



3-Year Bachelor of Computer Application (BCA) Curriculum and Syllabus

Six Semester

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIU-UTR-T300	Career advancement and Skill Development-(SAP – ABAP)	2	0	1	3
TIU-UMG-T314	Professional Ethics & Human Values	2	1	0	3
TIU-UCA-T306	Data Science Through R	3	1	0	4
TIU-UCA-E304	Advanced Web Design (Elective II)	3	1	0	4
TIU-UCA-E306	Cloud Computing (Elective II)				
TIU-UCA-E308	Distributed Design(Elective II)				
TIU-UCA-E310	Software Project Management (Elective III)	3	1	0	4
TIU-UCA-E312	Management Fundamentals & information Systems (Elective III)				
Practical					
TIU-UCA-L306	Data Science Through R	0	0	3	3
Sessional					
TIU-UES-S398	Entrepreneurship Skill Development	0	0	3	2
TIU-UCA-P396	Final Project	0	0	8	10
Total Credits					33

Approved by:

External Expert-1 (Prof. Subhadip Basu, J.U.)
External Expert-2 (Prof. Amlan Chakraborty, C.U.)
HOD - (Prof. A.B. Chaudhuri)



Detailed Syllabus

6th Semester

Career Advancement & Skill Development

TIU-UTR-T300

L-T-P: 2-0-1

Credit 3

SAP - ABAP

Professional Ethics and Human Values

TIU-UMG-T314

L-T-P: 2-1-0

Credit: 3

1. Human Values

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage – Empathy – Self-Confidence – Character.

2. Engineering Ethics

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment –

3. Engineering As Social Experimentation

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

4. Safety, Responsibilities and Rights

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

5. Global Issues

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-

6. Cyber Law

Understanding Copy Right in Information Technology, Understanding the technology of Software, copyright vs. Patent, debate Authorship, Assignment issues Commissioned work, Work for hire Idea/Expression dichotomy, Copy right in internet, Legal Issues in internet and Software Copyright Jurisdiction Issues, Copyright Infringe Remedies of Infringement Multimedia, Copyright issues Software Piracy, Patents understanding, Cyber Crimes, Understanding Cyber Crimes in context of Internet, Indian Penal Law & Cyber Crimes Fraud Hacking Mischief, International law, Obscenity and Pornography Internet, Potential of Obscenity Indian, Law On Obscenity & Pornography Technical,

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EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

Legal solutions International efforts Changes in Indian Laws, Ecommerce & Taxation, UNCITRAL model law of E-Commerce, Indian Legal Position on E-Commerce IT Act 2000/Indian Evidence, Act/Draft law on E-Commerce.

Recommended Books:

Main Reading:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. Gray Hat Hacking: The Ethical Hackers Handbook by Allen Harper, Shon Harris, Cyber Laws by C.K punia, Sumit Enterprises
4. Cyber Crime and Law Enforcement by V. D. Dudeja, Commonwealth Publishers

Supplementary Reading:

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

Data Science through R

TIU-UCA-T306

L-T-P: 3-1-0

Credits: 4

Course Description: Data Science is the study of the generalizable extraction of knowledge from data. Being a data scientist requires an integrated skill set spanning mathematics, statistics, machine learning, databases and other branches of computer science along with a good understanding of the craft of problem formulation to engineer effective solutions. This course will introduce students to this rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset. Students will learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication. The focus in the treatment of these topics will be on breadth, rather than depth, and emphasis will be placed on integration and synthesis of concepts and their application to solving problems. To make the learning contextual, real datasets from a variety of disciplines will be used.

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Learning Outcomes: At the conclusion of the course, students should be able to:

- Describe what Data Science is and the skill sets needed to be a data scientist.
- Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.
- Use R to carry out basic statistical modeling and analysis.
- Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.
- Describe the Data Science Process and how its components interact.
- Use APIs and other tools to scrap the Web and collect data.
- Apply EDA and the Data Science process in a case study. 1
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling. Explain why Linear Regression and k-NN are poor choices for Filtering Spam. Explain why Naive Bayes is a better alternative.
- Identify common approaches used for Feature Generation. Identify basic Feature Selection algorithms (Filters, Wrappers, Decision Trees, Random Forests) and use in applications.
- Identify and explain fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine (dimensionality reduction, singular value decomposition, principal component analysis). Build their own recommendation system using existing components.
- Create effective visualization of given data (to communicate or persuade).
- Work effectively (and synergically) in teams on data science projects.

Detailed Topics:

Unit 1: **Introduction to Business Analytics:** Overview, Business Decisions and Analytics, Types of Business Analytics, Applications of Business Analytics, Data Science Overview.

Unit 2: **Review of R programming:** Program logics, Data Structures, Graphical presentation, File and Database handling.

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- Unit 3:** **Data Collection and Data Blending:** Basic Concepts, Case Study 1- Collecting Data from Twitter, Business Intelligence and Data Warehousing, Data Science Project Life Cycle, Data Visualization, Case Study 2 - Analyzing data from Movie Lens.
- Unit 4:** **Statistical Inference:** Introduction to Hypothesis, Types of Hypothesis, Data Sampling, Confidence and Significance Levels, Hypothesis Tests about Population Means, Hypothesis Tests about Population Variance, Hypothesis Tests about Population Proportions
- Unit 5:** **Introduction to Machine Learning:** Clustering, Association Rules, Case Study 3 – Creating a Data Product using Machine Learning Algorithm, Regression and Classification

Advanced Web Design

TIU-UCA-E304

L-T-P: 3-1-0

Credits: 4

Evolution of Internet, TCP/IP: addressing and routing.

Internet applications: FTP, Telnet, Email, World Wide Web: HTTP protocol.

Designing web pages: Forms, CGI scripts and clickable maps, JAVA applets, JAVAscript, JAVA servlets, Perl. DHTML, XML. E-Commerce and security issues including symmetric and asymmetric key, encryption and digital signature, authentication. Emerging trends, Internet telephony, virtual reality over the web, etc. Intranet and extranet, firewall design issues.

Recommended Books:

Main Reading:

1. Jennifer Niederst Robbins, Learning Web Design Paperback – 3 Nov 2012, Shroff; Fourth edition (3 November 2012)

Supplementary Reading:

1. Jennifer Niederst Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics [Kindle Edition], O'Reilly Media; 4 edition (10 August 2012)

Cloud Computing

TIU-UCA-E306

L-T-P: 3-1-0

Credits: 4

Overview of Computing Paradigm: - Recent trends in ComputingGrid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud ComputingEvolution of cloud computingBusiness driver for adopting cloud computing

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Introduction to Cloud Computing:-Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics & Disadvantages Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards

Cloud Computing Architecture:- Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS)

Deployment Models:- Public cloud Private cloud Hybrid cloud Community cloud Infrastructure as a Service (IaaS): Introduction to IaaS IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine (VM)

Resource Virtualization: Server Storage Network Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing (storage as a service)

Examples Amazon EC2 Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus

Platform as a Service (PaaS): Introduction to PaaS: What is PaaS, Service Oriented Architecture (SOA)

Cloud Platform and Management: Computation Storage

Examples: Google App Engine Microsoft Azure Salesforce.com's Force.com platform

Software as a Service (SaaS): Introduction to SaaS Webservices Web 2.0 Web OS Case Study on SaaS

Service Management in Cloud Computing:- Service Level Agreements (SLAs) Billing & Accounting Comparing Scaling Hardware: Traditional vs. Cloud Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability & Cloud Services Database & Data Stores in Cloud Large Scale Data Processing

Cloud Security:- Infrastructure Security: Network level security, Host level security, Application level security

Data security and Storage:- Data privacy and security Issues, Jurisdictional issues raised by Data location

Identity & Access Management Access Control Trust, Reputation, Risk Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

Case Study on Open Source & Commercial Clouds: Eucalyptus Microsoft Azure Amazon EC2

Recommended Books:

Main Reading:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011

Supplementary Reading:

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1. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

Distributed Database Management

TIU-UCA-E308

L-T-P: 3-1-0

Credits: 4

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design – fragmentation, allocation criteria.

Storage mechanisms. Translation of global queries/ Global query optimisation. Query execution and access plan. Concurrency control – 2 phase locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase unit protocols. Architectural aspects. Node and link failure recoveries.

Distributed data dictionary management. Distributed database administration. Heterogeneous databases- federated database, reference architecture, loosely and tightly coupled.

Main Reading:

1. Principles of Distributed Database Systems. Ozsü and Valduriez. Prentice Hall.

Supplementary Reading:

1. Distributed Systems: Concept and Design. Coulouris, Dollimore, and Kindberg. AW.
2. Distributed Database Principles and Systems. Ceri and Pelagatti. McGraw Hill.

Software Project Management

TIU-UCA-E310

L-T-P: 3-1-0

Credits: 4

Objective of the Course:

The course presents a new management framework uniquely suited to the complexities of modern software development. The course provides a clear and provocative discussion of the economic, metrics and management strategies needed to plan and execute a software project successfully. This comprehensive course also covers all the qualitative and quantitative aspects of project management with a practical treatment of many engineering

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and managerial issues. At the end of the course, students will gain a practical framework for systematically improving the planning and execution of any software project.

Detailed Syllabus

1. Review of software engineering concepts:

Principles of software engineering, Features of good software, Quality Requirement in different Application Areas.

2. Software Process:

Software Process and Models, Tools and techniques of Process Modeling, Product and Process.

3. Introduction to Project Management:

Definition of the project, Project specification and parameters, Principles of Project management, Project management life cycle

4. Software Project Planning:

Project activities and Work Breakdown Structure (WBS), Criteria for completeness in the WBS, Activity Resource Requirements and Cost, Joint Project Planning Session, Project Management Plan.

5. Project Economics:

Project Costing, Empirical Project Estimation Techniques, Decomposition Techniques, Algorithmic methods, Automated Estimation Tools.

6. Project Scheduling and Tracking Techniques:

Why are projects delayed? Effort Estimation Techniques, Task Network and Scheduling Methods, Monitoring and Control Progress, Graphical Reporting Tools.

7. Risk Analysis and Management:

Risk Concepts and Identification, Risk Assessment and Control, Risk Components and Drivers, Risk Tracking and Monitoring, Risk Mitigation and Management.

8. Software Metrics and Project Management:

Measures, Metrics and Indicators, Process and project metrics, Statistical Metrics and Process Monitoring, Function-point and project management.

9. Project Control and Closur:

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10. Project Management Issues with regard to New Technologies:

Object-oriented Methodology, Web-based Projects, Embedded Systems

RECOMMENDED BOOKS

MAIN READING

1. John J. Rakos, "Software Project Management for Small to Medium Sized Projects", 1998, Prentice Hall, ISBN: 0138261733.
2. Walker Royce, "Software Project Management: A Unified Framework", 2001, Addison-Wesley Professional, ISBN-10: 0201309580, ISBN-13: 9780201309584.
3. Pankaj Jalote, "Software Project Management in Practice", 2001, Addison-Wesley Professional, ISBN-10:0-201-73721-3, ISBN-13: 9780201737219.

MANAGEMENT FUNDAMENTALS AND INFORMATION SYSTEMS

TIU-UCA-E312

L-T-P: 3-1-0

Credits: 4

Objective of the course:

This paper is concerned with the strategic importance of Management concepts and its processes in an business organization. This course provides a broad review of the field of Information system development, integration and managing security of such information systems in the modern business environment. It recognizes that many organizations employ information Technology (IT) Professionals, they have a key role to play in as the information provider that adds significant value to the ever-increasing volume of data processed for management decision making. At the end of the course, candidates should be able to:

- Develop an understanding of general management and information system concepts and practices.
- To understand the technological environment of the contemporary organization and to apply a systematic approach to the use of information technology in organizations.
- Appraise the technological environment in order to support the practical aspects of information development, integration, usage and understand security holes and its security controls to prevent information from various frauds.
- To gain application ability of necessary controls and standards in computerized Information system.

DETAILED SYLLABUS

1. THE PROCESS OF MANAGEMENT:

Functions Of Management Business Organization, Levels of Management, the classical organizational theory, the Behavioral Approach, the Management Science Approach:

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Planning- Mission, Vision and goal setting; and SWOT Analysis; **Organizing** -Types of Organizational Structures, Power, Authority, Delegation, Centralization and Decentralization, Formal and informal organizations, Functions and Design of an organization; **Leading** - Motivation, Theories of Motivation; **Controlling:** Control Process. Relevance of Computer applications in different functional areas of Management.

2. INFORMATION SYSTEM CONCEPTS.

Definition of system, Types of systems: Physical and Abstract Systems, Deterministic and Probabilistic systems, Open and Closed systems. Need of an efficient information system, Major types of systems in organizations on the basis of organizational levels.

3. FUNCTIONAL AND OTHER INFORMATION SYSTEMS:

Finance and Accounting Information systems- order processing, Inventory control Accounts receivable system Accounts Payable System, Payroll System, General ledger, Billing System, Purchase system. Marketing and Sales, Manufacturing and Productions and Human Resources Information Systems. OAS, TPS, MIS, DSS, GDSS EIS, and ES.

4. ENTERPRISE SYSTEMS:

Redesigning the organization with information systems, BPR, Enterprise System Architecture : Integration of business functions. ERP: Meaning Characteristics, Benefits, Limitations, Risks in ERP implementations. Supply Chain Management (SCM) Customer Relationship Management (CRM). E-Business

5. SYSTEM DEVELOPMENT PROCESS:

Introduction to SDLC/Basics of SDLC; Requirements analysis and systems design techniques; Strategic considerations :-Acquisition decisions and approaches; Software evaluation and selection/development ;Alternate development methodologies- RAD, Prototype etc; Hardware evaluation and selection; Systems operations and organization of systems resources; Systems documentation and operation manuals; User procedures, training and end user computing; System testing, assessment, conversion and start-up; Hardware contracts and software licenses System implementation; Post-implementation review; System maintenance; System safeguards.

6. INFORMATION SYSTEM SECURITY:

System Vulnerability, Computer frauds, computer abuse, preventing computer frauds , Ensuring System Quality, Information Security – Need, Contents of information security plan , Principles of information security ,Best approach to implement information security.

7. INFORMATION SYSTEMS CONTROL TECHNIQUES:

Introduction, General Controls-Operating System controls, Data Management Controls, Organizational Structure Controls, System Development Controls, System Maintenance Controls, Computer Centre Security Controls, Internet and Intranet Controls, PC controls. Application Controls: Input controls, Processing controls, Output controls, Storage Controls.

Case studies:

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RECOMMENDED BOOKS

MAIN READING

1. K. C. Laudon and J. P. Laudon, "Management Information Systems: Organization and Technology", 11th Edition, Prentice Hall India, New Delhi.
2. Sushila Madan, "Management Fundamentals and Information Systems" Taxman Publishing New Delhi.

SUPPLEMENTARY READING

- i. Harold Koontz and Heinz Weihrich, "Essentials of Management", VIIIth Edition Tata McGraw-Hill Publishing New Delhi
- ii. Management Principles and Practice By Dr, C.B. Gupta Published by Scholar Tech Press Edition 2009 New Delhi.
- iii. W. S. Jawadkar, "Management Information System", IV th edition Tata McGraw- Hill Publishing New Delhi.

Model Questions

Ques. 1

- (a) What is the significance of motivation in an organization ? (5 marks)
- (b) Explain the various skills that managers at different levels of management should possess. (5 marks)
- (c) Explain the effects of applying computer technology to MIS. (5 marks)
- (d) What are the characteristics of information required for strategic planning? (5 marks)

Ques. 2

- (a) What is the importance of planning in an organization? (5 marks)
- (b) What are the differences between programmed and non- programmed decisions? (5 marks)
- (c) Define and distinguish between Line, Staff and Functional relationships. (5 marks)
- (d) What are the various principles of delegation of authority? (5 marks)

Ques 3.

- (a) Why information systems are required? (5 marks)
- (b) What are the inputs and outputs of MIS and what processing is performed in MIS? (5 marks)
- (c) Describe the comparison between MIS and DSS. (5 marks)
- (d) What are the advantages of an expert system? (5 marks)

Ques 4.

- (a) What is the purpose of preliminary investigation? (5 marks)
- (b) Explain the various steps involved in system analysis. (5 marks)
- (c) "The final step of system implementation is its evaluation". What functions are being served by system evaluation ? (5 marks)
- (d) Explain the advantages and disadvantages of using prototyping approach of system development (5 marks)

Ques. 5

- (a) What are the major factors to be considered in designing user inputs? (5 marks)
- (b) Write a short note on system manual. (5 marks)
- (c) Explain the advantages of pre-written application software package. (5 marks)
- (d) Compare and contrast between direct conversion and parallel conversion. (5 marks)

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Ques. 6

- (a) What are the benefits of ERP systems? (5 marks)
- (b) Briefly describe the various financial decisions. (5 marks)
- (c) What are the characteristics of computer frauds? (5 marks)
- (d) Explain private key and public key encryption. (5 marks)

Ques. 7

- (a) What is firewall? What are the objectives of firewall? (5 marks)
- (b) What are the various risks involved in ERP implementation? (5 marks)
- (c) What is information security? What are the objectives and contents of information system security plan? (5marks)
- (d) Explain the factors upon which “ make or buy” decision of an application software Depends.

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