



(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

S.P.G.Chidambara Nadar - C.Nagammal Campus

S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR).

**B.Tech. INFORMATION TECHNOLOGY
REGULATION – 2020
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
VII TO VIII SEMESTER CURRICULUM AND SYLLABI**

VISION:

To make the department of Information Technology the unique of its kind in the field of Research and Development activities in this part of world

MISSION:

To impart highly innovative and technical knowledge in the field of Information Technology to the urban and unreachable rural student folks through Total Quality Education.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

- PEO 1:** Technical Knowledge : Graduates will be able to identify, analyze and create solutions for real life, industrial and societal needs by applying the principles and practices of Information Technology.
- PEO 2:** Teamwork & Ethics : Graduates will be able to collaborate effectively and ethically in a multi-disciplinary team as a member &/ as a leader.
- PEO 3:** Lifelong Learning : Graduates will be able to adopt the contemporary technologies in the field of Information Technology to provide solutions for challenging environments.

PROGRAM OUTCOMES:

After going through the four years of study, the B.Tech. Information Technology graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Demonstrate technical and interpersonal skills to design and develop IT enabled solutions to meet the real time industrial and societal needs

PSO2 : Exhibit an ability to adapt to the evolutionary changes in computing

SEMESTER VII

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	CS1771	Cloud Computing	PC	3	3	0	0	3
2	IT1701	Software Project Management Techniques	PC	3	3	0	0	3
3	GE1471	Professional Ethics and Human Values	HS	3	3	0	0	3
4	PE4	Professional Elective – IV [#]	PE	4	2	0	2	3
5	PE5	Professional Elective – V	PE	3	3	0	0	3
6	OE2	Open Elective II [*]	OE	3	3	0	0	3
PRACTICALS								
8	CS1781	Cloud Computing Laboratory	PC	4	0	0	4	2
9	IT1721	Project Development	EEC	4	0	0	4	2
TOTAL				27	17	0	10	22

SEMESTER VIII

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1	IT1821	Project Work	EEC	16	0	0	16	8
TOTAL				16	0	0	16	8

* Course from the Curriculum of other UG programmes.

Theory cum Laboratory Course

PROFESSIONAL ELECTIVES (PEs)

PROFESSIONAL ELECTIVE IV (SEMESTER VII)

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1	IT1731	Applied Virtual Reality and Augmented Reality [#]	PE	4	2	0	2	3
2	IT1732	Essentials of .NET Framework [#]	PE	4	2	0	2	3
3	IT1733	Intrusion Detection System and Prevention System [#]	PE	4	2	0	2	3

PROFESSIONAL ELECTIVE V (SEMESTER VII)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1734	Cyber Security and Forensics	PE	3	3	0	0	3
2	IT1735	Web Development Frameworks	PE	3	3	0	0	3
3	AD1702	Natural Language Processing	PE	3	3	0	0	3

Theory cum Laboratory Course

OPEN ELECTIVES (OEs)

OPEN ELECTIVE II (SEMESTER VII) – (Offered to ECE, EIE, EEE, MECH, MTR)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	OIT171	Fundamentals of Cloud Computing	OE	3	3	0	0	3
2	OIT172	Fundamentals of Deep Learning	OE	3	3	0	0	3

L	T	P	C
3	0	0	3

OBJECTIVES:

This course enables the students to

- Understand the basic concepts of cloud computing and its principles
- Make use of virtualization techniques in cloud computing
- Explain various service models and resource management in cloud computing
- Expose to cloud programming model and software environment
- Understand security and resource allocation issues in cloud computing

UNIT I INTRODUCTION, PRINCIPLES AND ARCHITECTURE 9

Cloud Computing : Reference model – Characteristics and challenges – historical development – Building cloud computing environment – Computing platforms and Technologies – Parallel Vs Distributed computing – Elements of parallel and distributed computing – Technologies for distributed computing – Cloud Computing Architecture: NIST Cloud Computing Reference Architecture – Types of Clouds – economics – Open challenges. Web services SOA, REST.

UNIT II VIRTUALIZATION 9

Characteristics of virtualized environments – Taxonomy of virtualization techniques – Execution virtualization – Machine reference model -Hypervisors – Hardware virtualization techniques – Operating system-level virtualization – Application-level virtualization – Virtualization and cloud computing – Pros and cons of virtualization – Technology examples – Xen: Para-virtualization – VMware: Full virtualization and binary translation – Microsoft Hyper-V – Management of Virtual Machines for Cloud infrastructure – Anatomy – Distributed management – Scheduling techniques – Capacity management to meet SLA commitment.

UNIT III CLOUD INFRASTRUCTURE AND RESOURCE MANAGEMENT 9

Cloud Computing and Services Model – Public, Private and Hybrid Clouds – Cloud Eco System IaaS – PaaS – SaaS – Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges – Inter Cloud Resource Management – Resource Provisioning and Platform Deployment –Global

Implementation, Management and Security, CRC Press, 2017.

REFERENCE BOOKS

1. RajkumarBuyya, James Broberg, AndrzejGoscinski, *Cloud Computing: Principles and Paradigms*, Wiley, 2012
2. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing - A Practical Approach*, Tata Mcgraw Hill, 2009.
3. George Reese, *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)*, O'Reilly, 2009.

Virtual teams - Communications genres - Communication plans.

UNIT V SOFTWARE QUALITY

9

Software Quality in project planning : Importance of Software Quality, Defining Software Quality , ISO9126 - Product and process metrics : Product versus Process Quality Management, Quality Management Systems - Process Capability Models - Techniques to help enhance Software Quality - Testing - Software Reliability - Quality Plan - Overview of Prince 2.

TOTAL: 45 PERIODS

OUTCOMES

Upon successful completion of course the students will be able to

- CO1:** Infer the activities in projects, planning and assessment
- CO2:** Construct network planning model to schedule the activities and overcome the anticipated risks.
- CO3:** Outline the factors that influence the project management and control
- CO4:** Illustrate the strategy adapted in selecting right people for right job and organizing teams
- CO5:** Interpret the importance of software development standards to enhance the Quality of projects.

TEXT BOOK

1. Bob Hughes, Mike Cotterell & Rajib Mall, 2018, *Software Project Management*, 6th ed, Tata McGraw Hill, New Delhi.

REFERENCE BOOKS

1. Robert K. Wysocki, 2011, *Effective Software Project Management*, Wiley Publication.
2. Gopalaswamy Ramesh, 2013, *Managing Global Software Projects*, McGraw Hill Education.

Witnesses and Advisors - Moral Leadership – Code of Conduct - Corporate Social Responsibility

TOTAL: 45 PERIODS

OUTCOMES

Upon successful completion of course the students will be able to

- CO1:** Summarize the various Morals, Values, Ethics, Integrity and other Human Values
- CO2:** Describe the Senses of Engineering ethics, its related Theories and Models of Professional Roles
- CO3:** Explain the Codes of Ethics for various Engineering Experiments.
- CO4:** Examine the various Risk, Safety and Risk Benefit Analysis for a Product/Service in an Organization
- CO5:** Explain the Various Global Issues in Ethics and Review the Responsibilities and Rights of Professionals and Employees in an Organization

TEXT BOOKS

1. Mike W. Martin and Roland Schinzinger, 2017, *Ethics in Engineering*, 4th Edition, McGraw Hill.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, 2004, *Engineering Ethics*, Prentice Hall of India.

REFERENCE BOOKS

1. Charles B. Fleddermann, 2012, *Engineering Ethics*, 4th Edition, Prentice Hall.
2. Charles E. Harris, Michael S. Pritchard, Raw W. James, Elaine E. Englehardt, and Michael J. Rabins, 2019, *Engineering Ethics – Concepts and Cases*, 12th Edition, Cengage Learning.
3. John R Boatright, Jeffery Smith, 2016, *Ethics and the Conduct of Business*, 8th Edition, Pearson Education.
4. Edmund G Seebauer and Robert L Barry, 2001, *Fundamentals of Ethics for Scientists and Engineers*, South Asia Edition, Oxford University Press.

L	T	P	C
0	0	4	2

OBJECTIVES:

This course enables the students to

- Learn how to use Cloud Services
- Implement Virtualization
- Build Private Cloud using Openstack / Eucalyptus
- Build Hadoop Cluster and execute Programs
- Implement Task Scheduling algorithms using cloudsims
- Execute version control commands using Github / Gitbash

LIST OF EXPERIMENTS

1. Study and Usage of Google Apps.
2. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8 & Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Create instances and volume attachment in AWS.
4. Setup a private cloud Using Eucalyptus.
5. Implement virtual machine migration from one node to another node.
6. Install Openstack on your local machine using Devstack.
7. Install a Single node Hadoop Cluster.
8. Implement Map Reduce concept for an application.
9. Simulate Task Scheduling algorithm using CloudSim
10. Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories using Git Bash and Git Hub

TOTAL: 60 PERIODS

SOFTWARE SPECIFICATIONS

S.NO.	NAME OF THE SOFTWARE
1	Eucalyptus or Open Stack or Cloudsim or equivalent
2	Git bash
3	Oracle or VMWare
4	DevStack C / Java / Python

OUTCOMES

Upon successful completion of course the students will be able to

Students will be able to

CO1: Create virtual machines from available physical resources.

CO2: Construct a virtual machine using Openstack/Eucalyptus.

CO3: Demonstrate the procedure to install single node Hadoop.

CO4: Execute scheduling algorithms in Cloudsim.

CO5: Implement version control commands for file management.

IT1731

**APPLIED VIRTUAL REALITY AND AUGMENTED
REALITY**

L	T	P	C
2	0	2	3

OBJECTIVES:

This course enables the students to

- Understand the basic concept and framework of virtual reality
- Be familiar with the relevance among virtual reality concept, methodology and environment
- Develop engineering applications using virtual reality in mobile.
- Understand augmented reality methodology
- Demonstrate the basic functionalities of augmented reality

UNIT I INTRODUCTION 6

The three I's of virtual reality - commercial Virtual Reality technology and the five classic components of a Virtual Reality system - Input Devices: (Trackers, Navigation, and Gesture Interfaces) : Three-dimensional position trackers, navigation and manipulation - interfaces and gesture interfaces - Output Devices: Graphics displays - sound displays & haptic feedback.

**UNIT II VIRTUAL REALITY DEVELOPMENT PROCESS AND
CONTENT CREATION CONSIDERATIONS 6**

Geometric modelling - kinematics modelling- physical modelling - behaviour modelling - model Management, Methodology and terminology-user performance studies - Virtual Reality health and safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality environment.

UNIT III VIRTUAL REALITY ON THE MOBILE 6

Google Virtual Reality for Android-Scripts, mobile device configuration, building to android-cameras and interaction-teleporting-spatial audio-Assessing human parameters-device development and drivers-Design Haptics.

UNIT IV INTRODUCTION TO AUGMENTED REALITY 6

Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods,

OUTCOMES (LAB)

Upon successful completion of course the students will be able to

- CO1: Construct Game engine with Unity 3D
- CO2: Develop virtual reality applications with unity
- CO3: Develop games using augmented reality with unity
- CO4: Choose target and set levels in a game with Unity
- CO5: Build an app with augmented reality in mobile

TEXT BOOKS

1. C. Burdea & Philippe Coiffet, 2008, *Virtual Reality Technology*, 2nd Edition, Gregory, John Wiley & Sons, Inc.
2. Alan B. Craig, 2013, *Understanding Augmented Reality, Concepts and Applications*, Morgan Kaufmann, Elsevier.

REFERENCE BOOKS

1. Dieter Schmalstieg & Tobias Hollerer, 2016, *Augmented Reality: Principles and Practice (Usability)*, by Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States.
2. Jason Jerald. 2015, *The VR Book: Human-Centred Design for Virtual Reality*, Association for Computing Machinery and Morgan & Claypool, New York, USA.
3. Steve Aukstakalnis, 2016, *Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability)*, Addison-Wesley Professional.
4. Jos Dirksen, 2015, *Learning Three.js: The JavaScript 3D Library for WebGL*, 2nd Revised ed , Packt Publishing - ebooks Account.
5. Dieter Schmalstieg & Tobias Hollerer, 2016, *Augmented Reality: Principles & Practice*, Addison-Wesley.
6. Cawood, Mark Fiala , 2008, *Augmented Reality: A Practical Guide*, Pragmatic Bookshelf.

L	T	P	C
2	0	2	3

OBJECTIVES:

This course enables the students to

- Understand the .NET architecture and basic features of C#.
- Be familiar with the object oriented programming concepts of C# .
- Gain knowledge about advanced features in C#.
- Build simple application using database connectivity with C#.
- Develop web application using ASP.NET.

UNIT I INTRODUCTION TO THE .NET FRAMEWORK 6

Introduction to .NET Architecture - CLS, CTS, BCL, Overview of C# - Introduction to ASP.NET – IIS – MVC – Assembly - ASP.NET objects and Name Spaces – ASP.NET Application – Building ASP.NET website

UNIT II DEVELOPING ASP.NET APPLICATIONS 6

ASP.NET applications- Code behind – Global.asax – Understanding ASP.NET Configuration- Web form fundamentals – HTML control-page-server controls – Web controls-Validation controls

UNIT III STATE MANAGEMENT 6

Session – View – Query String – Cookies – Tracing – Logging – Error Handling

UNIT IV ADO.NET AND DATABASE CONNECTIVITY 6

Overview of ADO.NET – ADO.NET object model – SQL basics – Creating connection-Data Binding - Connected Model - Disconnected Model – Data List, Data Grid

UNIT V XML & Web Services 6

Introduction to XML – XSD – XSLT – AJAX - Web Services – Creating ASP.NET Web Services – server and client

LIST OF EXPERIMENTS 30

1. Develop simple web applications using HTML tags
2. Develop simple web applications using advanced ASP.NET Controls
3. Develop simple web application using ASP.NET validation controls

4. Create Master Page in a web application
5. Usage of gacutil
6. Develop web application to work with ADO.NET & CRUD
7. Develop web application with session management
8. Develop an application to work with XML
9. Develop web application with AJAX
10. Create a web service to implement the basic calculator services

TOTAL: 60 PERIODS

OUTCOMES (THEORY)

Upon successful completion of course the students will be able to

- CO1:** Explain the basic concepts of C# and .NET framework.
- CO2:** Illustrate the object oriented programming concepts using C# programming.
- CO3:** Demonstrate the exception handling and threading concepts.
- CO4:** Show the three tier applications using ADO.NET
- CO5:** Extend the concepts of web services using ASP.NET.

OUTCOMES (LAB)

Upon successful completion of course the students will be able to

- CO1:** Choose the appropriate HTML tags for creating the web application.
- CO2:** Apply the concepts of ASP.NET to validate the forms in the web application.
- CO3:** Create a master web page using ASP.NET
- CO4:** Develop a web application to interact with database using ADO.NET
- CO5:** Build simple web application using ASP web services.

TEXT BOOKS

1. Mathew Mac Donald, *ASP.NET complete Reference*, Tata McGraw Hill 2005.

2. Herbert Schildt, *C# 4.0: The Complete Reference*, McGraw Hill Education, Indian Edition, 2010, Reprint 2017.

REFERENCE BOOKS

1. Crouch Matt J, *ASP.NET and VB.NET Web Programming*, Addison Wesley 2002.
2. J.Liberty, D.Hurwitz, *Programming ASP.NET*, Third Edition, O'REILLY, 2006.
3. Daniel Solis, *Illustrated C#*, Apress, Second Edition, 2012.

Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDS and IPS.

LIST OF EXPERIMENTS on IDS and IPS using SNORT

18

1. Installing Snort into the Operating System
2. Configuring and Starting the Snort IDS
3. Working with Snort command line options
4. Writing and Adding a Snort Rule
5. Triggering an Alert for the New Rule
6. Working with preprocessors and output modules
7. Integrating Snort with MySQL
8. Using ACID and Snort Snarf with Snort
9. Agent development for intrusion detection

TOTAL: 60 PERIODS

OUTCOMES (THEORY)

Upon successful completion of course the students will be able to

- CO1:** Explain the need for Intrusion Detection System to handle the threats in host based and network based systems
- CO2:** Paraphrase the various intrusion detection and prevention techniques to protect the systems from intruders
- CO3:** Outline the architectures of different types of Intrusion Detection and Prevention System
- CO4:** Summarize the SNORT commands for intercommunication between networks
- CO5:** Demonstrate the Intrusion Detection and Prevention System using SNORT

OUTCOMES (LAB)

Upon successful completion of course the students will be able to

- CO1:** Experiment with initial process of SNORT IDS
- CO2:** Choose appropriate commands to perform intrusion detection using SNORT rules
- CO3:** Utilize the SNORT preprocessor and output modules to represent the data for intrusion detection

CO4: Develop an Intrusion detection and prevention system that interact with database

CO5: Create an agent for intrusion detection system

TEXT BOOKS

1. Carl Enrolf, Eugene Schultz, Jim Mellander, *Intrusion detection and Prevention*, McGraw Hill, 2004
2. Rafeeq Rehman, *Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID*, 1st Edition, Prentice Hall , 2003

REFERENCE BOOKS

1. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: *Intrusion Detection and Correlation Challenges and Solutions*, 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander, *Intrusion Detection & Prevention*, 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak, *Network Intrusion Detection*, 3rd Edition, New Riders Publishing, 2002.

1. George K.Kostopoulos, *Cyber Space and Cyber Security*, CRC Press, 2013
2. Martti Lehto, Pekka Neittaanmäki, *Cyber Security: Analytics, Technology and Automation* edited, Springer International Publishing Switzerland 2015
3. Nelson Phillips and Enfinger Steuart, *Computer Forensics and Investigations*, Cengage Learning, New Delhi, 2009.
4. Marjie T Britz, *Computer Forensics and Cyber Crime: An Introduction*, Pearson Education, 2nd Edition, 2008.

L	T	P	C
3	0	0	3

OBJECTIVES:

This course enables the students to

- Identify the usage of the fundamentals of web development framework
- Demonstrate the use of Java based web development framework concepts
- Identify the usage of python based web development framework
- Work with Code Igniter web development frameworks
- Create applications using various web development frameworks

UNIT I INTRODUCTION TO WEB DEVELOPEMNT FRAMEWORKS 3

Web Framework-History-Types of framework architectures -Model-view-controller (MVC)-Three-tier organization -Introduction to frameworks- Framework applications - General-purpose website frameworks -Server-side-Client-side-Features

UNIT II HIBERNATE FRAMEWORK 12

Introduction to Java Web Frameworks- Introduction to Hibernate and JPA – JDBC and HB in object persistence - O-R mapping – HB basics - Architecture of HB- Configuration – HB Life Cycle – Annotations - HB Mapping – HQL – HCQL – Hibernate in web application.

UNIT III SPRING FRAMEWORK 9

Introduction to Spring Core – Aspect Oriented Programming- Spring Architecture – Spring web MVC – Spring in web application – Bean descriptor – Spring data access – Spring using Hibernate – Data access using Spring’s JDBC

UNIT IV FLASK FRAMEWORK 9

Introduction to Python Frameworks-Web 2.0, introduction to Flask – Installation and setup - Basic application structure – Templates – Web forms – working with databases

UNIT V DJANGO FRAMEWORK 12

Introduction to Django-Django History-Django Components-Alternate Components-MVC Architecture in Django-Django Forms – Validation – Session Framework – Developing Web Application

TOTAL: 45 PERIODS

OUTCOMES

Upon successful completion of course the students will be able to

- CO1:** Use the fundamental concepts of web development framework
- CO2:** Demonstrate the use of Java based web development framework concepts
- CO3:** Identify the usage of python based web development framework
- CO4:** Work with CodeIgniter web development frameworks
- CO5:** Create applications using various web development frameworks

TEXT BOOKS

1. Madhusudhan Konda, *Just Hibernate : A lightweight Introduction to the Hibernate Framework*, O'Reilly, 2015
2. Rod Johnson, Jorgen Holler, Alef Arendsem, Thomas Risberg, Colin Sampaleanu, *Professional Java Development with the Spring Framework*, wrox, 2005
3. Dana Moore, Raymond Budd, William Wright, *Professional Python Frameworks Web 2.0*, John wiley & sons, 2008

REFERENCE BOOKS

1. Carlos de la Guardia, *Python Web Frameworks*, O'Reilly, 2016
2. Miguel Grinberg, *Flask Web Development*, O'Reilly, 2014

L	T	P	C
3	0	0	3

OBJECTIVES:

This course enables the students to

- Learn the fundamentals of natural language processing
- Understand the use of CFG and PCFG in NLP
- Understand the role of semantics of sentences and pragmatics
- Apply the NLP techniques to IR applications

UNIT I INTRODUCTION 9

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II WORD LEVEL ANALYSIS 9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS 9

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT IV SEMANTICS AND PRAGMATICS 10

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES 8

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC). Applications - Machine Translation, Information Retrieval and Extraction, Text Categorization and Summarization.

TOTAL: 45 PERIODS

OUTCOMES

Upon successful completion of course the students will be able to

- CO1:** Explain the fundamentals of Natural Language Processing.
- CO2:** Illustrate the algorithms used in word level analysis in NLP.
- CO3:** Describe the use of CFG and PCFG syntactic analysis of NLP.
- CO4:** Explain the role of semantics of sentences and pragmatics in NLP.
- CO5:** Compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXT BOOKS

1. Daniel Jurafsky, James H Martin, 2014, *Speech and Language Processing: An Introduction to Natural Language Processing*, Computational Linguistics and Speech, Pearson Publication.
2. Steven Bird, Ewan Klein & Edward Loper, 2009, *Natural Language Processing with Python*, 1st ed, O__Reilly Media.

REFERENCE BOOKS

1. Breck Baldwin, 2015, *Language Processing with Java and LingPipe Cookbook*, Atlantic Publisher.
2. Richard M Reese, 2015, *Natural Language Processing with Java*, O__Reilly Media.
3. Nitin Indurkha & Fred J Damerau, 2010, *Handbook of Natural Language Processing*, 2nd ed, Chapman and Hall/CRC Press.

4. Tanveer Siddiqui, Tiwary, 2008, *Natural Language Processing and Information Retrieval*, Oxford University Press.

L	T	P	C
3	0	0	3

OBJECTIVES:

This course enables the students to

- Understand the concept and issues of cloud and utility computing
- Familiarize the types of virtualization
- Understand various cloud service models
- Know the lead players in cloud
- Appreciate the emergence of cloud as the next generation computing paradigm

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security – Application Security – Virtual Machine Security.

UNIT V CASE STUDIES 9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TOTAL: 45 PERIODS

OUTCOMES

Upon successful completion of course the students will be able to

- CO1:** Outline the evolution of cloud Computing, its principles and characteristics
- CO2:** Paraphrase the cloud technologies and virtualization techniques
- CO3:** Interpret different cloud architectures and resource provisioning methods
- CO4:** Demonstrate Hadoop and Map Reduce application
- CO5:** Elucidate cloud security and various cloud technology platforms

TEXT BOOKS

1. Buyya R., Broberg J., Goscinski A., *Cloud Computing: Principles and Paradigm*, First Edition, John Wiley & Sons, 2011..
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, *Distributed and Cloud Computing, From Parallel Processing to the Internet of Things*, Morgan Kaufmann Publishers, 2012
3. Rittinghouse, John W., and James F. Ransome, *Cloud Computing: Implementation, Management, And Security*, CRC Press, 2017.

L	T	P	C
3	0	0	3

OBJECTIVES:

This course enables the students to

- Present the mathematical, statistical and computational challenges of building neural networks
- Study the concepts of deep learning
- Introduce dimensionality reduction techniques
- Enable the students to know deep learning techniques to support real-time applications
- Examine the case studies of deep learning techniques

UNIT I INTRODUCTION 9

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression) - Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNIT II DEEP NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT III DIMENSIONALITY REDUCTION 9

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures - AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

UNIT IV OPTIMIZATION AND GENERALIZATION 9

Optimization in deep learning - Non-convex optimization for deep networks - Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models-

Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

UNIT V CASE STUDIES AND APPLICATIONS 9

Imagenet- Detection - Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection BioInformatics - Face Recognition - Scene Understanding - Gathering Image Captions.

TOTAL: 45 PERIODS

OUTCOMES

Upon successful completion of course the students will be able to

- CO1:** Understand basics of deep learning
- CO2:** Implement various deep learning models
- CO3:** Realign high dimensional data using reduction techniques
- CO4:** Analyze optimization and generalization in deep learning
- CO5:** Explore the deep learning applications

TEXT BOOKS

1. Cosma Rohilla Shalizi, *Advanced Data Analysis from an Elementary Point of View*, 2015.
2. Deng & Yu, *Deep Learning: Methods and Applications*, Now Publishers, 2013.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, MIT Press, 2016.
4. Michael Nielsen, *Neural Networks and Deep Learning*, Determination Press, 2015.