocessing on dataset student.arff , labor.arff  
Load the data, view the attributes, compute some basic strategies on each attribute, view the basic statistics on the attributes, visualization in the form of cross-tabulation across two attributes, Selecting or filtering attributes, Removing an attribute, Discretization on numeric or continuous attributes.
3. Association rule mining on dataset contactlenses.arff, test.arff using **apriori algorithm**
4. Classification of dataset student.arff, employee.arff using **j48 algorithm**
5. Classification of dataset employee.arff using **id3 algorithm**
6. Classification of dataset employee.arff using **Naïve Bayes algorithm**
7. Clustering of dataset student.arff, iris.arff using **simple k-means**

### **IS 182-MINI PROJECT**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:25  
Univ.Exam:7550

Extension of Project out in the first semester covering implementation using programming language. Design patterns where ever necessary, testing, deployment and configuration management. The students are expected to demonstrate the working model on the computer

system in addition to submission of detailed project report at the time of university examination.

### III - SEMESTER

S.NO	COURSE CODE	COURSE TITLE	Scheme of Examination		L	T	P / Dg	CONTACT Hrs/Wk	Credits
			CIE	SEE					
<b>THEORY</b>									
1	IS 201	Digital Logic and Embedded Systems	30	70	4		0	4	4
2	IS 202	Big Data	30	70	4		0	4	4
3	IS 203	Formal Languages and Compiling Techniques	30	70	4		0	4	4
4	IS 204	Cloud Computing	30	70	4		0	4	4
<b>ELECTIVE - II (ANY ONE)</b>									
	IS 210	Human Computer Interaction	30	70	4		0	4	4
	IS211	Enterprise Application Integration	30	70	4		0	4	4
	IS 212	Production and Operations Management	30	70	4		0	4	4
<b>PRACTICALS</b>									
1	IS 514	Big Data Lab	25	50	0		4	4	2
2	IS 515	Embedded System Lab	25	50	0		4	4	2
3	IS 223	Soft Skills -III	25	50	0		4		
<b>TOTAL</b>			<b>225</b>	<b>500</b>	<b>20</b>		<b>12</b>	<b>26</b>	<b>26</b>

**IS 201**

**DIGITAL LOGIC AND EMBEDDED SYSTEMS**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

**UNIT -I**

**Design Concepts**-Digital Hardware, design process, design of digital hardware Introduction to logic circuits - Boolean Algebra, Gates, CAD tools

**VHDL Implementation Technologies** - NMOS, CMOS, PLDs, practical aspects, transmission gates, Implementation of PLDs and FPGAs

**UNIT-II**

**Optimized implementation of logic functions**- Karnaugh map, strategy, minimization of product of sums, NAND and NOR gates, Multilevel Synthesis, Cubical representations and minimization using cubical representation, CAD tools. Design of arithmetic circuits using CAD tools.

**Combinational Building blocks** - Multiplexers, decoders, encoders, code converters, VHDL for combinational circuits.

**Latches**-Basic. Gated SR, Gated D; Flip flops- D.T, and JK, Registers, Counters, using CAD tools.

**UNIT -III**

**Synchronous sequential circuits** - Basic design, state assignment, Mealy state model, design of finite state machines using CAD tools, State minimization, counter using sequential circuit, FSM as arbiter circuit, analysis, ASM charts.

**Asynchronous sequential circuits** - behavior, analysis, synthesis, state assignment, hazards.

**Digital System design** - Building block circuits, design examples, clock synchronization, Testing.

## **UNIT-IV**

**General Purpose processors software** - Basic architecture, operation, programmers view, development environments, ASIPs.

**Standard single purpose processor** - introduction, timers, UARTs, PWM, LCD controller, keypad controller, stepper motor controller. *A/D* converter.

**Memory** - Introduction, Common Memory types.

**Interfacing** - Communication basics. I/O Addressing, Interrupts, DMA, Arbitration, Advanced communication principles, Serial protocols, Parallel protocols, wireless protocols.

## **UNIT - V**

**State Machine and concurrent process models** - Models, Languages, FSM. Using state machines, HCFSM, PSM, Concurrent Process model- Processes, communication synchronization, implementation.

**Control Systems** - Open loop, closed loop, PID controllers, practical issues, benefits

**IC Technology** - VLSI, ASIC.

**Design Technology** - Automation: Synthesis, Verification, reuse.

### **Suggested Reading:**

1. Stephen Brown, Zvonko Vranesic - "Fundamentals of Digital logic with VHDL design", McGraw 2000.
2. Frank Vahid, Tony Givargis - "Embedded System Design - A Unified Hardware / Software Introduction", John Wiley, 2002.



With effect from the academic year 2015-2016

**IS 202**

**BIG DATA**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

### **UNIT-I**

**Overview:** Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, Advantages of Big Data Analytics, Future of Big Data

**Exploring the Use of Big Data in Business Context:** Social Networking, Preventing Fraudulent Activities, Detecting Fraudulent Activities in Insurance Sector, Retail Industry

**Introducing Technologies for Handling Big Data:** Distributed and Parallel Computing, Hadoop, Cloud Computing and Big Data, In-Memory Computing Technology for Big Data

### **UNIT-II**

**Hadoop:** Hadoop Ecosystem, Hadoop Distributed File System, Map Reduce, Hadoop YARN, H Base, Hive, Pig and Pig Latin, Scoop, Zookeeper, Flume, Oozier

**Map Reduce Fundamentals:** The Map Reduce Framework, Techniques to Optimize Map Reduce Jobs, Uses of Map Reduce

**Big Data Technology Foundations:** Exploring the Big Data Stack, Virtualization and Big Data, Virtualization Approaches

**Storing Data in Hadoop:** Introducing HDFS, Introducing H Base, Combining H Base and HDFS

Selecting the Suitable Hadoop Data Organization for Applications

## UNIT-III

**Processing Your Data with Map Reduce:** Concept of Map Reduce Framework, Developing Simple Map Reduce Application, Points to Consider while Designing Map Reduce

**Customizing Map Reduce Execution:** Controlling Map Reduce Execution with Input Format, Reading Data with Custom Record Reader, Organizing Output Data with Output Formats, Customizing Data with Record Writer, Optimizing Map Reduce Execution with Combiner, Controlling Reducer Execution with Partitioners

**Exploring Hive:** Introducing Hive, Getting Started with Hive, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive

**Analyzing Data with Pig:** Introducing Pig, Running Pig, Getting Started with Pig Latin, Working with Operators in Pig, Working with Functions in Pig

## UNIT-IV

**Storing Data in Databases and Data Warehouses:** RDBMS and Big Data, Non-Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouses, Big Data Analysis and Data Warehouse, Changing Deployment Models in Big Data Era

**No SQL Data Management:** Introduction to No SQL, Aggregate Data Models, Key Value Data Model, Document Databases, Relationships, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, Shading, Map Reduce Partitioning and Combining, Composing Map Reduce Calculations

**Analytics and Big Data:** Comparing Reporting and Analysis, Types of Analytics, Points to Consider during Analysis, Developing an Analytic Team, Understanding Text Analytics

**Analytical Approaches and Tools to Analyze Data:** Analytical Approaches, History of Analytical Tools, Introducing Popular Analytical Tools, Comparing Various Analytical Tools

## UNIT-V

**Data Visualization:** Introducing Data Visualization, Techniques Used for Visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Tools Used in Data Visualization

**Social Media Analytics and Text Mining:** Introducing Social Media, Introducing Key Elements of Social Media, Introducing Text Mining, Understanding Text Mining Process, Sentiment Analysis

Performing Social Media Analytics and Opinion Mining on Tweets

**Mobile Analytics:** Introducing Mobile Analytics, Introducing Mobile Analytics Tools, Performing Mobile Analytics, Challenges of Mobile Analytics

### Suggested Reading:

1. DT Editorial Services, Big Data Black Book, Dream Tech Press, 2015
2. Tom White, Hadoop: The Definitive Guide, O Reily, 4<sup>th</sup> Edition, 2015
3. Alex Homes, Hadoop in Practice, Manning Publications Co, 2012
4. Jimmy Lin, Chris Dyer, Data-Intensive Text Processing with Map Reduce, Morgan Claypool Publishers. 2010

With effect from the academic year 2015-2016

**IS 203                      FORMAL LANGUAGES AND COMPILING TECHNIQUES**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

**UNIT - I**

**Theory of computation** – Introduction basic concepts.

**Finite Automata** - DFA, NFA, Regular languages and regular grammars - Regular expressions, connection between regular expressions and regular languages, regular grammars, Closure properties of regular languages.

**UNIT-II**

**Context** - Free Languages- CFG, Parsing and ambiguity, context free grammars and programming languages.

**Simplification of context free grammars** - Methods, normal forms. Push-down automata - Non-deterministic push down automata, PDA and CFG Pumping Lemmas, Introduction to Turing machine.

**UNIT-III**

**Compiler** - Introduction, Phases of compiler.

**Lexical Analysis** - role, specification of tokens, recognition of tokens, LEX.

**UNIT-IV**

**Syntax Analysis** - role of parser, Top-down parsing, Bottom-up parsing, YACC, Symbol Table organization.

## **UNIT - V**

Semantic Analysis, Code generation, Code Optimization.

### **Suggested Reading:**

1. Peter Linz, "An Introduction to Formal Languages and Automata", Narosa, 2001.
2. J.P. Bennett, " Introduction to Compiling Techniques", McGraw Hill, 1996.
3. Aho & Ullman, Compiler Design

With effect from the academic year 2015-2016

**IS 204**

**CLOUD COMPUTING**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

### **UNIT-I**

**Overview of Cloud Computing:** Introduction to Cloud Computing, Need and Motivation of Cloud computing, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

### **UNIT-II**

**Virtualization:** Introduction to virtualization, Virtual Machines and Virtualization of Clusters and Data Centers, Levels of Virtualization, Virtualization Structures / tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

**Case Studies:** Xen Virtual machine monitors – Xen API. VMware – VMware products – VMware features. Microsoft Virtual Server – Features of Microsoft Virtual Server.

### **UNIT-III**

**Cloud computing architectures over Virtualized Data Centers:** Data–Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

#### **UNIT-IV**

**Cloud Security and Trust Management, data Security in the Cloud:** An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, **CryptDb:** Onion Encryption layers – DET, RND, OPE, JOIN, SEARCH, HOM and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

#### **UNIT-V**

**Cloud Programming and Software Environments:** Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Overview of Hadoop, Map Reduce and MPI, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

**Common Standards in Cloud Computing:** The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

#### **Suggested Reading:**

1. John W. Ritting House, James F. Ran Some, "Cloud Computing: Implementation, Management, and Security ", CRC Press 2009.
2. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, “Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,” [Cloud Computing: Principles and Paradigms \(Wiley Series on Parallel and Distributed Computing\)](#), Wiley Publishing ©2011
4. Raluca Ada Popa, Catherine M. S. Redfield, Nikolai Zeldovich and Hari Balakrishnana, “Crypt DB: Protecting Confidentiality with Encrypted Query Processing” 23<sup>rd</sup> ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
5. Craig Gentry, A Fully Homomorphic Encryption Scheme, September 2009.
6. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

#### **Web resources:**

1. <http://aws.amazon.com/>
2. <http://code.google.com/appsengine>
3. <http://www.buyya.com/>

With effect from the academic year 2015-2016

**Elective – II**  
**(Any one of the following)**

**IS 210**

**HUMAN COMPUTER INTERACTION**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

**UNIT- I**

Importance of the user interface. Characteristics of graphical and web user interfaces, User Interface **Design Process:** Knowing the client, Understanding business function, Principles of good screen design.

**UNIT-II**

System Menus and Navigation Schemes, Kinds of windows, Device based controls, Screen based controls, Test and Messages.

**UNIT- III**

Feedback, Guidance and assistance. Internationalization and accessibility, graphics, icons and images, colours, Layout windows and pages.

**UNIT- IV**

**Interaction Design:** Introduction, Goals, Usability, Conceptualization interaction: Problem space, Conceptual models, Interface metaphors, Interaction paradigms, **Cognition:** Conceptual frameworks for cognition. **Collaboration and Communication:** Social mechanism, Conceptual framework.

**UNIT- V**

Affective aspects, Expressive interface, User frustration, Agents, Process of interaction design, Activities characteristics, Practical issues, Life cycle models, **Design:** Prototyping and construction, Prototyping, conceptual design, **Physical design Evaluation:** Introduction, Framework, **Testing and modelling users:** Kinds of tests ,Doing user testing, Experiments, Predictive models.

**Suggested Reading:**

1. Wilbert O. Galitz, The Essential Guide to User Interface Design, Wiley Dream tech 2002.
2. Sharp, Rogers, Preece, Interaction Design, John Wiley, 2007.
3. Andrew Sears, Julie A Jacko, Human, Computer Interaction Fundamentals, CRC Press, 2009.
4. Dan R Oslen, Human, Computer Interaction, Cengage Learning, 2010.

With effect from the academic year 2015-2016

**IS 211**

**ENTERPRISE APPLICATION INTEGRATION**

Instruction per week : 4Hrs  
Duration of Examination : 3 Hrs

Sessionals:20  
Univ.Exam:80

**UNIT – I**

**Application Integration** - Need, issues. Data level integration. Application Interface level integration. Method level integration.

**UNIT-II**

User interface level integration, EAI process. **Middleware** – Models, Transaction, RPC, MOM, Distributed objects, Database oriented Middleware.

**UNIT-III**

Enterprise Integration Design objectives. **Enterprise architecture** -General characteristics, Business

Systems hierarchy, **Integration infrastructure**- Network, workflow. Business Systems Domain

Enterprise Data: s Tonge, knowledge access. **F\_tal1Jjsl:** ting Enterprise infrastructure Busin; >.ss

**System Domain** - characteristics, components, Application lie sign issues. !"

**UNIT -IV**

**Message Infrastructure** - Design Objectives, JMS, Design consideration Work Flow - Introduction, process design considerations, Integration elements, scalability, product requirements, standards.

**Web based user Access** - environment. client facilities, server facilities, session

management.

**XML Integration** - benefits, XML extended technology, impact.

#### **UNIT - V**

**Component Technology** - strategy, specifications. **Enterprise System security** - requirements, techniques, strategy. **Enterprise Intelligence** - Business requirements, architectural support.

**Implementing architecture** - Strategic planning, changing user mind set, implementing infrastructure, managing infrastructure, setting application integration goals, managing application development, setting standards. managing change- ,...""

#### **Suggested Reading:**

1. David S Linthicum, "Enterprise Application Integration", Addison, 2000.
2. Fred A Cummins, "Enterprise Integration", John Wiley, 2002.

With effect from the academic year 2015-2016

#### **IS 212**

#### **PRODUCTION AND OPERATIONS MANAGEMENT**

Instruction per Week: 4 Hrs

Sessionals: 20

Duration of Examination: 3 Hrs

Univ. Exam. :80

#### **UNIT-1**

**Introduction to production and operations management** : Definition of production and operation management, evolution of production management as operation management. Role of operation management in total management system. Interface between the operation system and systems of other functional areas.

#### **UNIT – II**

**Production planning and control** : Basic functions of production planning and control, production cycle- characteristics of process technologies. Project, job shop. Assembly and continuous inter relationship between product life cycle and process life cycle. Scheduling and control of production operation control procedures and devices. Product sequencing – Sequencing of products in multi product multi – stage situations – plant capacity and line balancing- plant layout- different types of layouts. Location and the factors influencing location.

#### **UNIT- III**

**Maintenance Management** : objectives – failure concept. Reliability, preventive and breakdown maintenance, replacement policies and quality control – Standards and specifications. Quality assurance and quality circles – statistical quality control – control charts for average. Range fraction defective and number of defects – total quality



management. **ISO certification improvement of productivity** : work study, various techniques in the methods study for identifying the most appropriate method. Work measurement – its uses and different methods. Computation of allowance and allowed time.

#### **UNIT-IV**

**Materials management:** Need use and importance of material management – materials requirement planning- materials budgeting – Techniques for prioritization of materials – Sour of supply of materials – Selection. Evaluation and performance of suppliers- make or buy decisions and its implications under various circumstances – vendor rating – determinants of vendor rating.

#### **UNIT- V**

Stores management- Objectives of stores management – requirements for efficient management of stores – safety stock – inventory control – types of inventory. Costs – systems of inventory control – ABC, VED and FNSD analysis. Different systems if inventory control – value analysis – importance in cost reduction – concepts and procedures.

#### **Suggested Reading:**

1. Everett. Adam. Jr. and Ronald J. Elbert, “Production and Operations Management Concepts and Behavior”. Prentice Hall International Ltd. 1995.
2. Joseph G. Monks – “ Operations Management – Theory and Problems”. McGraw Hill. New York, 1987.
3. Hamid Noori and Russel Radford: “Production and Operation Managements – Total Quality and Responsiveness” McGraw Hills – 1995.

## PRACTICALS

With effect from the academic year 2015-2016

**IS 221**

**BIG DATA LAB**

Instruction per week : 3Hrs  
Duration of Examination : 3 Hrs

Sessionals:25  
Univ.Exam:50

1. Install and Set up Hadoop
2. Work with basic HDFS Commands
3. Write Map Reduce program to count the occurrences of words in an input file
4. Write Map Reduce program to perform secondary sorting
5. Write Map Reduce Program that uses custom data types
6. Write Map Reduce Program to create custom partitioner class
7. Write Map Reduce Program to identify transactions performed on Sports Accessories data
8. Install and configure Hive
9. Write DDL, data manipulation, data retrieval queries in Hive
10. Install and configure Pig
11. Use operators and functions in Pig
12. Install and configure H base
13. Work with H base table commands

With effect from the academic year 2015-2016

**IS 222**

**EMBEDDED SYSTEMS LAB**

Instruction Per Week: 3hrs  
Duration of Examination: 3hrs

Sessionals :25  
Univ. Exam :50

Embedded Systems Practical involves development of an Application controller using either VHDL or a Micro Controller (such as 8051, z80).

**Tools Required:**

- a) Xilinx ISE Tool / Max Plus synthesizer Tool
- b) 8050 or z80 Emulator

**Suggested Reading :**

1. David E. Siman, “ An Embedded Software Prime”, Pearson Education 1999.
2. Myke Predko, “ Programming and Customizing the 8051 Micro Controller “ Tata McGraw Hill, 1999.
3. Mohammed Ali Mazidi, Janice Gillespie Mazidi, “ 8051 Micro Controller and Embedded Systems”, Pearson 2000.

With effect from the academic year 2015-2016

**IS 223**

**SOFT SKILLS - III**

Instruction per week : 3hrs  
Examination : Viva- voce

Sessionals:25

Mock Interview

Role Play

Public Speaking

Group Discussion

Team Work Ability

#### IV SEMESTER

S.NO	COURSE CODE	COURSE TITLE	Scheme of Examination		L	T	P / Dg	CONTACT Hrs/Wk	Credits
			CIE	SEE					
<b>PRACTICALS</b>									
1	IS 251	Main Project	100	VIVA			12	12	6
2	IS 252	Seminar	25	***			4	4	2
		<b>TOTAL</b>	<b>125</b>	<b>***</b>			<b>16</b>	<b>16</b>	<b>8</b>

## IS 251 - MAIN PROJECT

Instruction	12 Periods per week
Duration of University Examination	Viva Voce
University Examination	Grade*
Sessionals	100 Marks

Solving a real life problem should be the focus of U.G. projects. Faculty members should propose the projects (brief scope and references) well in advance which should be made available to the students at the department library. The project could be classified as hardware, software, modeling, simulation etc. The project should involve one or many elements of techniques such as analysis, design, synthesis.

The department will appoint a project coordinator who will coordinate the following:

- Grouping of students (maximum of 3 in a group)
- Allotment of projects and project guides
- Project monitoring at regular intervals.

All projects allotment is to be completed by the 4<sup>th</sup> week of 4<sup>th</sup> year 1<sup>st</sup> semester so that the students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through student presentations. Sessional marks are to be based on the Grades/Marks, awarded by a monitoring committee comprising of faculty members as well as by the supervisor.

Efforts should be made that some of the projects are carried out in industries with the help of industry coordinators, Problems can also be invited from the industries to be worked out through U.G. projects.

Common norms will be established for the final documentation of the project report by the respective departments.

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**\*Excellent / Very Good / Good / Satisfactory / Unsatisfactory**

**Note:** Three periods of contact load will be assigned to each project guide.

### **IS 252 - SEMINAR**

Instruction per week : 4Hrs

Sessionals:25

Examination : Viva- voce

**Each student will be required to:**

1. Submit one page of synopsis on the project work for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the project.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of Sessional marks which will be on the basis of performance in all the 3 items stated above.

The project seminar presentation should include the following components of the project:

- Problem definition and specification.
- Literature survey, familiarity with research journals.
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar(activity) charts
- Presentation-oral and written.