



Techno India University, West Bengal
Syllabus for 3-YEAR M.C.A.

3RD Semester

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIU-UTR-T201	Career Advancement and Skill Development- (SAP-ABAP & PHP-MySql)	2	1	2	2
TIU-PCA-T211	Web Technologies -2 (J2EE)	3	0	0	3
TIU-PCA-T217	Tools and Techniques of R Programming	2	1	0	3
TIU-PCA-T213	Blockchain for Enterprises	2	1	0	3
TIU-PCA-E215	Software Service Models and Agile Computing (Elective I)	2	1	0	3
TIU-PCA-E203	Bioinformatics (Elective I)				
TIU-PCA-E211	Data Warehousing and Data Mining (Elective II)	2	1	0	3
TIU-PCA-E213	Digital image processing (Elective II)				
Practical					
TIU-PCA-L207	Web technology lab	0	0	3	2
TIU-PCA-L217	R programming Lab	0	0	3	2
Sessional					
TIU-PCA-P289	Minor Project & Seminar	0	0	3	8
TIU-PES-S299	Entrepreneurship Skill Development	0	0	2	2
Total Credits					31

Approved by:

External Expert-1 (Prof. Subhadip Basu, J.U.)

External Expert-2 (Prof. Amlan Chakraborty, C.U.)

HOD -



Detailed Syllabus

Career Advancement and Skill Development((SAP-ABAP For MCA & PHP-MySql For IMCA))

TIU-UTR-T201

L-T-P: 2-0-0

Credit: 2

Introduction to SAP-ABAP

Web Technologies-2 (J2EE)

TIU-PCA-T211

L-T-P: 3-0-0

Credit 3

COURSE OBJECTIVE

1. The **objective** of this **course** is to provide the necessary knowledge to design and develop dynamic, database-driven application using **J2EE**.
2. Students will learn how to connect to any JDBC-compliant database, and perform hands on practice with a database to create database-driven connectivity.

COURSE OUTCOME:

After completion of this course the student should be able to:

CO1: Explain the basic knowledge of j2ee.

CO2: Develop dynamic, database-driven application using J2EE.

CO3: Connect to any JDBC-compliant database.

CO4: Perform hands on practice with a database to create database-driven connectivity.

CO5: Develop a project independently.

Detailed syllabus

Servlet API 3.x

- Introduction to JEE, Overview of Dynamic web applications
- Introduction to Servlet, Servlet life cycle, Annotations and their use in Servlet development
- Difference b/w web server & application server, Installing and configuring web & application server, Web Application formats.
- Deployment modes supported by servers, Creating and deploying a simple web application, Understanding the role of ServletRequest & ServletResponse, Differene b/w parameters and attributes, Using different content type for response
- Using RequestDispatcher for Include & Forward, Initialization Parameters and their use
- ServletConfig & ServletContext, Inter application collaboration
- State Management and use of HttpSession & Cookies, Hidden Form fields and URL Rewriting

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- Using Http only Cookies, Listeners and web application events
- Applying Filters to servlets, Asynchronous request processing
- File Uploading & downloading, Security.
-

Java Server pages (JSP)

- -Advantages of JSP over Servlet, JSP Architecture, Integration of JSP & servlet API, JSP implicit objects, Use of JSP Tags, Actions and Directives
- Error Handling in JSP, Using Java Beans in JSP, Defining Custom Tags, JSTL & Expression Language.

Tools & IDE

- Introduction to Eclipse, installing eclipse, Understanding Perspective & workspaces, Changing Compiler, JRE and other setting, Adding and removing plug-in,
- Project Management, Creating various type of projects, Closing & Importing projects, Building projects, Managing Libraries and Dependencies, Adding jar files from eclipse library, Adding third party jar , Removing jar files from a project ,Code Generation & Refactoring ,Generating getter & Setter methods, Generating constructors, Overriding and implementing methods, Renaming classes and members, Moving classes and packages, Extracting interfaces and abstract classes.
- Server Management, Configuring web/application server,
- Starting and stopping servers, Deploying and un-deploying applications, Debugging, Debug perspective, Using line, method, exception and data member breakpoints, Setting up conditional breakpoints, Using step into, step over, step return and resume.
- Peeking into stack and heap contents, Unit Testing.
- Introduction to JUnit, understanding assertions, Writing & executing Test Cases, Managing test cases with Test Suites
- Subversion (SVN) Code Repository & Client, Need of Code Repository, Architecture of SVN Code Repository, Configuring Project in a SVN Code Repository, Installing SVN Client
- Connecting client to SVN Repository, Checking out project form the repository, Updating SVN and local repository

Log4j

- Understanding the need of Logging
- Introduction to Apache Log4j
- Log4j Architecture: Appender, Logger & Layout
- Log4j Configuration for web application

Recommended Books:

Main Reading:

1. Kathy Sierra, Bert Bates, “Head First Servlets and JSP”, O’Reilly Media, Inc.
2. Kogent Learning Solutions, “JAVA Server Programming JAVA EE6 (J2EE 1.6)”, Black Book, Wiley

Supplementary Reading:

1. James L. Weaver, Kevin Mukhar, James P. Crume, Ivor Horton , “Beginning J2EE 1.4: From Novice to Professional (Apress Beginner Series) Paperback – February
2. Jim Keogh, J2EE: The complete Reference Paperback – 26 Oct 2002, OSBORNE.
3. James McGovern, Rohm Adatia, Yakov Fain, Jason Gordon & 7 more, Java2 Enterprise Edition 1.4 (J2EE 1.4) Bible Paperback – August 22, 2003

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HOD -



TOOLS AND TECHNIQUES OF R PROGRAMMING

TIU-PCA-T217

L-T-P: 2-1-0

Credit: 3

COURSE OBJECTIVE

1. The course focuses on imparting in-depth knowledge of many techniques for data analytics using R.
2. The course also includes real-life projects, R Cloud Labs and case studies. Master R language as well as Master advanced statistical concepts.

COUSE OUTCOME

1. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code.
2. Topics in statistical data analysis provides working examples.

Unit-1: Introduction to R, R character set, R words, constants, operators, precedence and associativity of the operators, R working environment as a displayer, R as a calculator, R as a data manipulator, R objects and their data types.

Unit 2: R as a programming environment, programming in R using, Sequence, Selection iteration and Case logic structures.

Unit 3: User-defined functions in R, Recursive Functions.

Unit 4: Basic data structures in R (vector, factor, list, data frame, matrix, array).

Unit 5: Charts and Graphs in R

Unit 6: Data file handling in R.

Unit 7: Object Oriented programming in R

Unit 8: Sorting, Searching and Traditional Data Structures in R

Recommended Books:

1. The art of Programming through R by Anil Bikash Chowdhury
2. The art of R programming by Norman Matloff, , No Starch Press, Sanfrancisco.
3. Statistical Programming in R by Srinivasa,Siddesh,Shetty and Sowmya, Oxford Higher Education.

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BlockChain for enterprises

TIU-PCA-T213

L-T-P: 2-1-0

Credit: 3

Course Objective

1. Understanding the basics of block chain enterprises.
2. Understanding basics of crypto primitives.

Course Outcomes

Upon completion of this course, students will be able to:

1. Define the basic knowledge of Distributed Ledger Technologies and how they work.
2. Define the basic knowledge of Bitcoin, Ethereum and Hyperledger fabric.
3. Describe about the current trends of Block chain and ability to imagine its use cases and future.
4. Implement the concept of Block Chain in Enterprise Applications.

Introduction to Block chain

Basic idea, Public Ledgers, Blockchain as public ledgers, Bitcoin, Blockchain 2.0, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, The Chain and the Longest Chain, Crypto currency to Blockchain 2.0, Permissioned Model of Blockchain.

Basic Crypto Primitives

Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

Crypto currency Basics

Creation of Bitcoins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

Distributed Consensus

Importance, Distributed consensus in open environments, Consensus in a Bitcoin network, Consensus in Bitcoin- Bitcoin Consensus, Proof of Work (PoW), Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

Permissioned Blockchain

Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Consensus models for permissioned blockchain, Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems, Practical Byzantine Fault Tolerance, Three phase commit, View Change.

Blockchain for Enterprise

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Concepts and benefits of blockchain for enterprise, The Hyperledger Project.

Blockchain Components and Concepts

Actors in a Block chain, Components in Block chain design, Ledger in Block chain.

Application of Block Chain Technology

Blockchain in: Financial Software and Systems, trade supply chain, Government Systems.

Recommended Books:

Main Reading:

1. https://nptel.ac.in/courses/nptel_download.php?subjectid=106105184
2. Don Tapscott and Alex Tapscott, Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World, Penguin UK.

Supplementary Reading:

1. Melanie Swan, Blockchain: Blueprint for a New Economy, O'Reilly Media, Inc.

Software Service Models and Agile Computing (Elective I)

TIU-PCA-T215

L-T-P: 2-1-0
(Pending)

Credit: 3

Bioinformatics (Elective I)

TIU-PCA-E203

L-T-P: 2-1-0

Credit: 3

COURSE OBJECTIVE

1. The basic **objective** is to give students an introduction to the basic practical techniques of **bioinformatics**.
2. Emphasis will be given to the application of **bioinformatics** and biological databases to problem solving in real research problems.

COURSE OUTCOME:

After completion of this course the student should be able to:

- CO1: Implement solutions to basic bioinformatics problems.
CO2: Discuss the use of bioinformatics in addressing a range of biological questions.
CO3: Describe how bioinformatics methods can be used to relate sequence, structure and function.
CO4: Discuss the technologies for modern high-throughput DNA sequencing and their applications.
CO5: Use and describe some central bioinformatics data and information resources.

Detailed syllabus

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Biological Data Acquisition: The form of biological information. Retrieval methods for DNA sequence, protein sequence and protein structure information; Databases – Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary sequence databases, protein sequence and structure databases; Organism specific databases; Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus global. Distance metrics. Similarity and homology. Scoring matrices. Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA, BLAST and PSI BLAST. Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment; Genome Analysis: Whole genome analysis, existing software tools; Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis: Comparative genomics, orthologs, paralogs. Methods of phylogenetic analysis: UPGMA, WPGMA, neighbour joining method, Fitch/Margoliash method, Character Based Methods.

TEXTBOOKS

1. Bioinformatics: Databases and Systems, by Stanley I. Letovsky
2. Bioinformatics Databases: Design, Implementation, and Usage (Chapman & Hall/ CRC Mathematical Biology & Medicine), by Sorin Draghici
3. Data base annotation in molecular biology, principles and practices, Arthur M. Lesk
4. Current topics in computational molecular biology, Tao, Jiang, Ying Xu, Michael Q. Zang
- 5.

Data Warehousing and Data Mining (Elective II)

TIU-PCA-E211

L-T-P: 2-1-0

Credit: 3

COURSE OBJECTIVE:

1. Identify the scope and necessity of Data Mining & Warehousing for the society.
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. To understand various tools of Data Mining and their techniques to solve the real time problems.

COURSE OUTCOME:

After completion of this course the student should be able to:

CO1: Describe basic terminology.

CO2: Gather and analyze large sets of data to gain useful business understanding.

CO3: Describe basic data mining algorithms, methods, and tools.

CO5: Analyze business applications of data mining.

CO6: Define the developing areas

Detailed syllabus

Unit I

Need for data warehouse, definition, goals of data warehouse, Data Mart, Data warehouse, architecture, extract and load process, clean and transform data, star, snowflake and galaxy schemas for multidimensional databases, fact

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and dimension data, Designing fact tables, Partitioning, partitioning strategy– horizontal partitioning, vertical partitioning.

Unit II

Data warehouse and OLAP technology, multidimensional data models and different OLAP operations, OLAP Server: ROLAP, MOLAP and HOLAP. Data warehouse implementation, efficient computation of data cubes, processing of OLAP queries, indexing OLAP data.

Unit-III

Data preprocessing, data integration and transformation, data reduction, Discretization and concept Hierarchy Generation, Data mining primitives, Types of Data Mining, Data Mining query language, Architectures of data mining. Data generation & Summarization based characterization, Analytical characterization, mining class comparisons, and mining descriptive statistical measures in large databases. Mining Association Rules in large databases: Association rule mining, single dimensional Boolean association rules from Transactional DBS. Multilevel association rules from transaction DBS, multidimensional association rules from relational DBS and DWS, Correlation analysis, Constraint based association mining.

Unit IV

Classification and Prediction: Classification by decision tree induction, Back propagation, Bayesian classification, classification based in association rules, Prediction, classifier accuracy, Cluster analysis, partitioning and hierarchical methods, Density based methods, Grid based methods, web mining, Temporal and spatial data mining.

Recommended Books:

Main Reading

1. W.H.Inmon : Building Data Ware House, John Wiley & Sons.
2. S. Anahory and D. Murray : Data Warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber : Data Mining - Concepts & Techniques, Harcourt India Pvt. Ltd.

Supplementary Reading:

1. Michall Corey, M. Abbey, I Azramson& Ben Taub : Oracle 8i Building Data Ware Housing, TMH.
2. I.H. Whiffen : Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
3. SimaYazdanri&Shirky& S. Wong : Data Ware Housing with oracle

Digital image processing (Elective II)

TIU-PCA-E213

L-T-P: 2-1-0

Credit: 3

(Pending)

R programming Lab

TIU-PCA-L217

L-T-P:0-0-3

Credit: 2

As taught in the lab by respective faculty

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Web Technologies-2 Lab
TIU-PCA-L207

L-T-P: 0-0-3

Credit: 2

Assignments will be given by the concerned faculty.

Minor Project and Seminar
TIU-PCA-P289

L-T-P: 0-0-3

Credit: 8

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