

APPLICATION OF FINITE ELEMENT ANALYSIS IN GEOTECHNICAL ENGINEERING

Faculty: Dr. Tanmoy Kr. Deb

Course Duration: 30 Hours

Offered to: B. Tech, Semester - VI

The objective of the course is to introduce the students to the application of the concepts of Finite Element (FE) method in the area of Geotechnical Engineering.

Course Outcome

On successful completion of this course, the students should be able to:

- Utilize various constitutive models to simulate the behaviour of sandy and clayey soils.
- Model foundations of various types in sands and clays and determine the vertical bearing capacity using FE simulations.

Course Content:

Module 1: Introduction to finite element (FE) analysis.

Module 2: Constitutive modelling.

Module 3: Applications of Mohr-Coulomb model, Tresca model, Drucker-Prager model, Cam clay model.

Module 4: FE analysis of foundations in clayey and sandy soils.

Module 5: FE analysis of shallow and deep foundations.

Evaluation Scheme:

Components	Weightage
Assignment	30
Quiz	10
Project 1	20
Project 2	20
Project 3	20
Total	100

References:

 Potts, D. M., Zdravković, L., Addenbrooke, T. I., Higgins, K. G., & Kovačević, N. (2001).
 Finite element analysis in geotechnical engineering: application (Vol. 2). London: Thomas Telford.
 Wood, D. M. (2003). Geotechnical modelling (Vol. 1). CRC press.
 Helwany, S. (2007). Applied soil mechanics with ABAQUS applications. John Wiley & Sons.



Value Added Course Academic Year 2019-2020 SAFETY MANAGEMENT IN CONSTRUCTION

Faculty: Dr. D K Sharma

Course Duration: 32 Hours

Offered to: B. Tech, Semester - VII

The objective of this course is to provide practical guidance on technical, managerial and legal framework for safety and health in the construction sector.

Course Outcome

On successful completion of this course, the students should be able to: 1.Define the key safety requirements at construction sites 2.Identify the hazards and risks involved at construction sites 3.Implement the effective safety management system 4.Reduce workplace injuries through incident prevention methods 5.Improve safety culture within the organization

Course Content:

Module 1: Management of Safety in Construction Module 2: Safety in Road Construction Zones Module 3: Safety Practices During Construction Work: Module 4: Post Construction Safety & Safety During Emergency Module 5: Legal Issues in Quality and Safety

Evaluation Scheme:

Components	Weightage
Assignment	20
Mid Term Exam	20
End Term Exam	30
Report	15
Project	15
Total	100

References

1.Tang, S.L., Ahmed, S.M., Aoieong, Raymond T. and Poon, S.W. (2005), Construction quality management, Hong Kong University Press, Hong Kong.*

2.Poon, S.W., Tang, S.L. and Wong, Francis K.W. (2008), Management and economics of construction safety in Hong Kong, Hong Kong University Press.*

3.International Journal of Quality and Reliability Management. (Emerald's journal)

4.IRC:SP:55-2001 "Guidelines on safety in road construction zones, The Indian Road Congress, New-Delhi.

5.Building & other construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 (BOCWA)

6.Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998 (BOCWR)

7.OSHA Field Safety and Health Manual



Value Added Course

Academic Year 2019-20

"STAAD PRO"

Faculty: Mr. Amit Kumar

Course Duration: 30 Hours

Offered to: B. Tech, Semester - VI

The course has been very systematically arranged so that you can best understand the software. Once you complete this course, you will have all the necessary knowledge to do structural design of a building. You can work as a structural designer or can do the structural design of buildings on your own projects.

Course Outcome

On successful completion of this course, the students should be able to:

- Learn the details of the requirements of building components with predominance.
- To Understanding the functional and structural requirements.
- Design principles and designing of building components.
- Application different types of loads like dead load, live load, earthquake load, wind load.
- Design of the structural elements using different design codes.

Course Content:

Module 1: Introduction of STAAD Pro Software

•Module 2: Structural Analysis and Design of a RCC Building.

·Module 3: Detailing of Beams and Columns.

·Module 4: Earthquake Load Application.

Evaluation Scheme:

Components	Weightage
Assignment	20
Quiz	20
Theory Exam	40
Project 1	10
Project 2	10
Total	100

References:

 Staad Pro v8i for beginners By T.S.Sarma
 Exploring Bentley STAAD.Pro V8i (SELECTseries 6) By Sham Tickoo.



Academic Year-2020-21

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY JK Lakshmipat University

Name of the Course BUSINESS ANALYTICS WITH R

Course Faculty (s) Abhinav Kumar, Sonal Jain

Course CodeSessionCourse DurationCS2001August-December 202030 Hrs.

Offered to CSE, B.Tech. Computer Science Engineering Students (Sem III, V and VII)

Course Description

The course will provide concepts and practical approach to the statistical package R which has become an industry standard for machine learning and data mining. This course lays the foundation for aspiring business analytics students. It enables the participants to recognise, understand and apply the language, theory and models of the field of business analytics. Foster the ability to critically analyse, synthesise and solve complex unstructured business problems. Encourages an aptitude for business improvement, innovation, and entrepreneurial action. Encourages the sharing of experiences to enhance the benefits of collaborative learning. Instils a sense of ethical decision-making and a commitment to the long-run welfare of both organisations and the communities they serve. The techniques learned in this course will help in dealing with structured and unstructured data. R is currently used in Big data environments as well. This course will provide foundation to the advanced data management techniques.

Pre-requisites

Basic Statistics, Hypothesis Testing, CRISP-DM Methodology

On successful completion of this course, the participants should be able to:

- Use basic statistical concepts on multiple types of data to build predictive models.
- Use data sampling techniques to select, manipulate and analyse different data points to identify patterns and trends.
- Solve complex problems with R which is the most popular language for business analytics and an essential tool for ٠ analytics-driven companies.
- Optimise business situations that involve whole numbers, take decisions that involve multiple input variables to predict between two possible outputs, and optimise business situations where the two variables do not move in a linear fashion.
- Model decisions under a variety of future uncertain states, depending on the decision maker's proneness or aversion to risks.
- Compute correlation between data points in a time series.
- Compute the regression model for time series data that has a correlation within itself.
- Test hypothesis for experiments involving different treatments and Identify the source of differences to pinpoint which experimental treatments were effective.
- Model continuous outcomes that depend on more than one input variable.

Evaluation Scheme

Sr. No.	Program Evaluation Component	Weight age
1	Class Participation	20%
2	Quiz 1	35%
3	Quiz 2	35%
4	Attendance	10%

Course Contents

Module 1: Business Analytics application and relevance in Real World across Industries

- Automotive
- Business Intelligence
- Financial Services and Insurance
- Life Sciences
- Retail
- Telecom

Module 2: CRISP-DM, Mind map, Basics of R, and practical implementation in R

- Introduction to CRISP-DM and access to business analytics Mind map
- Installation of R and R Studio
- Basic Data Structures in R
- Data Manipulation

Module 3: Business Analytics in Automotive Industry

- Introduction to analytics application in Automotive Industry
- Developing the business problem
- Descriptive understanding of the data set
- Data Visualization (scatter plot, histogram, bar plot, dot plot, density plots, Normal QQ plot, linear model plots)
- Data transformation methods

Module 4: Business Analytics in Insurance Industry

- Introduction to analytics application in Insurance Industry
- Developing business problem
- Descriptive understanding of the data set
- · Missing data handling

- Understanding various data types
- Writing basic functions
- Introduction to various analytics packages
- Use Case Vehicle mileage prediction
- · Documenting business objective and constraints
- · Basics of linear predictive models
- Model Evaluation
- Use Case Insurance claim loss classification
- Documenting business objective and constraints
- Basics of classification models
- Model evaluation

Aviation

- Energy and Resources
- Manufacturing
- Healthcare
- Social Media

- Technology

Course Contents

Module 5: Business Analytics in Banking Industry

- Introduction to analytics application in Banking Industry
- Developing business problem
- Basics of Information Theory 101

Module 6: Business Analytics in Healthcare Industry

- Introduction to analytics application in Healthcare Industry
- Developing the business problem
- Model development and evaluation

Module 7: Business Analytics in Social Media

- Introduction to analytics application in Social Media
- Use Case Analysing customer reviews
- Descriptive understanding of text data
- Structuring unstructured data techniques (Bag of Words, Document Term Matrix, TFIDF)
- Data Visualization (Word Clouds)

Module 8: Business Analytics in Retail Industry

- Introduction to analytics application in Retail Industry
- Descriptive understanding of the data set
- Data Visualization (Network plot, Matrix plot, Scatter plot)

Module 9: Business Analytics in FMCG Industry

- Introduction to analytics application in FMCG Industry
- Descriptive understanding of the data set
- Data Visualization (Time plot, Lag Plot, ACF Plot)
- Data Driven forecasting (smoothing models)

- Use Case-Bank loan default
- Descriptive understanding of the data set
- Model evaluation
- Use Case Detecting the presence or absence of disease
- Descriptive understanding of the data set
- Data extraction from web (Amazon, Trivago, Snapdeal, etc.)
- Developing business problem
- Performing sentiment analysis
- Use Case Market Basket Analysis
- Basics of affinity analysis
- Model development and analysis
- Use Case Forecasting customer footfall and sales
- Basics of time series (level, trend, seasonality, noise)
- Model based forecasting (linear models)
- Model Evaluation

References

Participants will be provided recorded lectures for pre-requisites and the online classes. No books will be prescribed. The datasets and the codes for the case studies would be provided to the participants.



Academic Year-2019-20

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY

JK Lakshmipat University

Name of the Course CONTEST PROGRAMMING

Course Faculty (s)
SANTOSH KUMAR VERMA

Course Code

Course Duration 30 Hrs.

Offered to CSE/EE/ECE/ME/CE

Course Description

This Course is designed to equip learners with skills of computational problem solving with a focus on time and space efficiency. It includes analysis, selection, implementation, optimization and scalability of algorithms.

On successful completion of this course, the students should be able to:

- Identify the algorithmic way of solving problem
- Select an effective data structure and algorithm to efficiently solve the problem
- Analyze Time and Space Complexity of Solution
- Analyze Scalability of Solution
- Attempt an online/onsite national/international computational problem solving contest.
- Organize an online/onsite national/international computational problem solving contest/event
- Adapt Ethical Coding Practices.

Course Contents

Review of Concepts of programming(C/Core Java/C++/Python); Preparing Game Plan for a Contest; Programming Language selection for a contest; Essential Data Structures for Implementing Solution to a problem; Input /Output Techniques and constraints; Test Case analysis of a problem; Hands-on problem solving approaches (Brute Force Method, Greedy Algorithms, Dynamic Programming); Complexity analysis of an algorithm; Importance of Graph algorithms; Computational Geometry; Meet-up on ACM Programming Problems; Common Codes/Routines for Programming; Time Savor. use of various libraries like Standard Template Library (STL) and python supported libraries; Exploring the working of programming judges; Setting up the online and onsite judge (Codechef, Hackerrank, Hackerearth, Geeksforgeeks, CodingNinjas, PC2, etc.); Contest Administration; Ethical coding (awareness of Plagiarism).

Evaluation Scheme

Sr. No	Specifications	Marks
01	Attendance	10
02	Assignments	Nil
03	Class Participation	10
04	Quiz (4)	Nil
05	Theory Exam	Nil
06	Theory Exam	Nil
07	Theory Exam(Final)	Nil
08	Report-1	Nil
09	Report-2	Nil
10	Report-3	Nil
11	Project-1	Nil
12	Project-2	Nil
13	Project-3	Nil
14	Lab Evaluation1	Nil
15	Lab Evaluation2(Final)	Nil
16	Course portfolio	80
	Total (100)	100

References

- 1. Laaksonen, Antti. Guide to Competitive Programming: Learning and Improving Algorithms Through Contests. Springer, 2018.
- 2. Laaksonen, Antti. "Competitive Programmer's Handbook." Preprint (2017).
- 3. Horowitz, Ellis. Fundamentals of data structures in C++. Galgotia Publications, 2006.
- 4. Skiena, Steven S. The algorithm design manual: Text. Vol. 1. Springer Science & Business Media, 1998.
- 5. Mata-Toledo, Ramon A., and Pauline K. Cushman. Schaum's outline of Introduction to Computer Science. McGraw Hill Professional, 2000.
- 6. Narasimha, Karumanchi. "Data Structures and Algorithms Made Easy." (2018).
- 7. Lafore, Robert. Object-oriented programming in C++. Pearson Education, 1997.



Academic Year-2019-20

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY

JK Lakshmipat University

Name of the Course HANDS ON LINUX

Course Faculty (s) DR. GIREESH KUMAR

Course Code

Course Duration 30 Hrs.

Offered to B.Tech. Computer Science Engineering Students

Course Description

This course explores the various tools and techniques commonly used by Linux system administrators and end users to achieve their day-to-day work in a Linux environment.

On successful completion of this course, the students should be able to:

- To implement basic LINUX commands, manage files and directories
- To utilize the vieditor, work with Linux security mechanisms to protect files and programs
- To work with the Linux shell to control the flow and processing of data through pipelines
- To design and write shell programs of moderate complexity, and manage multiple concurrent processes in order to achieve higher utilization of Linux.

Course Contents

Module1: Getting Started.

- What is Linux/Unix?
- History of Linux.
- Components of Linux System.
- Basic features
- Logging In
- Logging Out
- Try a Few More Commands
- Changing Your Password
- Installation of RHEL on virtual machine
- Virtual Machines
- Kernel
- Dynamic memory allocation

Module2: The File System – Files

- What is a File?
- The Is Command
- The cat Command
- The more and pg Commands
- The head and tail Commands
- The cp Command
- The mv Command
- The rm Command
- File names

Module3: The File System – Directories

- Hierarchical File System
- Pathnames
- The pwd Command Print Working Directory
- The cd Command Change Directory
- The mkdir Command Make Directories
- The rmdir Command-Remove Directories
- The cp Command (again)-Copy Files
- Two useful directory names -. and ..

Module4: Editing with vi

- What is vi?
- The vi Buffering Process
- Command Mode and Insert Mode
- Modes Diagram
- Getting Started
- Moving the Cursor Around
- Inserting Text
- Deleting a Character or Line
- Undo Last Command
- Opening a New Line
- Save Your Work or Abort the Session

Module5: Text Handling Utilities

- The grep Utility
- The tr Utility
- The cut Utility
- The paste Utility
- The sort Utility
- The wc Utility

Module6: File System Security

- File Permissions
- The chmod Utility
- Directory Permissions
- The umask Command

Module7: Using the Shell

- What is a Shell?
- Which Shell?
- The Command Line
- Standard Input, Standard Output and Standard Error
- Using Default Standard In and Standard Output
- I/O Redirection
- Appending Output of a File
- Pipes
- The tee Utility

Course Contents

Module8: Filename Generation

- Filename Generation
- The? special Character
- The * special Character
- The [] special Characters
- The! special Characters

Module9: Shell Programming Concepts

- What is a Shell?
- What is a Shell Script?
- Why Use Shell Scripts?
- Shell Programming: Introduction

- Shell Programming: Control Structure
- Shell Programming: Working with files
- Shell Programming: Examples

Module10: Process Management Commands in Linux.

Module11: Networking Utilities – Linux

- Web server configuration
- Installation of http package, yum configuration, starting and stopping a service, webpage deployment.
- Networking concepts SSH and SCP.
- File transfer protocol and remote access of systems.

Evaluation Scheme

Evaluation Scheme		
Sr. No	Specifications	Marks
01	Assignments	20
02	Quiz	20
03	Lab Evaluation-I	30
04	Lab Evaluation-II	30
	Total (100)	100

References

- 1. Richard Blum, Christine Bresnahan. Linux Command Line and Shell Scripting Bible, Wiley, 2015.
- 2. Daniel P. Bovet, Marco Cesati. Understanding the Linux Kernel, O'Reilly media 3rd Edition, 2005.
- 3. M.G. Venkateshmurthy. Introduction to Unix & Shell Programming, Pearson Education, 2009.
- 4. Jason Cannon, Linux for Beginners: An Introduction to the Linux Operating System and Command, 2013.



Academic Year-2019-20

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY JK Lakshmipat University

Name of the Course

INTRODUCTION TO NETWORKS, SWITCHING AND ROUTING

Course Faculty (s) DEVENDRA BHAVSAR

Course Code

Course Duration 45 Hrs.

Offered to B.Tech. Computer Science Engineering Students

Course Description

Introduction to Networks Switching and Routing introduces Computer Networks architectures, models, protocols, and networking elements – functions needed to support the operations and priorities of Fortune 500 companies to small innovative retailers. The principles and structure of IP addressing and thefundamentals of Ethernet concepts, media, and operations are introduced to provide a foundationfor the curriculum. This course also covers components and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality.By the end of the course, students will be able to build simple LANs, performbasic configurations for routers and switches, and implement IP addressing schemes. The course includes activities using Packet Tracer, hands-on lab work, and a wide array of assessment types and tools.

On successful completion of this course, the students should be able to:

- 1. Build simple LANs, perform basic configurations for routers and switches, and implement IPv4 and IPv6 addressing schemes.
- 2. Define the role of a centralized Security Intelligence solution and how it integrates with other IT enterprise security components
- 3. Configure routers, switches, and end devices to provide access to local and remote network resources and to enable end-to-end connectivity between remote devices.
- 4. Configure and troubleshoot connectivity a small network using security best practices.
- 5. Develop critical thinking and problem-solving skills using real equipment and Cisco Packet Tracer.
- 6. Develop basic skills of routing, switching, and advanced technologies to prepare for the Cisco CCNA exam, networking related degree programs, and entry-level networking careers.
- 7. Configure Ethernet switch ports and implement VLANs.
- 8. Implement static routing.
- 9. Implement DHCP on a router.
- 10. Implement network address translation (NAT).
- 11. Implement access control lists (ACLs) to filter traffic.

Course Contents

Module 1: Explore the Network: Globally Connected, LANs, WANs, and the Internet, Network as a Platform, Configure a Network Operating System: IOS Bootcamp, Basic Device Configuration, Address SchemesPhysical Layer Protocols.

Module 2: Network Media, Data Link Layer Protocols Media Access Control, Ethernet Protocol, LAN Switches, Address Resolution Protocol, Network Layer Protocols, Routing, Routers, Configuring a Cisco Router, IPv4 Network Addresses, IPv6 Network Addresses, Connectivity Verification, Subnetting an IPv4 Network, Addressing Schemes, Design Considerations for IPv6.

Module 3: Transport Layer Protocols, TCP and UDP, Application Layer Protocols

Well-Known Application Layer Protocols and Services Network Design, Network Security, Basic Network Performance, Network Troubleshooting, Router Initial Configuration, Routing Decisions, Router Operation, Implement Static Routes, Configure Static and Default Routes, Troubleshoot Static and Default Routes.

Module 4: Dynamic Routing Protocols, RIPv2, Routing Table, Switched Networks: LAN Design, Switched Environment, Basic Switch Configuration, Switch Security, VLAN Segmentation, VLAN Implementations, Inter-VLAN Routing Using Routers.

Module 5: Access Control Lists (ACL): ACL Operation, Standard IPv4 ACLs, Troubleshoot ACLsDHCPv4, DHCPv6NAT Operation, Configure NAT, Troubleshoot NATDevice Discovery, Device Management and Device Maintenance.

Evaluation Scheme

Prerequis	sites	No
	Evaluation Scheme	
Sr. No	Specifications	Marks
1	Quiz (CISCO Chapter Exams)	40
2	Theory Exam-III (CISCO Final Exam)	40
3	Lab Evaluation-II (CISCO Lab Exam)	20
	Total (100)	100

<u>References</u>

- Lammle, T. (2016). CCNA Routing and Switching Complete Study Guide: Exam 100-105, Exam 200-105, Exam 200-125. John Wiley & Sons.
- Lammle, T. (2013). CCNA routing and switching study guide: exams 100-101, 200-101, and 200-120. John Wiley & Sons.
- Lammle, T. Cisco Certified Network Associate Study Guide. 2nd. Edition
- Stallings, W. (2004). Computer networking with Internet protocols and technology. Upper Saddle River, NJ, USA: Pearson/Prentice Hall.
- Kurose, J., & Ross, K. (2010). Computer networks: A top down approach featuring the internet. Peorsoim Addison Wesley.
- Lammle, T. (2011). CCNA Cisco Certified Network Associate Deluxe Study Guide. John Wiley & Sons.



Academic Year-2019-20

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY JK Lakshmipat University

Name of the Course REFRESHER COURSE IN PROGRAMMING

Course Faculty (s)

SONAL JAIN, DEVENDRA BHAVSAR, AMIT MISHRA, SANTOSH VERMA, TARUNA JAIN ALOK KUMAR, KAVITA CHOUDHARY

Course Code

Course Duration **30 Hrs.**

Offered to

B.Tech. Computer Science Engineering Students

Course Description

The course will strengthen the concepts of Programming in students

On successful completion of this course, the students should be able to:

- Write programs
- Understand Data Structures
- Attempt Placement Technical Programming rounds

Course Contents

Module 1: Data Types (Primary and Composite), Storage Classes, Strings, Bit wise Operations

Module 2: Files

Module 3: Macros, Functions (With Recursion)

Module 4: Pointers, Dynamic Memory Allocation, Linked Lists, Trees, Graphs

Evaluation Scheme

Prerequi	sites	Introduction to Networks, Switching and Routing
	Evaluation Scheme	
Sr. No	Specifications	Marks
1	Quiz	40
2	Class Participation	20
3	Lab Evaluation	40
	Total (100)	100

References

- 1. Programming with ANSIC++ by Bhushan Trivedi, Oxford University Press
- 2. An Introduction to Object Oriented Programming with Java, CThomas WU, Fourth Edition, Tata McGraw Hill.
- 3. Concepts of Programming Languages Robert .W. Sebesta 8/e, Pearson Education, 2008.
- 4. Programming Language Design Concepts, D. A. Watt, Wiley dreamtech, rp-2007.



Academic Year-2020-21

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY JK Lakshmipat University

Name of the Course
SWITCHING, ROUTING AND WIRELESS ESSENTIALS

Course Faculty (s)
DEVENDRA BHAVSAR

Course Code CS1209 Session
August-December 2020

Course Duration 40 Hrs.

August-December 2020

Offered to B.Tech. Computer Science Engineering Sem V Students

Course Description

Switching, Routing, and Wireless Essentials (SRWE) covers the architecture, components, and operations of routers and switches in small networks and introduces wireless local area networks (WLAN) and security concepts. Students learn how to configure and troubleshoot routers and switches for advanced functionality using security best practices and resolve common issues with protocols in both IPv4 and IPv6 networks. This course focuses on switching technologies and router operations that support small-to-medium business networks and includes wireless local area networks (WLAN) and security concepts. With the support of video and rich interactive media, participants learn, apply, and practice CCNA knowledge and skills through a series of in-depth hands-on experiences and simulated activities that reinforce their learning.

On successful completion of this course, the students should be able to:

- 1. Configure VLANs and Inter-VLAN routing applying security best practices.
- 2. Troubleshoot inter-VLAN routing on Layer 3 devices.
- 3. Configure redundancy on a switched network using STP and Ether Channel.
- 4. Troubleshoot Ether Channel on switched networks.
- 5. Explain how to support available and reliable networks using dynamic addressing and first-hop redundancy protocols.
- 6. Configure dynamic address allocation in IPv6 networks.
- 7. Configure WLANs using a WLC and L2 security best practices.
- 8. Configure switch security to mitigate LAN attacks.
- 9. Configure IPv4 and IPv6 static routing on routers.

Course Contents

Module 1 : Basic Device Configuration: Configure a Switch with InitialSettings, Configure Switch Ports, Secure Remote Access, Basic Router Configuration, Verify Directly Connected, Networks Frame Forwarding, Switching Domains VLANs: Overview of VLANs, VLANs in a Multi-Switched Environment, VLAN Configuration DTP Inter-VLAN Routing Operation, Router-on-a-StickInter-VLAN Routing, Inter-VLAN Routing using Layer 3 Switches, TroubleshootInter-VLAN Routing.

Module 2 : STP : Purpose of STP, STP Operations, Evolution of STP EtherChannel Operation, Configure EtherChannel, Verify and Troubleshoot, EtherChannel, DHCPv4: DHCPv4 Concepts, Configure DHCPv4 Server, Configure DHCPv4 Client IPv6 Global Unicast Address Assignment, SLAAC DHCPv6, Configure DHCPv6 Server.

Module 3 : FHRP ConceptsFirst Hop Redundancy Protocol, HSRP LNM Security Concepts: Endpoint Security, Access Control, Layer 2 Security Threats, MAC Address Table Attack, LAN Attacks Implement Port Security, Switch Security Configuration: Mitigate VLAN Attacks, Mitigate DHCP Attacks, Mitigate ARP Attacks Mitigate STP Attacks.

Module 4 : WLAN Concepts: Introduction to Wireless, Components of WLANs WLAN Operation, CAPWAP Operation, Channel Management, WLAN Threats, Secure WLANs, Remote Site WLAN, Configure a Basic WLC, Configuring a WPA2 Enterprise, WLAN on the WLC, Troubleshoot WLANIssues.

Module 5: Routing Concepts: Path determination, Packet Forwarding, Basic Router Configuration review, IP Routing Table, Static and Dynamic Routing IP Static Routing: Static Routes, Configure IP Static Routes, Configure Floating Static Routes, Configure Static Host Routes, Packet Processing with Static Routes, Troubleshoot IPv4 Static and Default Route Configuration

Evaluation Scheme

Prerequis	sites	Introduction to
		Networks
	Evaluation Scheme	
Sr. No	Specifications	Marks
1	Quiz SRWE CISCO Chapter Exams	40
2	Theory Exam-III (CISCO Final Exam)	40
3	Lab Evaluation-I (CISCO Lab Exam)	10
4	Lab Evaluation-II (CISCO Lab Exam)	10
	Total (100)	100

References

Text Books:

- Lammle, T. (2016). CCNA Routing and Switching Complete Study Guide: Exam 100-105, Exam 200-105, Exam 200-125. John Wiley & Sons.
- Lammle, T. (2013). CCNA routing and switching study guide: exams 100-101, 200-101, and 200-120. John Wiley & Sons.
- Lammle, T. Cisco Certified Network Associate Study Guide. 2nd. Edition

<u>Reference Books</u>

- Stallings, W. (2004). Computer networking with Internet protocols and technology. Upper Saddle River, NJ, USA: Pearson/Prentice Hall.
- Kurose, J., & Ross, K. (2010). Computer networks: A top-down approach featuring the internet. Peorsoim Addison Wesley.
- Lammle, T. (2011). CCNA Cisco Certified Network Associate Deluxe Study Guide. John Wiley & Sons.



Academic Year-2019-20

Offered by

Department of Computer Science Engineering INSTITUTE OF ENGINEERING AND TECHNOLOGY JK Lakshmipat University

Name of the Course WEBSITE DESIGN USING WORDPRESS

Course Faculty (s) DR. SONAL JAIN, SANTOSH KUMAR VERMA

Course Code

Course Duration 30 Hrs.

Offered to B.TECH ALL BRANCHES

Course Description

This Course is designed to equip learners with skills of Web/Blogging site development. WordPress is a free open source blogging tool and content management system. WordPress can be used to create a traditional blogging site; however, it can also be used to create a standard website for business or personal use. This course focuses on creating websites using WordPress. No previous experience is needed. This course is structured in a way to help all students, regardless of their experience, learn WordPress.

On successful completion of this course, the students should be able to:

- Set up a domain and hosting account
- Set up a MySQL database on their server
- Install WordPress on the MySQL database
- Plan their website by choosing color schemes, fonts, layouts, and more
- Search for themes in WordPress
- Select, install, and activate a theme
- Add posts to their website
- Create website pages
- Add images, photo galleries, and more
- Create tags for SEO and categories to organize their posts
- Use WordPress as a content management system (CMS)
- Use widgets and plugins
- Create an ecommerce site
- Integrate WordPress with social media
- Customize a WordPress site using PHP, CSS, and HTML

Course Contents

Lesson 1: Introduction to WordPress

- A brief history
- More about WordPress
- WordPress Blogs vs. Websites
- A brief introduction to WordPress themes
- Getting started with WordPress

Lesson 2: Finding a Home for your WordPress Site

- Finding a domain
- Registering a domain
- Choosing a web hosting package
- WordPress feature through your host

Lesson 3: Installing WordPress on Your Site

- How to install WordPress
- The MySQL database
- Uploading your files
- The install script
- About WordPress Release Cycles
- Upgrading WordPress

Lesson 4: Content Management using WordPress

- Archiving content
- The purpose of categories
- Naming a category
- Creating a new category
- About static page parents and children
- Permalinks

- Dressing up links
- Customizing links
- Checking Links with Your Server
- Syndicated content (RSS)
- About Feed Readers
- RSS options
- RSS and Social Media

Lesson 5: Selecting the Right Tools

- Picking a text editor
- Picking a web browser
- About cross-browser compatibility
- An introduction to FTP
- Setting up for FTP
- Using an FTP client
- Transferring files
- Editing files (FTP)
- File Permissions
- •
- Lesson 6: Image Formats
- Image types and formats
- Comparing image formats
- About graphic design software programs
- Raster based software
- Vector based software
- Image optimization
- Image librariese

Course Contents

Lesson 7: Fonts and Colors

- About Color
- The color wheel
- The color models
- Color schemes
- Color combinations
- Creating colors using codes
- About fonts
- Web safe fonts
- Fonts for graphic design
- Installing fonts on a computer

Lesson 8: Designing Your WordPress Site

- Choosing a site width
- Fixed widths
- Fluid widths
- Responsive Layouts
- Columns
- Navigation
- Content display options
- The Sandbox environment

Lesson 9: The WordPress Default Layout

- About the layout and structure
- Customizing the header image
- Choosing a header image
- Creating your own header image
- Custom navigation
- About widgets
- Using widgets
- Adding widgets to a sidebar or footer
- The text widget
- The RSS widget

Lesson 10: Themes and Templates

- About WordPress themes
- PHP and MySQL
- Defining PHP
- The template tag
- Using PHP
- Managing your database
- Template files
- How templates work with WordPress themes
- Stylesheets
- About the Main Index and The Loop
- The different templates
- Template tags, values, and parameters
- Using template tags in blog posts
- Connecting templates
- Using more than one stylesheet

Lesson 11: More on Widgets and Template Tags

- Common template tags
- Calendar
- List pages
- Post archives
- Categories
- Content types
- More template tags
- Adding widget areas
- Registering widget ideas
- Adding widget areas to template files
- Using template files
- Named templates
- Template parts
- Page templates
- Adding support

Lesson 12: Parent and Child Themes

- Understanding parent and child themes
- Creating a child theme
- Loading a parent theme style
- Customizing the parent theme style
- Using images in child theme designs
- Edit theme structure with child themes
- Overriding parent template files
- Adding new template files
- Removing template files
- Modifying theme functions file
- Preparing a parent theme

$Lesson\,13:\,\,Creating\,a\,Custom\,Site$

- Getting acquainted with CSS
- CSS Selectors
- Classes and IDs
- CSS properties and values
- Changing background mage or colors
- Adding a custom background
- Changing the background with CSS
- Positioning your header image using CSS
- Repeating or scrolling background images
- Changing theme elements
- Adding effects
- Setting font, color, and size
- An introduction to basic HTML
- Inserting images
- Inserting links
- Inserting lists

Course Contents

Lesson 14: Using WordPress as a Content Management System

- Creating the front page
- Creating a static page
- Using a static page as your front page
- Making a blog look like a website
- Creating blank blog pages
- Assigning the new page as a blog page
- Creating custom page templates
- The default page template
- Comparing templates
- Using different sidebarand footer templates
- Custom styles for sticky, category, and tag posts

Lesson 15: Using WordPress Plugins

- Installing plugins using the dashboard
- Finding plugins
- Installing and activating plugins
- Installing plugins manually
- Ecommerce plugins
- Photo galleries and portfolios
- Inserting images onto pages or into posts
- Creating web forms using plugins
- About BuddyPress
- Integrating plugins with social networks

Sr. No	Specifications	Marks
01	Attendance	Nil
02	Assignments	10
03	Class Participation	10
04	Quiz (4)	10
05	Theory Exam	Nil
06	Theory Exam	Nil
07	Theory Exam(Final)	Nil
08	Report-1	10
09	Report-2	Nil
10	Report-3	Nil
11	Project-1	30
12	Project-2	30
13	Project-3	Nil
14	Lab Evaluation1	Nil
15	Lab Evaluation2(Final)	Nil
16	Course portfolio	Nil
	Total (100)	100

Evaluation Scheme

References

- 1. Sabin-Wilson, Lisa, Cory Miller, Kevin Palmer, Andrea Rennick, and Michael Torbert. WordPress All-in-one for Dummies. John Wiley & Sons, 2011.
- 2. Williams, Brad, David Damstra, and Hal Stern. Professional WordPress: design and development. John Wiley & Sons, 2015.
- 3. Leary, Stephanie. Beginning WordPress 3. Apress, 2010.
- 4. Brazell, Aaron. Wordpress bible. Vol. 684. John Wiley & Sons, 2010.
- 5. Hedengren, Thord Daniel. Smashing WordPress: Beyond the Blog. Vol. 32. John Wiley & Sons, 2012.
- 6. Guide, Getting Started. "WordPress." (2010).
- 7. https://www.universalclass.com/articles/computers/wordpress/theme-selection-for-developing-a-wordpresswebsite.htm
- 8. https://www.universalclass.com/articles/computers/wordpress/wordpress-basics.htm
- 9. https://www.universalclass.com/articles/computers/wordpress/website-design/making-use-of-wordpress-plugins.htm
- 10. https://www.universalclass.com/articles/computers/wordpress/making-a-wordpress-theme-original.htm



BASICS OF MACHINE LEARNING

Faculty: Dr. Devika Kataria, Mr. Vijay Shantagiri Analogica

Course Duration: 34 Hrs

Offered to: 2015-20 BTCSEMTECH; 2016-20 B.Tech. ECE; 2016-20 B.Tech. CSE; 2017-21 B.Tech. ECE; 2017-21 B.Tech. CSE, 2018-22 B.Tech. EEE; 2018-22 B.Tech. CSE.

The course involves sessions where concepts on python programming, linear algebra, regression and algorithms for supervised and nonsupervised learning were discussed and hands-on activities are conducted.

Course Outcome

On successful completion of this course, students should be able

- 1. Write python program for implementation of classifier algorithms.
- 2. Write program for decision trees and implement algorithm for prediction using datasets.
- 3.Write program for classification using KNN for different datasets
- 4.Use SVM for data classifiers using supervised learning

Course Content

Module 1

Machine Learning with Python-Supervised/Unsupervised Learning, Testing & Training, Concepts of Probablity/conditional probability, Baysean Theorem, Naïve Bayes, Implementing classifiers.

Module 2

Measuring Entropy, Clustering-Kmean, Decision Trees, Ensemble Learning.

Module 3

Support Vector Machine, Using SVM to cluster people, KNN – Predictions implementation, Reinforcement Leaning, understanding confusion matrix, Measuring classifiers.

Evaluation Scheme:

Components	Weightage
Quizzes	25
Mid Term Theory Exam	25
End Term Theory Exam	50
Total	100

References:

1. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly, ISBN-10: 1449369413.



DESIGNFORASOLARPOWEREDELECTRICVEHICLECHARGING STATION

Faculty: Dr. Jagdish Prasad Sharma Course Duration: 30 Hours

Offered to: 2017-21 B.Tech, EEE

This course has been specifically designed to understand professional practices for designing a solar powered electric vehicle charging station. It focuses on extracting information from technical data sheets for designing solar powered electric vehicle charging station. Students learnt about battery pack design, suitability checks between relational between PV module and inverter. The course will help students to design EV charging station, and same time applies the skill gained. Moreover, a Case study is also included so that students may have a glimpse over how different measures are taken to promote electric vehicle by authorities. After finishing, you will have general knowledge about electric vehicles and how it different from gasoline vehicles.

Course Outcome

On successful completion of this course, students should be able to

1.Choose components for a given electrical vehicle design and dimension them according to the specification.

2.How to extraction of relevant information's from PV Module Specification, PV Module, solar inverter and Lithium ion cell data Sheet.3.Design a lithium battery pack for electrical vehicles.

4.Evaluate inverter and battery size for an uninterruptible power system (UPS) for defined load details.

Course Content:

Module I

Data sheet, load calculation, Design On-Grid solar charging stations for a parking lot, Plans for EVSE Installation, Single line diagram of charging station, Types of Electric Vehicle. **Module II**

Public Charging Infrastructure (PCI) -Components of charging station, Electric vehicle charging station, Electric Vehicle Supply Equipment - Bharat EV AC Charger (BEVC-AC001), Bharat EV DC Charger (BEVC-DC001), CHAdeMO standard - DC fast charging.

Module III

Types of lithium-ion Battery and Classification, Battery cell parameters- cell voltage, Cell AH, Specific energy, life Cycle, Charging and discharging curve of lithium-ion cells, C-rating, SOC, DOD.

Evaluation Scheme:

Components	Weightage
Class Participation	20
Quiz 1	35
Quiz 2	35
Attendance	10
Total	100

References:

 S. Tanveer, S. Gupta, R. Rai, N. K. Jha and M. Bansal, "Solar based electric vehicle charging station," 2019 2nd International Conference on Power Energy, Environment and Intelligent Control (PEEIC), Greater Noida, India, 2019, pp. 407-410, doi: 10.1109/PEEIC47157.2019.8976673.
 T. S. Biya and M. R. Sindhu, "Design and Power Management of Solar Powered Electric Vehicle Charging Station with Energy Storage System," 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, India, 2019, pp. 815-820, doi: 10.1109/ICECA.2019.8821896.

3.Data sheet for PV module- TECHNICAL DATA ELDORA GRAND SERIES, SG60KTL- String Inverter and lithium ion battery

4.S. Khan, A. Ahmad, F. Ahmad, M. Shafaati Shemami, M. Saad Alam and S. Khateeb, "A comprehensive review on solar powered electric vehicle charging system", Smart Sci., vol. 6, no. 1, pp. 54-79, Jan. 2018



ELECTRICAL CAD DESIGN

Faculty: Dr. Pushpendra Singh

Course Duration: 30 Hrs

Offered to: 2016-20 B.Tech. EE

Electrical CAD course focuses on the overview of AutoCAD electrical with emphasis on naming conventions; the use of symbol and their libraries, generation, Preparing single line diagram of grid sub-stations, Preparing single line diagram of Solar photo voltaic systems, Preparing single line diagram of Industries, Panel layout, Cutout of MCB, Switchgear design. Insertion of PLC layout modules, creating PLC I/O drawings from spreadsheets, wire numbering, and component tagging.

Course Outcome

On successful completion of this course, the students should be able to:

- 1.Student will know how to bring components into panel for layout
- 2.Generate and update customizable reports and use folders to organize drawings.
- 3.Know about the symbol naming conventions
- 4.Use of multiple symbol libraries, generate PLC layout modules,
- 5.Insert PLC modules and organize PLC database files.
- 6.Create PLC I/O drawings from spreadsheets.
- 7.Learn to do wire numbering and component tagging in circuits design.
- 8. Create computer generated schematics and electrical drawings.
- 9.Generate bill of materials.

Evaluation Scheme:

Components	Weightage
Quiz	40
Theory Exam III	30
Lab Evaluation-I	15
Lab Evaluation-II	15
Total	100

References:

- 1.M. Yogesh, B. S. Nagaraja, N. Nandan, "Computer Aided Electrical Drawing", PHI Learning Pvt. Ltd.
- 2. Matt Weber, Gaurav Verma, "AutoCAD Electrical 2015 Black Book", Create Space Publishing.



EMBEDDED SYSTEM PROJECT DESIGN

Faculty: Dr. Devika Kataria, Mr. Divanshu Jain

Course Duration: 40 Hrs

Offered to: 2016-20 B.Tech. EE 2016-20 B.Tech ECE

The department of Electrical and Electronics Engineering organized Value-added course on "Embedded System Project Design. 2018. The resource person for the course were invited expert Prof. Dhananjay V. Gadre (Netaji Subhas University of Technology, New Delhi, India) and faculty member of JKLU- Dr Devika Kataria.

Course Outcome

1. To get knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware.

2. A broad competence from different areas of technology, especially from computer engineering, robotics, electronics, intelligent systems and mechatronics.

3. State-of-the-art theoretical knowledge in the areas of real-time systems, artificial intelligence, learning systems, sensor and measuring systems, and their interdisciplinary nature needed for integrated hardware/software development of embedded systems.

4. Ability to analyze a system both as a whole and in the included parts, to understand how these parts interact in the functionality and properties of the system.

Course Content Module I

Introduction to Microcontrollers -8051, ATMega 328P, MSP430. Architecture types (Von Neumann, Harvard), Instruction Set (CISC, RISC), concepts of Pipelines, Memory management, Clock generators.

Module II

Programming concepts, Familiarizations with Integrated development environments, Embedded C programming, Concepts of Register level programming for MSP430- reading sensor data from Ports, Programming for low power mode, Using Timers for waveform generation and for interrupts, Interrupt Handling.

Module III

Project Identification, Planning, PCB layout design, Fabrication and Testing prototypes, Understand and experience of state-of-thepractice industrial embedded systems and intelligent embedded system development

Evaluation Scheme:

Components	Weightage
Quizzes	20
End Term Theory Exam	30
Project - 1	50
Total	100

References:

- 1. Dhananjay Gadre and Nehul Malhotra, "TinyAVR Microcontroller Projects for the Evil Genius", McGraw Hill, ISBN: 978-0-07-174455-3.
- 2. Dhananjay Gadre and Dureja Rohit, "Programming and Customizing the Arduino", McGraw Hill Education.



JK LAKSHMIPAT UNIVERSITY Institute of Design

Value Added Course 2019- 2020

ENGLISH LANGUAGE AND COMMUNICATION

Faculty: Gaurav Juyal

TThe course is aimed at students who want to build confidence in communicating in English. The course covers the topics as follows:1. Research on the origin of the English language.2. History of English-speaking regions like USA and UK3. Group Discussion aimed at ice breaking with English language4. Common English language mistakes5. Fears of public speaking

Course Outcomes:

 Students are less fearful when approaching to learn English.
 Builds inner confidence of speaking a new language.
 Students understand the importance of micro-group learning.

References:

1.https://www.fluentu.com/blog/english/tip
s-for-learning-english/
2. https://www.duolingo.com/
3. https://whatsknowledge.com/how-to-learn-english-speaking-in-hindi/

Evaluation Scheme:

Components	Weightage
Attitude towards learning	40
Class Participation	30
Reading and Research	30
Total	100



Value Added Course

Academic Year- 2019-20

LIBERAL ARTS

Course Duration: 30-34 hours Offered to:Students of BBA- Sem. II, IV and VI; B.Com (H)- Sem. VI

OVERVIEW:

JKLU is creating some great opportunities for students to learn in a holistic manner. To nurture interdisciplinary thinking, JKLU is organising a Liberal Arts Week from 2nd-7th March 2020 at the University on four impactful topics - Filmmaking- A Powerful Media to Influence Action; Law & Citizenship; Diagnostics of Unemployment & Job Creation; and Markets & Public Policy.

These courses are being delivered over 6 days by some of the best experts for these topics in the country at the University.

We believe that is a very interesting opportunity for the students to learn more about some of the most significant topics in that impact the world and society at large from world class external faculty and experts. These can become some things worth highlighting in their CV, cover letters and SOPs, in their conversations and to enhance their awareness and decision making skills.

COURSES WITH FACULTY PROFILE LINKS

Course – Filmmaking– A Powerful Media to Influence Action Faculty – Aman Kaleem Founder & CEO Kahaani Waale; Visual Artist Fellow, Harvard University Dates – 2nd–3rd March, 2020 Duration – 10–11 hours

Course - Law & Citizenship Faculty - Apurv Mishra Editor-in-Chief, India Law Journal; Faculty of Law, Ashoka University Dates - 4th -5th March 2020 Duration - 10-12 hours

Course – Diagnostics of Unemployment & Job Creation Faculty – Dr Santosh Mehrotra Professor of Economics, Jawaharlal Nehru University; Former Director General,Institute of Applied Manpower Research, Planning Commission, Govt. of India Dates – 6th March 2020 Duration – 5–6 hours

Course - Markets & Public Policy Faculty - Dr Shubhashis Gangopadhyay Founder & Research Director, India Development Foundation; Former Advisor to Finance Minister, Govt. of India Dates - 7th March 2020 Duration - 5-6 hours

EVALUATION SCHEME

Component	Weightage
Class Participation and Class Attendance	20%
Assignment Report and Presentation	50%
Quizzes	30%

REFERENCES

Participants will be provided recorded lectures for prerequisites and the online classes. No books will be prescribed.



3D MODELLING USING AUTODESK INVENTOR

Faculty: Mechanical Engineering

Autodesk Inventor training program is scheduled for 2nd and 3rd year students of Mechanical Engineering Department from 02nd March 2020 to 07th March 2020. All interested students can register to Dr. Mohd. Zubair. The training will be conducted by Dr. Mohd. Zubair, Dr. Bhargav Prajwal Pathri, and Ms Deepika Mishra.

Course Outcome

After the completion of this course students will be able to

- Understand the concept of engineering drawing.
- 3D modelling using Autodesk Inventor software.
- Create assembly from the part.

Course Content:

Day 1

Introduction and application of Autodesk Inventor, Sketcher: 2-D Module, Assignment and Practice session-1

Day 2

Part Modelling: 3-D module session-1, PartModelling: 3-D module sessiont-2,Assignment and Practice session-2

Day 3

Assembly of parts session-1, Assembly of parts session-2, Assignment and Practice session-3

Day 4

Static analysis of parts, Static analysis of assembled models, Assignment and Practice session-4

Day 5

Dynamic Analysis session-1, Dynamic Analysis session-2, Practice session Day 6

Assignment and Practice session, Doubts clearing and Practice session

Evaluation Scheme:

Components	Weightage
Assignment 1	25
Assignment 2	25
Assignment 3	25
Assignment 4	25
Total	100

References:

1. Mastering CAD/CAM, Ibrahim Zeid, McGraw Hill Education; 2nd edition (7

August 2006).

2. CAD/CAM Paperback, M. Groover,

Pearson, Kindle Edition, 2003.



AUTOCAD

Faculty: Mechanical Engineering

The Department of Mechanical Engineering is planning to conduct AutoCAD training program for 2rd year students of Mechanical Engineering Department from 13th Jan 2020 to 17th March 2020. All interested students can register to Dr. Bhargav Prajwal Pathri.

Course Outcome

After the completion of this course students will be able to

- Understand the concept of engineering drawing.
- 2D modelling using AutoCAD software.
- Create parts of assembled components.

Course Content:

1. Introduction to AutoCAD

2. Drawing and Editing Command

3. Command for dimensioning

4.2D drawing for types of Thread

- 5.2D drawing for types of Rivets6. Rivet joints
- 7. Other type of joints like Knuckle joint
- 8.2D drawing of butterfly valve parts
- 9.2D drawing of radial engine parts

Evaluation Scheme:

Components	Weightage
Assignment 1	25
Assignment 2	25
Assignment 3	25
Assignment 4	25
Total	100

References:

 Mastering AutoCAD 2018 and AutoCAD LT 2018,George Omura, Brian C. Benton
 AutoCAD 2020 For Beginners by CADFolks



TWO WHEELER ASSEMBLY AND DISASSEMBLY

Faculty: Mechanical Engineering

The workshop program focused on giving an outreach to the participants about the latest technological developments in the two-wheeler industry. One can practically explore innovation involved in this field right from the beginning stages to the present age. The uniqueness of the program was that one can learn about the automobile by demos and handson. Their realizations and experience with the present technology gives one the right platform to get inspired and innovate effective methodologies for a technology which would prevail through the sands of time.

Our program was carefully designed to do justice to each and every person gaining from it. Great amount of care has been taken to bring down the complexities involved in real automobile world to an easily understandable manner. One would have a great time participating in our exhaustive sessions with continuous hands-on practical experience

Course Outcome

1.Able to identify each and every part of the two-wheeler2.Able to assemble and dis-assemble 2-wheeler3.Able to identify various tools required to

dis-assemble the 2-wheeler

Evaluation Scheme:

Components	Weightage
Hands on practice	50
Viva	50
Total	100

References

1. Automotive Chassis- Heldt .P. M, Chilton Co., (Nyack, N.Y., P.M. Heldt, 1945) Literary Licensing, LLC, 2012.

2. Automotive Mechanics- N.K. Giri, 8th Edition, Khanna Publications, New Delhi, 2008.

3. Automobile Engineering / William H Crouse

4. Text Book Automobile Engineering-Manzoor, .Nawazish Mehdi & .Yosuf Ali, Frontline Publications.

5. Kamaraju Ramakrishna, "Automobile Engineering", PHI Learning, New Delhi, 1st Print, 2012.

6. Jain &Asthana, "Automobile Engineering", Tata McGraw-Hill, New Delhi, 2002.