ESTD: 1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognised by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA
Recognised as Scientific and Industrial Research Organisation
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)
IV/IV B.TECH
(With effect from **2017-2018**Admitted Batch onwards**)**
COMPUTER SCIENCE & ENGINEERING
(Accredited by NBA)
I-SEMESTER

Code No.	Name of the Subject	Credits	Lect Hrs	Tutorial Hrs	Lab Hrs	Contact Hrs/ Week	Internal Marks	External Marks	Total Marks
B17 CS 4101	Big Data Analytics	3	3	1	-	4	30	70	100
B17 CS 4102	Internet of Things	3	3	1	-	4	30	70	100
B17 CS 4103	Machine Learning	3	3	1	-	4	30	70	100
B17 BS 4101	Managerial Economics And Financial Accountancy	3	3	1	-	4	30	70	100
#ELE-II	Elective-II	3	3	1	-	4	30	70	100
B17 CS 4107	Big Data Analytics Lab	2	-	-	3	3	50	50	100
B17 CS 4108	Internet of Things Lab	2	-	-	3	3	50	50	100
Total		**19**	**15**	**5**	**6**	**26**	**250**	**450**	**700**

#ELE-II	B17 CS 4104	Cryptography and Network Security
	B17 CS 4105	Software Project Management
	B17 CS 4106	Scripting Languages

Code: B17 CS 4101

BIG DATA ANALYTICS

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. To provide an overview of an exciting growing field of Big Data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, MapReduce etc.

Course Outcomes: By the end of the course, student should be able to:

S. No	Outcome	Knowledge Level
1	Identify characteristics of big data and its application areas.	**K3**
2	Build HDFS and Map Reduce to store and process the big data.	**K3**
3	Apply advanced map reduce applications on big data.	**K3**
4	Identify the need-based tools, viz., Pig and Hive to handle.	**K3**

SYLLABUS

UNIT-I

Introduction to Big Data: Big data definition, Characteristics of big data, Importance of big data, Patterns for big data development, data in warehouse and data in hadoop.

UNIT-II

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files, Hadoop Command line interface, Hadoop file system, HAR,distcp.

UNIT-III

Writing MapReduce Programs: A Weather Dataset, Analyzing the data with unix tools, Analyzing the data with hadoop, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, Combiner, Partitioner.

UNIT-IV

Pig - Hadoop Programming Made Easier: Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

UNIT-V

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data TEXT.

Text Books:

1. Understanding Big Data by Chris Eaton, Dirk Deroos, Tom Deutsch,George Lapis and Paul Zikopoulos
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss

Reference Books:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne

Web Links:

1. **Hadoop:** http://hadoop.apache.org/
2. **Hive:** https://cwiki.apache.org/confluence/display/Hive/Home
3. **Piglatin:** http://pig.apache.org/docs/r0.7.0/tutorial.html

Code: B17 CS 4102

INTERNET OF THINGS

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. To understand building blocks of IoT and their characteristics
2. To Know various architectures and protocols in IoT and security issues
3. To use cloud services for data analytics in IoT applications
4. To develop IoT applications using Arduino and Raspberry pi

Course Outcomes: At the end of the course, the students can able to

S. No	Outcome	Knowledge Level
1	Distinguish between various IoT architectures	**K4**
2	Apply various communication protocols in IoT	**K3**
3	Use various sensors and Actuators in IoT applications	**K3**
4	Implement IoT applications using Arduino and Raspberry pi.	**K3**
5	Analyse data in IoT applications using cloud services	**K4**
6	Know various security issues in IoT	**K2**

SYLLABUS

UNIT-I

Fundamentals of IoT: IoT definition, characteristics of IoT, Physical design of IoT, Logical Design of IoT, IoT protocols, IoT levels and deployment templates

Introduction to IoT Architectures: IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures The oneM2M IoT Standardized Architecture, The IoT World Forum (IoTWF) Standardized Architecture, IT and OT Responsibilities in the IoT Reference Model, Additional IoT Reference Models, A Simplified IoT Architecture

UNIT-II

IoT Access Technologies: PHY/MAC Layer(IEEE 802.15.4, IEEE 802.11.ah), HART, LoRAWAN, Bluetooth Low Energy, Zigbee, 6LoWPAN, RPL.

Transport Layer – TCP & UDP

Session layer protocols- CoAP, XMPP, AMQP, MQTT.

UNIT-III

Basic Building blocks: IOT Physical devices and Endpoints: Basic building blocks of an IOT device. Sensors, Participatory sensing, RFIDs: Sensor Technology, Participatory sensing, Industrial IOT and Automotive IOT, Actuator and radio Frequency Identification Technology**.**

Programming with Arduino and Raspberry Pi: Features of Arduino, Components of Arduino board, Arduino IDE, C programming concepts for Arduino, Interrupts, Traffic control system, DHT Sensor with Arduino, Servo Motor Interface with Arduino.

IoT implementation with Raspberry Pi: Architecture, Python packages for IOT; JSON, XML, HTTPLib & URLLib, SMTPLib libraries, Raspberry Pi interface for Blinking LED, Temperature dependent Auto cooling system.

UNIT-IV

Data analytics and Cloud: Introduction to IoT analytics, IoT, Cloud and Bigdata integration for IoT analytics – cloud based IoT platform, Data analytics for the IoT, Data collection using low power long range Radios, Open source frame work IoT analytics as a service, AAAS, SAAS & SAAS examples.

UNIT-V

Security issues in IoT: Vulnerabilities, Security Requirements and Threat Analysis, IoT Security Tomography and Layered Attacker model, Identity management and establishment, Access control secure message communication, Security models, profiles and protocols for IoT.

Domain models in IoT: Home Automation: Home intrusion detection, smart Cities: Smart parking, environment: whether reporting bot, agriculture: smart irrigation

Text Books :

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015.
2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things - David Hanes, Gonzalo Salgueiro, Patrick Grossetete Robert Barton, Jerome Henry. 24750 Copyright© 2017 Cisco Systems, Inc. Published by: Cisco Press 800 East 96th Street.
3. Internet of Things: Architecture and Design Principles by Rajkamal, McGraw Hill Education private limited, 2017.
4. Internet of Things, Jeevajose,Khanna Publishing; First edition (2018).
5. Building Blocks for IoT Analytics Internet-of-Things Analytics, John Soldatos, River Publishers.

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister,Oreilly.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD),2014.

Pre-requisite online course references:

1. Introduction to Internet of Things
   https://swayam.gov.in/nd1_noc20_cs66/preview
2. An Introduction to Programming the Internet of Things(IoT) specialization
   https://www.coursera.org/specializations/iot

Code: B17 CS 4103

MACHINE LEARNING

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. To introduce the basic concepts and techniques of Machine Learning.
2. To demonstrate regression, classification and clustering methods.
3. To introduce the concepts of dimensionality reduction, artificial neural networks and reinforcement learning
4. To show the application of machine learning model evaluation and optimization techniques

Course Outcomes:

S. No	Out Come	Knowledge Level
1	Formulate the concepts of ingredients and preliminaries of machine learning	**K2**
2	Apply tree models, linear models and distance based models	**K3**
3	Demonstrate the concepts of dimensionality reduction techniques, model evaluation and selection techniques	**K2**
4	Identify and construct features and ensemble models	**K3**
5	Formulate the concepts of artificial neural networks, reinforcement learning	**K2**

SYLLABUS

UNIT-I

The ingredients of machine learning: Basic concepts, designing a learning system, Issues in machine learning, Types of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning.

Preliminaries: The curse of dimensionality, Overfitting, Training, Test and Validation sets, The confusion matrix, The accuracy metrics: Accuracy, sensitivity, specificity, precision, recall, F1 measure, ROC curve, Unbalanced datasets, Prior probability, Conditional probability, Naïve Bayes Classifier, Some basic statistics: variance, covariance,bias-variance tradeoff.

UNIT-II

Tree Models: Decision Trees.

Linear Models: The least-squares method: Univariate linear regression, Logistic Regression, Support vector machines, Going beyond linearity with Kernel methods (Except Logistic regression others Peter Flach.

Distance Based Models: Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT-III

Features: Kinds of feature, Feature transformations: Thresholding and discretisation, Normalisation, Incomplete Features , Feature construction and selection.

Model ensembles: Bagging, random forests, Boosting: AdaBoost, Gradient Boosting. XGBoost

UNIT-IV

Dimensionality Reduction: PCA, LDA

Model Evaluation and Optimization: Cross Validation, Grid Search, Regularization

UNIT-V

Neurons, NNs, Linear Discriminants: The Brain and the Neuron, Neural Networks, The perceptron, Linear separability, Linear regression, Multilayer perceptrons: Going forwards, Going backwards: Backpropagation of error, Multilayer perceptron in practice, Examples of using MLP, A recipe for using the MLP

Reinforcement Learning: Overview, Example, Markov Decision Process, Values, Back on Holiday: Using reinforcement learning, Uses of Reinforcement Learning

Text Books:

1. Introduction to Machine Learning, Alpaydin E, MIT Press (2014) 3rdEdition
2. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
3. Machine Learning: An algorithmic perspective, Stephen Marsland, 2nd edition, CRC press
4. Python Machine Learning Cookbook-Practical Solutions from Preprocessing to Deep Learning, Chris Albon, Oreilly

Reference Books:

1. The elements of statistical learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Second edition , Springer
2. Machine Learning in Action, Peter Harington, 2012, Cengage
3. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, Tensorflow, Sebastian Raschka, Vahid Mirjalili, Second edition

Online MOOC Courses:

1. "Machine Learning" course by Andrew Ng on Coursera
2. "Introduction to Machine Learning (IITKGP)" by Prof. Sudeshna Sarkar, on Swayam
3. "Machine Learning A-Z (Python & R in Data Science Course)" on Udemy

Useful Reference Links:

1. "Linear Discriminant Analysis", https://sebastianraschka.com/Articles/2014_python_lda.html

2. “Principal Component Analysis versus Linear Discriminant Analysis”, https://medium.com/analytics-vidhya/illustrative-example-of-principalcomponent-analysis-pca-vs-linear-discriminant-analysis-lda-is-105c431e8907
3. “A gentle introduction to K-fold cross validation”, https://machinelearningmastery.com/k-fold-cross-validation/
4. “Grid search for model tuning”, https://medium.com/analyticsvidhya/illustrative-example-of-principal-component-analysis-pca-vs-lineardiscriminant-analysis-lda-is-105c431e8907
5. “Regularization in Machine Learning”, https://towardsdatascience.com/regularization-in-machine-learning76441ddcf99a

Code: B17BS4101

MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY
(Common to CSE & IT)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. To Study Managerial Economics and Demand Analysis
2. To familiarize about the Concepts of Cost and Break-Even Analysis.
3. To understand the nature of markets and to know the Pricing Policies
4. To learn about Accounting cycle and preparation of Financial Statements.
5. To know the concept of Capital and sources of raising and Depreciation

Course Outcomes:

S. No	Outcome	Knowledge level
1	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.	**K2**
2	The knowledge of understanding Cost and its types and ability to calculate BEP	**K3**
3	The pupil is also ready to understand the nature of different markets	**K2**
4	The Learner is able to understand Pricing Practices prevailing in today's business world	**K2**
5	The Learner is able to prepare Financial Statements and know how to calculate Profit & Loss for a firm	**K3**
6	The Learner can able to know Types of capital and their sources and know how to calculate Depreciation	**K2**

SYLLABUS

UNIT -I

Introduction to Managerial Economics and demand Analysis:

Managerial Economics: Definition of Economics & Classification of Economics (Micro & Macro), Meaning, Nature, & Scope of Managerial Economics. **Demand Analysis:** Concept of Demand, Determinants of Demand, Demand schedule, Demand curve, Law of Demand and its exceptions. Elasticity of Demand, Types of Elasticity of Demand. Importance of demand forecasting and its Methods.

UNIT- II:

Cost Analysis: Importance of cost analysis, **Types of Cost-** Actual cost Vs Opportunity cost, Fixed cost Vs Variable cost, Explicit Vs Implicit cost, Historical cost Vs Replacement cost,

Incremental cost Vs Sunk cost; **Elements of costs** – Material, Labor, Expenses; **Methods of costing** - Job costing, contract costing, Process costing, Batch costing, Unit costing, Service costing, Multiple costing. **Break-even analysis:** Determination of Breakeven point - Applications, Assumptions and Limitations of Break -even analysis (Theory only).

UNIT -III

Introduction to Markets & Pricing Policies

Market Structures: Salient Features of Perfect Competition, Monopoly, Monopolistic competition, Oligopoly and Duopoly. **Pricing:** Importance of pricing and its meaning ; **Methods of Pricing**: **Cost Based** -Full cost, Mark-up, Marginal & Break even; **Demand Based** - Penetrating, Skimming; **Competition Based-** Going rate, Sealed Bid, Discount; **Internet Pricing** - Flat-rate, Usage sensitive.

UNIT -IV

Introduction to Accounting & Financing Analysis: Importance of Accounting: Meaning, Types of accounts - Personal a/c, Real a/c, Nominal a/c, Rules of Debit and Credit, Accounting cycle, Recording, Classifying, & Summarizing Financial Statements; Journal and Ledger their differences; Contents of Trading, Profit & loss a/c, and Balance Sheet (Theory only).

UNIT V: Capital & Depreciation: Types of Capital - Fixed capital & Working Capital, Components of Working Capital, Factors influencing Working capital. Methods of Raising Finance - Long term, Medium term, & Short term financial sources. **Depreciation-** Importance of depreciation and its meaning, causes; Methods of Depreciation- Straight line and diminishing balancing methods.(Theory only)

Text Books:

1. A R Aryasri, Managerial Economics and Financial Analysis, TMH Pvt.Ltd, New Delhi
2. Dr. N.Appa Rao, Dr.P.VijayKumar:'Managerial Economicsand Financial Analysis',Cengage Publications, New Delhi

Reference Books :

1. Dr.B.Kuberudu & T.V. Ramana : Managerial Economics and Financial anaysis, Himalaya Publishing House
2. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & CompanyLtd,
3. Shashi K. Gupta & R.K. Sharma Management Accounting, Kalyani Publishers
4. MaheswariS.N,An Introduction to Accountancy, Vikas Publishing House PvtLtd

Code: B17 CS 4104

CRYPTOGRAPHY AND NETWORK SECURITY
(Elective-II)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**:70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

This course will provide students with in depth theoretical knowledge of cryptography and network security. By the end of the course, students should be able to:

1. Identify network security threats, security services, and countermeasures.
2. Have a strong knowledge of various symmetric and asymmetric cryptographic techniques and apply the knowledge to network security.
3. To study about message authentication and hash functions.
4. To analyze various protocols for network security to protect against the threats in the networks.
5. Learn the recent developments in Network security.
6. Prefer Network security as research area

Course Outcomes:

S. No	Outcome	Knowledge Level
1	Illustrate the basic security principles, attacks and mechanisms.	**K2**
2	Identify various symmetric and asymmetric cryptographic Techniques.	**K3**
3	Demonstrate message authentication, Digital Signature techniques.	**K2**
4	Describe the various protocols for network security.	**K2**
5	Explore the importance/role of new technologies like Block chain, Quantum computing in Security.	**K2**

SYLLABUS

UNIT-I :

Basics of Cryptography and Symmetric Encryptions

Basics of Cryptography: Basic Principles:Security Goals , Cryptographic attacks: Cryptanalytic Attacks, NonCryptanalytic attacks , Services & mechanisms: Security services, Security Mechanisms, Relation between Services and Mechanisms,

Symmetric Encryptions: Introduction to Modern Symmetric Key Ciphers: Modern Block Ciphers, DES , triple DES, AES

UNIT-II

Asymmetric Encryptions and Key management

Asymmetric Key Cryptography: Introduction, RSA Cryptosystem, Diffie hellman key exchange , Side Channel Analysis: , Key Management: Symmetric Key Distribution, Kerberos, Symmetric key Agreement, Public Key Distribution .

UNIT-III

Data Integrity, Digital Signatures Schemes

Message Integrity and Message Authentication Codes: Message Integrity, Message Authentication. , Cryptographic hash Functions: Introduction, SHA512.

Digital Signature: Comparison, Process, Services, Attacks on Digital Signatures, SCHEMES: RSA Digital Signatures, Digital Signature Standard, Variations and Applications

UNIT-IV

Internet Security Protocols and Firewalls

Security at Application layer: PGP and S/MIME , Transport Layer Security SSL & TLS . Security at Network Layer: IP Sec, Two Modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

Firewalls: Firewall characteristics, types of firewalls, Firewall location and configuration.

UNIT-V

Network Security & Cryptography in the age of Quantum Computers

Advanced topics including overview of Block chains: cryptographic Techniques used in Crypto currency, The Bitcoin Network, limitations and improvements, Overview of Quantum cryptography: Introduction, quantum cryptography fundamentals.

Text Books:

1. Cryptography and Network Security Behrouz Forouzan, DebdeepMukopadaya (3e), McGraw Hills
2. Cryptography and Network Security Principles and Practices, Fourth Edition By William Stallings
3. Cryptography and Network Security by AtulKahate,Tata Mc-Graw Hill
4. Bitcoin and cryptocurrency technologies: a comprehensive introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, Princeton University Press, 2016.
5. Introduction to Quantum Cryptography By Xiaoqing Tan.

Code: B17 CS 4105

SOFTWARE PROJECT MANAGEMENT
(Elective-II)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. To study how to plan and manage projects at each stage of the software development life cycle (SDLC)
2. To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process.
3. To understand successful software projects that support organization's strategic goals

Course Outcomes:

S. No	Out Come	Knowledge Level
1	To match organizational needs to the most effective software development model	**K2**
2	To understand the basic concepts and issues of software project management	**K3**
3	To effectively Planning the software projects	**K4**
4	To implement the project plans through managing people, communications and change	**K2**
5	To select and employ mechanisms for tracking the software projects	**K2**
6	To conduct activities necessary to successfully complete and close the Software projects	**K2**
7	To develop the skills for tracking and controlling software deliverables	**K2**
8	To create project plans that address real-world management challenges	**K3**

SYLLABUS

UNIT –I

Introduction Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure

UNIT –II

Project Approach Lifecycle models, Choosing Technology, Prototyping Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows (Book 2)

UNIT –III

Effort estimation & activity Planning Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation , Activity Identification Approaches, Network planning models, Critical path analysis. Risk Management Risk categories, Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach

UNIT –IV

Project Monitoring & Control, Resource Allocation Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling.

UNIT –V

Software Quality Planning Quality, Defining Quality - ISO 9016, Quality Measures, Quantitative Quality Management Planning, Product Quality & Process Quality Metrics, Statistical Process Control Capability Maturity Model, Enhancing software Quality (Book3)

Text Books:

1. Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill
2. Software Project Management, Walker Royce: Pearson Education, 2005.
3. Software Project Management in practice, Pankaj Jalote, Pearson.

Reference books:

1. Software Project Management, Joel Henry, Pearson Education.

Code: B17 CS 4106

SCRIPTING LANGUAGES
(Elective-II)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. The course demonstrates an in depth understanding of the tools and the scripting languages necessary for design and development of applications dealing with Bioinformation/ Bio-data.
2. The instructor is advised to discuss examples in the context of Bio-data/ Bio-information application development

Course Outcomes:

S. No	Outcome	Knowledge Level
1	To master the theory behind scripting and its relationship to classic programming.	**K2**
2	To survey many of the modern and way cool language features that show up frequently in scripting languages.	**K3**
3	To gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages.	**K3**
4	To design and implement one's own scripting language.	**K6**

SYLLABUS

UNIT – I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT – II

Advanced perl Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT- III

PHP Basics PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions. Advanced PHP Programming PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP,

UNIT – IV

Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World. TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming.

UNIT -V

Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk. Python Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

Text books:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech)

Reference books:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1, I.Bayross and S.Shah, The X Team, SPD.
5. Core Python Programming, Chun, Pearson Education.
6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.

Code: B17 CS 4107

BIG DATA ANALYTICS LAB

		Int. Marks	**: 50**
Lab	**: 3 Periods**	**Ext. Marks**	**: 50**
Exam	**: 3 Hrs.**	**Credits**	**: 2**

Course Objectives:

1. Able to run the tools like UBUNTU Operating System, Java 8, and Eclipse.
2. Able to build Hadoop Environment and develop Map-Reduce Programs for Real time applications.

Course Outcomes:

S. No	Out Come	Knowledge Level
1	Build Hadoop environment.	**K3**
2	Develop a solution for a given problem using map reduce.	**K3**

SYLLABUS

1. Setting up Hadoop on Single machine.
2. Setting up Hadoop on multi-node.
3. Basic Hadoop file system commands.
4. Write a map-reduce program for word count in give text dataset.
5. Write a map-reduce program for finding maximum temperature in weather dataset.
6. Write a map-reduce program for join of two records.
7. Write a map reduce program to find duplicate record in csv file.
8. Write a map reduce program to find patent citations in patent dataset.
9. Write a Map reduce program for total retail collection.(retail dataset)
10. Write a Map reduce program for store wise collection.(retail dataset)
11. Write a Map reduce program for product wise collection.(retail dataset)
12. Write a map reduce program for display highest ctc in each dept in employ ctc dataset **Note:** Cost to company (**CTC**) is a term for the total salary package of an **employee**
13. Sample Programs on PIG
14. Sample Programs on HIVE

Extra Programs List

1. Write a map-reduce program for word count in give text dataset.(with combiner)
2. Write a map-reduce program for word count in give text dataset.(without case sensitive)
3. Write a map reduce program to sum of numbers in text file.
4. Write a map-reduce program for finding minimum temperature in weather dataset.

Reference Book:

1. Hadoop Map Reduce Cookbook, Srinath Perera & Thilina Gunarathne, 2013, PACKT PUBLISHING.

Code: B17 CS 4108

INTERNET OF THINGS LAB

		Int. Marks	**: 50**
Lab	**: 3 Periods**	**Ext. Marks**	**: 50**
Exam	**: 3 Hrs.**	**Credits**	**: 2**

Course Objectives:

1. To know how to use various hardware components and Protocols in IoT applications
2. To Know how to develop various IoT applications

Course Outcomes: At the end of the course, the students can able to

S. No	Out Come	Knowledge Level
1	Use sensors, actuators, Arduino and Raspberry pi in IoT applications	**K3**
2	Design and Develop various IoT applications.	**K6**

SYLLABUS

1. To interface Bluetooth with Raspberry Pi/Arduino and write a program to send sensor data to smart phone using Bluetooth.
2. To interface Bluetooth with Raspberry Pi/Arduino and write a program to to turn ON/OFF LED when '1'/'0' is received from smart phone using Bluetooth.
3. Application of WiFi in IoT Systems
4. App design for WiFi application to ON/OFF Light
5. Use of various network protocols in IoT systems
6. Application of 802.15.4 Zigbee in IoT Systems.
7. Design a simple IoT System comprising sensor, Wireless Network connection, Data Analytics
8. Design and Interface ESP32 with DC motor using L298 motor driver
9. Experiment on connectivity of Rasberry Pi with existing system components.

Reference Book:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)
IV/IV B.TECH
(With effect from **2017-2018**Admitted Batch onwards**)**
COMPUTER SCIENCE & ENGINEERING
(Accredited by NBA)
II-SEMESTER

Code No.	Name of the Subject	Cr.	Lect Hrs	Tut. Hrs	Lab Hrs	Contact Hrs/ Week	Int. Marks	Ext. Marks	Total Marks
B17 BS 4201	Management and Organisational Behaviour	3	3	1	--	4	30	70	100
#ELE-III	Elective-III	3	3	1	--	4	30	70	100
B17 CS 4204	Machine Learning Lab	2	--	--	3	3	50	50	100
B17 CS 4205	Seminar	2	--	--	--	--	50	--	50
B17 CS 4206	Project Work	10	--	--	3	3	60	140	200
Total		**20**	**6**	**2**	**6**	**14**	**220**	**330**	**550**

#ELE-III	B17 CS 4201	Deep Learning
	B17 CS 4202	Concurrent and Parallel Programming
	B17 CS 4203	Artificial Neural Networks

B17 BS 4201

MANAGEMENT AND ORGANISATIONAL BEHAVIOUR
(Common to CSE & IT)

Lecture	**: 3 Periods**	**Int.Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. To familiarize with the concept of management, functions and principles
2. To provide conceptual knowledge on functional management that is on Human resource management and Marketing management
3. To provide basic insight into contemporary management practices and Strategic Management
4. To learn theories of motivation and also deals with individual behavior, their attitude and perception of individuals
1. To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress managementt

Course Outcomes:

S.No	Out Come	Knowledge Level
1	Explain management functions and principles	**K2**
2	Will be able to describe the concepts of functional management that is HRM and Marketing functions	**K2**
3	Will be able to get discuss about vision, mission, goal, objective and a strategy based on which the corporate planning depends	**K2**
4	The learner is able to recognise strategically contemporary management practices and describe corporate planning process	**K2**
5	The learner can discuss about individual behaviour and motivational theories	**K2**
6	The student can explain about ways in managing conflicts and stress	**K2**

SYLLABUS

UNIT-I: Introduction to Management:

Management: Concept, Nature and importance of Management, Functions of management, Evolution of Management thought, Taylor's Scientific Management, Fayol's principles of Management, Social Responsibility of Business.

UNIT- II: Functional Management:

Human Resource Management (HRM): Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Compensation & Performance Appraisal.

Marketing Management: Concept, Functions of marketing; Marketing Mix - Product, Price, Place & Promotion; Marketing strategies based on Product life cycle, Channels of distribution.

UNIT - III: Strategic Management:
Vision, Mission, Goal, Objective, Policy, Strategy. Elements of Corporate planning process; Environmental scanning; SWOT analysis; steps in Strategy formulation, implementation, evaluation & control;Bench Marking; Balanced Score Card.

UNIT - IV : Organisational Behaviour:
Individual Behavior: Perception-Perceptual process; Attitude-Attitutidinalchange,Organisational Change, Factors Influencing Change, Types of Change.
Motivation: Meaning, Theories of Motivation - Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation.

UNIT - V :Group Dynamics:
Types of Groups, Stages of Group development; **Organizationalconflicts** -Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Stress - Causes and effects, coping strategies of stress.

TextBooks:

1. Subba Rao.P Management & Organizational Behavior, Himalaya Publishing House. Mumbai
2. A.R Aryasri - Management Science McGraw Hill Pvt Ltd, New Delhi

Reference Books:

1. Fred Luthans Organizational Behaviour, TMH, NewDelhi.
2. Robins, Stephen P., Fundamentals of Management, Pearson,India.
3. Kotler Philip & Keller Kevin Lane: Marketing Management 12/e, PHI,
4. Koontz & Weihrich: Essentials of Management, 6/e, TMH

B17 CS 4201

DEEP LEARNING
(Elective-III)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives: Student able to

1. Understand and recollect basic concepts of machine learning
2. Understand concepts of deep feed forward network mechanisms
3. Understand and analyze the concepts of CNN model
4. Study the concepts of auto encoders and optimization techniques
5. Study and analyze the different DNN architectures

Course Outcomes:

S.No	Out Come	Knowledge Level
1	The students able to outline the basic concept of Machine learning	K1
2	The students able to express the concepts of deep feed forward networks.	K2
3	The students able to explain the CNN model	K2
4	The students able to explain and apply optimization techniques and auto encoders.	K2,K3
5	The students able to learn about different DNN models and apply that knowledge to different applications.	K1,K3

SYLLABUS

UNIT-I

Fundamentals Concepts of Machine Learning: Historical Trends in Deep Learning-Machine Learning Basics: Learning Algorithms Supervised and Unsupervised Training, Linear Algebra for machine Learning, Testing, Cross-Validation, Dimensionality reduction, Over/Under-fitting, Hyper parameters and validation sets, Bias, Variance, Regularization

UNIT-II

Deep Feed Forward Networks: Deep feed forward networks-Introduction- Gradient-Based Learning- Various Activation Functions, error functions- Architecture Design-differentiation algorithms Regularization for Deep learning-Early Stopping, Drop out.

UNIT-III

Convolutional Neural Networks and Sequence Modeling: Convolutional Networks: Convolutional operation- Motivation- Pooling- Normalization, Sequence Modeling: Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Encoder-Decoder Sequence-to-Sequence Architectures, The Long Short-Term Memory and Other Gated RNNs .

UNIT-IV

Auto Encoders: Auto encoders - Auto encoders: under complete, regularized, stochastic, denoising, contractive, Optimization for Deep Learning

UNIT-V

More Deep Learning Architectures & Applications: Alexnet, ResNet, Transfer learning, Image Segmentation Sentiment Analysis using RNN and LSTM

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016 (available at http://www.deeplearningbook.org)
2. Charu C Agarwal, "Neural Networks and Deep Learning", IBM T. J. Watson Research Center, International Business Machines, Springer, 2018

Reference Books:

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2. Michael Nielsen, "Neural Networks and Deep Learning", Online book, 2016 (http://neuralnetworksanddeeplearning.com/)
3. Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Foundations and Trends in Signal Processing.
4. Christopher and M. Bishop, "Pattern Recognition and Machine Learning", Springer Science Business Media, 2006.
5. Jason Brownlee , "Deep Learning with Python" , ebook, 2016
6. N. D. Lewis , "Deep Learning Step by Step with Python: A Very Gentle Introduction to Deep Neural Networks for Practical Data Science
7. Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018

Useful Reference Links:

1. https://medium.com/nybles/create-your-first-image-recognition-classifierusing-cnn-keras-and-tensorflow-backend-6eaab98d14dd
2. https://www.analyticsvidhya.com/blog/2017/08/10-advanced-deep-learningarchitectures-data-scientists/
3. https://www.geeksforgeeks.org/cross-validation-machine-learning/
4. https://www.geeksforgeeks.org/activation-functions-neural-networks/
5. https://towardsdatascience.com/sentiment-analysis-using-lstm-step-bystep-50d074f09948 https://medium.com/@lamiae.hana/a-step-by-step-guide-on-sentimentanalysis-with-rnn-and-lstm-3a293817e314
6. https://towardsdatascience.com/common-loss-functions-in-machinelearning-46af0ffc4d23
7. https://d2l.ai/chapter_natural-language-processing-applications/sentimentanalysis-rnn.html

B17 CS 4202

CONCURRENT AND PARALLEL PROGRAMMING
(Elective-III)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. Improvement of students comprehension of CPP, new programming concepts, paradigms and idioms
2. Change of 'mood' regarding Concurrency counter-intuitiveness
3. Proactive attitude: theoretical teaching shouldn't be so dull
4. Multipath, individually paced, stop–and–replay, personalized learning process
5. Frequent assessment of learning advances on the subject

Course Outcomes:

S.No	Out Come	Knowledge Level
1	Understanding improvement of CPP concepts presented	K2
2	The number of reinforcement–exercises assigned	K3
3	The time required for the resolution of exercises	K3
4	Compliance level with the new model of theoretical teaching	K3

SYLLABUS

UNIT- I

Concurrent versus sequential programming. Concurrent programming constructs and race condition. Synchronization primitives.

UNIT-II

Processes and threads. Interprocess communication. Livelock and deadlocks, starvation, and deadlock prevention. Issues and challenges in concurrent programming paradigm and current trends.

UNIT-III

Parallel algorithms – sorting, ranking, searching, traversals, prefix sum etc.,

UNIT- IV

Parallel programming paradigms – Data parallel, Task parallel, Shared memory and message passing, Parallel Architectures, GPGPU, pthreads, STM,

UNIT-V

OpenMP, OpenCL, Cilk++, Intel TBB, CUDA,Heterogeneous Computing: C++AMP, OpenCL

Text books:

1. Mordechai Ben-Ari. Principles of Concurrent and Distributed Programming, Prentice-Hall International.
2. Greg Andrews. Concurrent Programming: Principles and Practice, Addison Wesley.
3. GadiTaubenfeld. Synchronization Algorithms and Concurrent Programming, Pearson.
4. M. Ben-Ari. Principles of Concurrent Programming, Prentice Hall.

Reference books:

1. Fred B. Schneider. On Concurrent Programming, Springer.
2. Brinch Hansen. The Origins of Concurrent Programming: From Semaphor

B17 CS 4203

ARTIFICIAL NEURAL NETWORKS
(Elective-III)

Lecture	**: 3 Periods**	**Int. Marks**	**: 30**
Tutorial	**: 1 Period.**	**Ext. Marks**	**: 70**
Exam	**: 3 Hrs.**	**Credits**	**: 3**

Course Objectives:

1. Understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling.
2. Provide knowledge of supervised learning in neural networks
3. Provide knowledge of computation and dynamical systems using neural networks
4. Provide knowledge of reinforcement learning using neural networks.
5. Provide knowledge of unsupervised learning using neural networks.
6. Provide hands-on experience in selected applications

Course Outcomes:

S.No	Out Come	Knowledge Level
1	This course has been designed to offer as a graduate-level/ final year undergraduate level elective subject to the students of any branch of engineering/ science, having basic foundations of matrix algebra, calculus and preferably (not essential) with a basic knowledge of optimization.	K2
2	Students and researchers desirous of working on pattern recognition and classification, regression and interpolation from sparse observations; control and optimization are expected to find this course useful. The course covers theories and usage of artificial neural networks (ANN) for problems pertaining to classification (supervised/ unsupervised) and regression.	K3
3	The course starts with some mathematical foundations and the structures of artificial neurons, which mimics biological neurons in a grossly scaled down version. It offers mathematical basis of learning mechanisms through ANN. The course introduces perceptrons, discusses its capabilities and limitations as a pattern classifier and later develops concepts of multilayer perceptrons with back propagation learning	K3

SYLLABUS

UNIT-I

Introduction and ANN Structure. Biological neurons and artificial neurons. Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

UNIT-II

Mathematical Foundations and Learning mechanisms.Re-visiting vector and matrix algebra. State-space concepts. Concepts of optimization. Error-correction learning. Memory-based learning. Hebbian learning. Competitive learning.

UNIT-III

Single layer perceptrons. Structure and learning of perceptrons. Pattern classifier - introduction and Bayes' classifiers. Perceptron as a pattern classifier. Perceptron convergence. Limitations of a perceptrons.

UNIT-IV

Feed forward ANN. Structures of Multi-layer feed forward networks. Back propagation algorithm. Back propagation - training and convergence. Functional approximation with back propagation. Practical and design issues of back propagation learning.Radial Basis Function Networks. Pattern separability and interpolation.

UNIT-V

Regularization Theory. Regularization and RBF networks.RBF network design and training. Approximation properties of RBF. Support Vector machines. Linear separability and optimal hyperplane.Determination of optimal hyperplane. Optimal hyperplane for nonseparable patterns.Design of an SVM.Examples of SVM.

Text Books:

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

Reference books:

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.

B17 CS 4204

MACHINE LEARNING LAB

		Int. Marks	**: 50**
Lab	**: 3 Periods**	**Ext. Marks**	**: 50**
Exam	**: 3 Hrs.**	**Credits**	**: 2**

Course Objectives:

1. Students will be able to implement different mechanisms in preprocessing and model evaluation & implementation
2. Students will be able to implement different dimensionality reduction techniques
3. Students will be able to implement different clustering & classification techniques
4. Students will be able to implement simple Feed-Forward Network
5. Students will be able to implement CNN, RNN and LSTM models

Course Outcomes: Students able to

S.No	Out Come	Knowledge Level
1	Design Preprocessing model for their own data sets	**K6**
2	Apply dimensional reduction techniques for their own datasets	**K3**
3	Develop different clustering & classification techniques	**K6**
4	Design simple FNN	**K6**
5	Design CNN, RNN and LSTM networks for image classification and sentiment analysis	**K6**

SYLLABUS

1. Data preprocessing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features
2. Model Evaluation and optimization: K-fold cross validation, learning and validation curves, grid search
3. Compressing data via dimensionality reduction: PCA, LDA
4. Ensemble Learning, Data Clustering & Classification
5. Vector addition.
6. Regression model.
7. Perceptron for digits.
8. Feed-Forward Network for wheat seeds dataset.
9. Image Classifier using CNN.
10. Transfer Learning for cat vs dog.
11. Autoencoder for MNIST
12. Sentiment analysis with RNN and LSTM.
13. Mini Project

Note: Students can implement in their interested environment like Scikit-Learn/Tensorflow/Keras etc.

References:

1. Chris Albon, “Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning”, O’REILLY Publisher,2018
2. Sebastian Raschka & Vahid Mirjalili, “Python Machine Learning”, Packt Publisher, 2017
3. Ian Good Fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
4. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018.
5. Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress , 2017.
6. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.
7. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.
8. Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016

Reference Links:

1. https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.Perceptron.html
2. https://towardsdatascience.com/15-data-exploration-techniques-to-go-from-data-to-insights-93f66e6805df
3. https://medium.com/ml-research-lab/chapter-4-knowledge-from-the-data-and-data-exploration-analysis-99a734792733
4. https://machinelearningmastery.com/implement-backpropagation-algorithm-scratch-python/
5. https://www.analyticsvidhya.com/blog/2016/01/guide-data-exploration/
6. https://towardsdatascience.com/wtf-is-image-classification-8e78a8235acb
7. https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-and-tensorflow-backend-6eaab98d14dd
8. https://analyticsindiamag.com/learn-image-classification-using-cnn-in-keras-with-code/
9. https://www.tensorflow.org/tutorials/images/transfer_learning
10. https://www.pyimagesearch.com/2020/02/17/autoencoders-with-keras-tensorflow-and-deep-learning/
11. https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html
12. https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f0994

Code: B17 CS 4205

SEMINAR

Lecture	**: --**	**Int.Marks**	**: 50**
Tutorial	**: --**	**Ext. Marks**	**: --**
Exam	**: --**	**Credits**	**: 2**

For the seminar, each student has to be evaluated based on the presentation of any latest topic with report of 10-15 pages and a PPT of minimum 10 slides. The student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member.

NOTE: Minimum of 50 % of marks is required to pass in seminar. If a student fails to get those minimum marks he/she has to again present the same topic within 2 weeks from the date of earlier presentation.

Code: B17 CE 4206

PROJECT WORK

Lab	**: 3 Hrs.**	**Int.Marks**	**: 60**
Tutorial	**: --**	**Ext. Marks**	**: 140**
Exam	**: --**	**Credits**	**: 10**

Course Outcomes: At the end of the Project Work students will be able to

S.No	Out Come	Knowledge Level
1	Identify a current problem through literature/field/case studies	K3
2	Identify the background objectives and methodology for solving the same.	K3
3	Design a technology/ process for solving the problem.	K6
4	Develop a technology/ process for solving the problem.	K6
5	Evaluate that technology/ process at the laboratory level.	K5

Format for Preparation of Project Thesis for B. Tech:

1. Arrangement Of Contents: The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page .
2. Bonafide Certificate
3. Abstract.
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

*The table and figures shall be introduced in the appropriate places.

Note:

Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the end semester examination. The end semester examination (VivaVoce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.