Autonomous Programme Structure of
Final Year B. Tech. (Computer Engineering)
Academic Year : 2019-2020 Onwards

Final Year B. Tech. (Computer Engineering) Semester – I										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 4101	Internet of Things	3	0	0	50	50	0	0	100	3
CE 4102	Software Engineering	3	0	0	50	50	0	0	100	3
HS 4101	Organizational Behavior	3	0	0	50	50	0	0	100	3
OE 4101	Open Elective I	3	0	0	50	50	0	0	100	3
CE 4103	Internet of Things Laboratory	0	0	2	0	0	50	0	50	1
CE 4104	Project Phase-I	0	2	14	100	0	50	0	150	9
	Total	**12**	**2**	**16**	**300**	**200**	**100**	**0**	**600**	**22**
	Grand Total	**30**			**600**				**600**	**22**

OE 4101: Open Elective I

1. Soft Computing
2. Computer Graphics
3. Introduction to Cyber Crime and Forensics

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CE 4101 INTERNET OF THINGS

Teaching Scheme
Lectures : 3 Hrs/week

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Prerequisite: Elective–III Embedded and Real time systems (PECE 3202)

Course Objectives:
To facilitate the learners to -

1. To understand the fundamental concepts, basic design and components in Internet of things(IoT).
2. Understand and design smaller systems for various devices.
3. To understand the various protocols used in IoT.
4. Learn and implement smaller scenarios using programming language.
5. To understand fundamentals of security in IoT and web and cloud based services for IoT.

Course Outcomes:
By taking this course, the learner will be able to –

1. Make use of Internet of Things with different components and design process to design various applications.
2. Apply the various things and design a system.
3. Analyze through Knowledge gain and skills to select application layer protocols for seamless integration of various components of an IoT ecosystem.
4. Build smaller codes with python programming.
5. Identify the fundamentals of security used in IoT with the different services provided in web and cloud.

Unit 1: Introduction to Internet of Things **(07)**

IoT: Definition and characteristics of IoT, Vision of IoT, IoT Ecosystem, IoT Reference Model, Physical Design Model, Logical Design: Functional Block, Communication models, Communication API's, IoT enabling Technologies, IoT Levels and Deployment Templates, Applications of IoT, IoT & M2M.

Unit 2: Embedded Devices and Programming for IoT **(07)**

Transducers, Sensors and Actuators for IoT, Introduction to Arduino, Beagle Bone Black, Raspberry Pi, Python Programming for IoT devices.

Unit 3: IoT Protocols **(07)**

Protocol Classification , Protocols for different Layers: Link layer, network layer, Transport layer and Application Layer : Message Queue Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Data Distribution Services (DDS), Advanced Message Queuing Protocol (AMQP), Constrained Application Protocol (COAP), Representational State Transfer (REST), Comparision of

Protocols.

Unit 4 : IoT Platform Design methodology and Case studies for IoT Design **(07)**

Introduction to IoT platform Design methodology, Steps involved in IoT system Design methodology, Case studies: Home automation, Smart cities, Agriculture.

Unit 5: Web of things and Cloud of Things **(07)**

Four pillars of IoT paradigms, Two Pillars of Web, Cloud of things architecture, Four Deployment Models : Private, Public, Community and Hybrid, Cloud computing paradigm: data collection, Storage and Computing, IoT cloud-based Services using Xivel, Nimbits and other platforms, Applications and features of Cloud IoT.

Unit 6: IoT Privacy, Security and Vulnerabilities Solutions **(07)**

Introduction to security, Vulnerabilities, Security requirements and Threat Analysis, Use and Miuses Cases, IoT Security Tomography and Layered Attacker Model, Identity Management and Establishment, Access control and Secure Message communication, Security Models, Profiles and Protocols for IoT.

Text Books:

1. Arshdeep Bagha, Vijay Madisetti, **'Internet of Things – A Hands-on-approach'**, Universities Press (2014).
2. Srinivasa K.G., Siddesh G.M., Hanumantha Raju R., **'Internet of Things'**,Cengage Publication.
3. Rajkamal, **'Internet Of Things: Architecture and Design Principles'** McGraw *Hill Education (India) Private Limited.*

References:

1. *Ovidiu Vermesan, Peter Friess, **'Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems'**,* River Publishers.
2. *Honbo Zhou, **'The Internet of Things in the Cloud'**, CRC Press(2013).*
3. *Peter Waher, **'Learning Internet of Things'**, Packt Publishing (2015).*
4. *https://onlinecourses.nptel.ac.in/*

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CE 4102 Software Engineering

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 3

Prerequisites: Software Design and Architecture (CE 3203)

Course Objectives:

To facilitate the learner to -

1. Develop familiarity with the software design and component based software engineering.
2. Get exposure to the various facets of agile software process model.
3. Learn the basic concepts of refactoring.
4. Gain knowledge about the various aspects of designing and testing of web applications.

Course Outcomes:

By taking this course, the learner will be able to -

1. Apply and analyze the concepts of component-level design to realize the solution of a system.
2. Apply and analyze the agile software process model for application development.
3. Identify and analyze the refactoring methods to restructure the classes.
4. Make use of various concepts of designing and testing for web applications.

Unit 1: Software Design Concepts and Component-Level Design **(07)**

Design within the context of Software Engineering, The design process, Design concepts, Design model. Component-Level Design: What is a component, Designing class-based components, Steps of component-level design, Component-based development.

Unit 2: Introduction to Agile Software Development **(07)**

Why agile software development - Limitations of traditional process models, Evaluating Agile Benefits, Understanding the Agile Manifesto, Outlining the Four Values of the agile Manifesto, Defining the 12 Agile Principles, Agile approaches - Lean, Scrum and Extreme Programming, Agile team.

Unit 3: Agile Project Planning and Software Practices **(07)**

Agile project inception, User stories, Estimation, Agile plan.

Agile software practices: Refactoring, Test-driven development, Continuous integration.

Unit 4: Introduction to Refactoring **(07)**

What is Refactoring, Why and when to refactor, Duplicated code, Long method, Extract method, Large class, Extract class, Alternative classes with different interfaces, Move method, Move field, Rename method, Replace method with method object.

Unit 5: Refactoring Methods **(07)**

Replace data value with object, Change unidirectional association to bidirectional, Switch statements, Replace conditional with polymorphism.

Remove control flag, Introduce assertion, Replace constructor with factory method, Replace error code with exception.

Pull up field, Pull up method, Push down method, Push down field, Extract subclass, Extract superclass, Extract interface, Replace inheritance with delegation.

Unit 6: Design and Testing of Web Applications **(07)**

WebApp design quality, Design goals, Design pyramid, WebApp interface design, Asthetic design, Content design, Architecture design, Navigation design, Component-level design, Object-oriented hypermedia design method.

Testing concepts for WebApps, Testing process - overview, Content testing, User interface testing, Component-level testing, Navigation testing, Configuration testing, Security testing, Performance testing.

Text books:

1. Roger S. Pressman, **'Software Engineering: A Practitioners Approach'**, *Tata McGraw Hill*, (7th Edition) (2010).
2. Jonathan Rasmusson, **'The Agile Samurai: How Agile Masters Deliver Great Software'**, *Shroff Publishers and Distributers (SPD)*, ISBN: 978-93-5213-411-3, (2016).
3. Martin Fowler, Kent Beck, John Brant, William Opdyke and Don Roberts, **'Refactoring: Improving The Design of Existing Code'**, *Pearson Education*, ISBN: 978-81-317-3466-7, (2017).
4. Mark C. Layton, Steven J. Ostermiller, **'Agile Project Management for Dummies'**, *Wiley*, (2nd Edition), (2017).

Reference books:

1. Ian Sommerville, **'Software Engineering'**, *Person Education*, (8th Edition) (2008).
2. Grady Booch, James Rumbaugh, Ivar Jacobson, **'The Unified Modeling Language User Guide'**, *Pearson Education*, (2nd Edition) (2008).

Web References:

1. Official website of R. S. Pressman and Associates, Inc: http://www.rspa.com/
2. Agile Software process model: https://www.agilealliance.org/
3. Basics of Scrum: https://www.scrumalliance.org/

CE 4103 Internet of Things Laboratory

Teaching Scheme
Laboratory : 2 Hrs/week

Examination Scheme
Oral: 50 Marks
Credits: 1

Course Objectives:
To facilitate the learners to -

1. Understand various development boards used for Internet of Things(IoT).
2. Learn and Understand the fundamentals of sensor based applications.
3. Implement and solve the problems using high level language.
4. Develop mini applications on IoT boards with proper design.

Course Outcomes:
By taking this course, the learner will be able to :–

1. Build Internet of Things on various development boards.
2. Design the minimum system for sensor based application.
3. Solve the problems related to the primitive needs using IoT.
4. Develop IoT application for distributed environment.

Example List of Laboratory Assignments:

Assignments Group A (Mandatory)

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation)
2. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board.
3. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs
4. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.
5. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.

Assignments Group B (Any 2)

1. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.
2. Assignments on Beagle Bone Black :
   a. Write an application using Beagle board to control the operation of stepper motor.
   b. Write an application using Beagle board to control the operation of a hardware simulated traffic signal.
   c. Write an application using Beagle board to control the operation of a hardware simulated lift elevator.
3. Assignments on Cloud of Things:
   a. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.

b. Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.

c. Create a simple web interface for Raspberry-Pi/Beagle board to control the connected LEDs remotely through the interface.

Assignments Group C (Any 1)

Sample Mini Project Statements :

1. Develop a Real time application like smart home with following requirements: When user enters into house the required appliances like fan, light should be switched ON. Appliances should also get controlled remotely by a suitable web interface. The objective of this application is student should construct complete Smart application in group.
2. Develop a Real time application like a smart home with following requirements: If anyone comes at door the camera module automatically captures his image send it to the email account of user or send notification to the user. Door will open only after user's approval.

References:

1. *Rajkamal, '**Internet Of Things: Architecture and Design Principles**' McGraw Hill Education (India) Private Limited.*
2. *Ovidiu Vermesan, Peter Friess, '**Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems**',* River Publishers.
3. *Honbo Zhou, '**The Internet of Things in the Cloud**', CRC Press(2013).*
4. *Peter Waher, '**Learning Internet of Things**', Packt Publishing (2015).*
5. *https://onlinecourses.nptel.ac.in/*

CE 4104 Project Phase-I

Teaching Scheme
Tutorial : 2 Hrs /week
Practical: 14 Hrs/Week

Examination Scheme
In Semester: 100 marks
Oral: 50 marks
Credits: 9

Summary of the subject:

Final Year Projects represent the culmination of study towards the Bachelor of Engineering degree. Projects offer the opportunity to apply and extend material learned throughout the program. It also provides an opportunity to learn new technologies and frameworks .It gives an enriching experience of working with industry and / or work with real life problems.

Projects are undertaken in small groups. It emphasises on team work and gives the students chance to present and polish their interpersonal and intrapersonal skills.

The projects undertaken, span a diverse range of topics. Projects can be sponsored by a sponsoring company, faculty defined, research oriented or self defined and vary from year to year. Projects can be undertaken in various domains like Artificial Intelligence, Data Warehousing, Data mining, Machine learning, App development, Network security, Networking, Cloud computing, Embedded Systems, Systems programming and many more. Approval of the problem statement by the Course Coordinator is required.

The course necessarily introduces the dimension of workload management. By applying suitable software development processes and project management concepts, students have to conduct this relatively unstructured "assignment" over the course of the semester.

The projects are assessed using a continuous evaluation process. Students can do seminar presentation, submission of a report, oral and technical presentation to present their work.

This course is to be conducted in the first semester.

Course Objectives:

To facilitate the learners to-

1) Explore state of art ,research approaches, algorithms, products in the domain.
2) Formulate a significant and challenging problem statement of relevance.
3) Provide a suitable and acceptable design solution to meet requirements considering relevent social,ethical and legal issues.
4) Have systematic approach as a team following best practices and engineering processes.
5) Choose and learn relevant tools, APIs, languages, frameworks, technologies for implementation of the project

6) Choose and apply appropriate SDLC approach like waterfall model, agile, RAD, Incremental model, Spiral, Prototyping etc.

7) Develop their personal skills

Course Outcomes:

By taking this course the learner will be able to -

1) Work in a team to develop the knowledge, skills, ethics and attitudes of a professional engineer.
2) Select appropriate tools, API, technologies to build a tested, working prototype, system.
3) Deliver solutions to real life problems that are acceptable.
4) Construct quality documents for entire Software Development Life Cycle.
5) Defend and justify effectively the work done, learning achieved, learning experience, and usefulness of product or service.

Evaluation Criteria:

The project work of the team will be assessed by the Project Guide. The guide will review the work done throughout the duration of the course. The guide can give assignments. The Final semester oral examination will be conducted by examiners where the project group has to present their work using presentations.

Assessment should be done on the basis of the following points:

- The quality of oral, written presentations.
- Fitness of project to problem statement.
- Innovations, well thought contributions in giving a solution, meeting requirements, use of technology and algorithms.
- The process including the project software engineering, teamwork and documentation.
- Understanding which tools, APIs and technologies can be applied and how.

HS 4101 Organizational Behavior

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits : 3

Course Objectives:
To facilitate the learner to -

1. Develop familiarity with the concepts related to organizational behavior.
2. Gain knowledge about personality traits and individual behavior.
3. Study group dynamics.
4. Get exposure to the recent trends in Organizational behavior.

Course Outcomes:
By taking this course, the learner will be able to–

1. Explain concepts of organizational behavior, its importance and culture.
2. Outline meaning of personality and how individual behavior impacts organization.
3. Relate with ideas of group dynamics and influence of groups in work place.
4. Recall latest trends in Organizational behavior.

Unit 1: Introduction **(07)**
Management and Organizational Behavior (OB), Organizational behavior in historical perspective, Developing an OB model, Challenges and Opportunities for OB, Foundation of individual behavior.

Unit 2: Individual **(08)**
Personality, personality frameworks, big five model, perception, individual decision making, attitudes, components of attitudes, attitudes and behavior, Job attitudes, values

Unit 3 : Diversity and Ethics **(06)**
Environmental context : diversity and ethics, Communication, Case studies

Unit 4: Trends **(07)**
International organizational behavior, emotional intelligence, strategic organizational behavior, Intra-preneurship, flat organization

Unit 5: Group Dynamics **(08)**
Foundation of group behavior, stages of group development, group decision making, team building, organizational conflicts and negotiation, power and politics

Unit 6: Dynamic Environment and Culture **(06)**
Information technology and globalization, Human resource policies and practices, Learning

Text books:

1. Stephen P. Robbins, Timothi A.Judge, **'Organisational Behavior'**, 18th Global Edition, Pearson Education, ISBN: 978-0-13-410398-3
2. Dr. S. S. Khanka, **'Organisational Behaviour (Text and Cases)'** , S. Chand & Company Pvt.Ltd. (2018), ISBN 978-81-219-2014-8
3. Fred Luthans, **'Organizational Behavior'**, 12th Edition, McGraw Hill Publication, ISBN-978-1-25-909743-0

Reference Books:

1. Moorhead, Griffin, **'Introduction to Organizational Behavior'**, India Edition, Cengage Learning, ISBN: 978-81-315-1242-5.
2. P. Subba Rao, **'Organisational Behaviour (Text , Cases and Games)'**, Himalaya Publishing House, ISBN 978-93-5024-673-3.
3. K. Aswathappa, **'Organisational Behavior : Text, Cases & Games'**, 10th Revised Edition,Himalaya Publishing House, ISBN 978-93-5051-588-4.

Web resources:

https://nptel.ac.in/downloads/110105034/#

OE 4101 Soft Computing

Teaching Scheme
Lectures : 3 Hrs/Week

Examination Scheme
In Semester : 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:
To facilitate the learners to -

1. To understand basics in soft computing
2. To understand concepts of fuzzy logic and fuzzy sets
3. To understand supervised and unsupervised neural network architecture, training and testing algorithms
4. To understand concept evolutionary programming, genetic algorithm and swarm intelligent systems

Course Outcomes:
By taking this course, the learner will be able to -

1. Identify various soft computing and artificial neural network constunets to solve the problems in engineering domain
2. Experiment with fuzzy logic principles
3. Analyze learning algorithms in artificial neural networks
4. Compare and apply principles of genetic algorithm and swarm intelligece in solving engineering problems

Unit 1: Introduction to Intelligent systems, soft tools and Artificial Neural network (07)

Soft computing constituents and conventional Artificial Intelligence, Artificial Neural network: definition, advantages of artificial neural network, Fuzzy Set Theory, Genetic algorithm, hybrid systems: neuro fuzzy, neuro genetic, fuzzy genetic, soft computing, Introduction to Artificial Neural Network: Fundamental concepts, basic models of artificial neural network, important terminologies of ANNs, McCulloch- Pitts Neuron, linear separability.

Unit 2: Fuzzy logic and fuzzy sets (07)

Introduction to fuzzy logic, fuzzy sets, fuzzy set operations, properties of fuzzy sets, classical relation, fuzzy relation, membership function, fuzzification, Methods of membership value assignments, lambda-cuts for fuzzy set, lambda-cuts for fuzzy relations, defuzzyfication.

Unit 3: Supervised Learning Networks (07)

Introduction, Perceptron Networks: Perceptron learning rule, Architecture, perceptron training algorithm for single output classes, perceptron training algorithm for multiple output classes, perceptron network testing algorithm, Back Propagation Network: flowchart for training process, training algorithm, linear factors of back- propagation networks, number of training data, number of hidden layer nodes, testing algorithm of back- propagation networks

Unit 4: Associative Memory Networks and Unsupervised Learning Networks (07)

Associative Memory Networks: Introduction, Training algorithm for pattern association: Hebb rule, Autoassociative Memory networks, Bidirectional associative memory: architecture, discrete bidirectional associative memory, Unsupervised Learning Networks: Introduction, Fixed wright competitive nets: max net, Kohonan Self organizing feature maps, counterpropogation networks, full counter propogation net.

Unit 5: Genetic Algorithm (07)

Introduction, biological background, genetic algorithms and search space, genetic algorithm vs. traditional algorithms, basic terminologies in in genetic algorithm, simple GA, operations

in genetic algorithm: encoding- binary, octal, selection- Roulette wheel selection, random selection, crossover- single point cross over, two point crossover, mutation- flipping, interchanging, stopping condition for genetic algorithm flow, constraints in genetic algorithm

Unit 6: Swarm Intelligent Systems **(07)**

Introduction, background of Ant Intelligent systems, Importance of the Ant Colony Paradigm, Ant colony systems, Development of Ant colony systems, Applications of Ant Colony Intelligence, the working of ant colony systems, practical swarm intelligent systems: The basic of PSO method, Characteristic features

Text Books:

1. S.N. Sivanandam- **"Principles of Soft Computing",** Second Edition, Wiley India- ISBN- 9788126527410, 2008
2. J. S. R. Jang, CT Sun and E.Mizutani, **"Neuro-Fuzzy and Soft Computing" ,** PHI PVT LTD, ISBN 0-13-261066-3. 2015
3. N.P.Padhy, **"Artificial Intelligence and Intelligent Systems"** Oxford University Press, ISBN 10: 0195671546, 2005

References:

1. De Jong, **"Evolutionary Computation: A Unified Approach",** Cambridge (Massachusetts): MIT Press. ISBN: 0-262-04194-4. 2006
2. S. Rajsekaran and G.A. Vijayalakshmi Pai, **"Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications"** , Prentice Hall of India, ISBN: 0451211243, 2003
3. Sinha N.K., **" Soft Computing And Intelligent Systems: Theory And Applications"**, ISBN-13: 978-0126464900, Elsevier. 2007.

OE 4101 Introduction to Cyber Crime and Forensics

Teaching Scheme:
Lecture: 3 Hrs./week

Examination Scheme:
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

To facilitate the learners to-

1 Learn fundamental concepts of cyber security
2. Understand Security challenges presented by mobile devices and information system access in cybercrime world
3 Learn tools used in Computer forensics and Cyber Applications
4. Understand risks associated with social media networking

Course Outcome:
By taking this course the learner will be able to-

1.Classify Cyber Crimes
2. Identify threats and risks within context of Cyber Security
3. Outline various laws and acts in Cyber security
4. Appraise various tools used in Cyber Security/ Digital forensics

UNIT- I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Ethical dimensions of cybercrime,Ethics and Morality,Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes (7)

UNIT – II:Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector- Infrastructure / Cloud Computing. (7)

UNIT – III: Cybercrime: Mobile and Wireless Devices : Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices,Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile,Organizational Security Policies an Measures in Mobile Computing Era, Laptops. (8)

UNIT IV:Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers,Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow. (7)

UNIT V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations. (7)

Unit VI : Digital Forensics- Introduction to Digital Forensics, Forensics Software and Hardware, Evaluating computer forensic tools , Software tools and Hardware Tools, New Trends, Sample Case studies. (6)

TEXT BOOK:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1
2. Computer Forensics and Investigations Bill Nelson, Amelia Phillips and Christopher Stuart Cenage learning. ISBN 978-81-315-1946-2

REFERENCE BOOK:

1. Intoduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group
2. Eoghan Casey,"Digital evidence and computer crime Forensic Science,Computers and the Internet , ELSVIER,2011 ISBN 978-0-12-374268-1

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Final Year B. Tech. (Computer Engineering) Semester – II										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 4201	Network and Information Security	3	0	0	50	50	0	0	100	3
PECE 4201	Programme Elective-I	3	0	0	50	50	0	0	100	3
OE 4201	Open Elective-II	3	0	0	50	50	0	0	100	3
CE 4202	Network and Information Security Laboratory	0	0	2	0	0	50	0	50	1
CE 4203	Project Phase-II	0	2	16	100	0	50	0	150	10
CE 4204	Project based Online Course**	2	0	0	50	0	0	0	50	2
	Total	**11**	**2**	**18**	**300**	**150**	**100**	**0**	**550**	**22**
	Grand Total	**31**			**550**				**550**	**22**

**The student shall register and complete the project based online course preferably in semester- I but may complete the same till the end of semester-II.

PECE 4201: Programme Elective-I

1. Parallel Computing
2. Compiler Construction
3. Java Full Stack Technologies
4. Deep learning

OE 4201: Open Elective II

1. Introduction to Natural Language Processing
2. e-Business
3. Big Data and Analytics

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CE 4201 NETWORK AND INFORMATION SECURITY

Teaching Scheme
Lecture: 3 Hrs. /week

Examination Scheme
In semester: 50 Marks
End semester: 50 Marks
Credits: 3

Prerequisite(s): Computer Networks (CE 3101)

Forward Course Linkage(s): -

Course Objectives:

To facilitate the learners-

1. To understand the fundamental concepts of security.
2. To know the basics of cryptography
3. To understand role of protocols at various layers.
4. To apply the various security concepts.

Course Outcomes:

By taking this course, the learner will be able to–

1. Apply principles Cryptosystem.
2. Analyze data security over the network.
3. Determine advance security issues and choose appropriate technology.
4. Develop an understanding of modern networks from security perspective.

Unit 1: Introduction to Network Security **(06)**

Introduction to Network Security, Architectures , Introduction to common attacks,Overview of SQL injection, Cross Site Scripting, Buffer overflow security services, A model for Network and Inter network Security, OSI security Architecture (services and Mechanism),Introduction to cryptography- Classical Cryptography.

Unit 2: Introduction to Cryptography **(07)**

Introduction to secrete key cryptography, Block cipher Basics, Introduction to DES, DES analysis, DES variants, Other example algorithms like AES and IDEA, Block cipher modes of operation

Unit 3: Public Key and Management **(08)**

Introduction to Public Key cryptography, The RSA algorithm, Analysis of RSA, Key management Basics, Diffie- Hellman Key exchange, Key distribution of Private and Public Keys.

Unit 4: Message Integrity and Authentication **(08)**

Message Digest, One way hash functions, MD5, SHA, Message authentication, Introduction and overview of Digital Signatures: Implementation, Algorithms standards(DSS),Digital Certificates and X.509, Certificate structure, Certificate revocation.

Unit 5: Firewalls and Security Protocols **(07)**

Introduction to Network Layer Security- Overview of Firewall, Design principles of

Firewalls ,Various types of firewalls and their working principles,Concept of VPN, Tunneling protocols, Detail working of IPSEC. Introduction to transport Layer security – detail working of SSL protocol.

Unit6:Application Security **(06)**

Overview of Application security, E-mail security (PGP), SET, Overview of Wireless security.

Text Books:

1. William Stalling **'Cryptography and Network Security, principles and practices'**, *6th edition. Pearson*

Reference Books:

1. Bernard Menezes, **'Network Security and Cryptography'**, *Cengage Learning.*
2. *Bruce Schneier:* **'Applied Cryptography'**, *Second Edition, John Wiley & Sons, New York, 2001.*
3. Atul Kahate, **'Cryptography and Network Security'**, *3rd edition McGraw Hill Publication.*
4. Charlie Kaufman, Radia Perlman and Mike Speciner, **'Network security, private communication in a public world'** .

CE 4202 Network and Information Security Laboratory

Teaching Scheme
Laboratory : 2 Hrs/week

Examination Scheme
Oral – 50 Marks
Marks – 50
Credit : 1

Course Objectives:

To Facilitate the Lerners to:-

1.Understand Basic Cryptography Algorithms
2.Learn various techniques for secure data transmission
3. Recognize the need of Network Perimeter Security
4.Learn various techniques used for common attacks

Course Outcome :

By taking this course the learner will be able to :-

1. Implement Standard Cryptography Agorithms
2. Apply the digital signature for secure data transmission
3. Apply packet filtering concept
4. Demonstrate some common attacks

Sample /Suggested List of Assignments :

1. Implement DES algorithm

2. Implement RSA algorithms

3. Implement Message Digest Algorithm and demonstarte the collision resistance property

4. Implementation of Diffie Hellman Key exchange

5. Creation and Verification of Digital Signatures

6. Simulation of packet Filtering (ACL) concepts using CISCO packet Tracer

7. Create a small application to demonstrate SQL injection and Cross Site scripting attacks

8. Develop a website to demonstrate how the contents of the web site can be changed by attackers if it is http based and not secured

9. Case Study - Enterprise network Security/ Wireless Security / Security Information and Event Management using IBM QRadar

CE 4203 Project Phase-II

Teaching Scheme
Tutorial: 2 Hrs /week
Practical:16Hrs/Week

Examination Scheme
In Semester: 100 marks
Oral: 50 marks
Credits: 10

Summary of the subject:

This course is an extension to Project Phase-I to be completed in the semester I.

The course focuses on workload management, implementation, usage of tools, testing and delivering deliverables as per the plan presented and finalized in the semester I. Students have to apply project management concepts.

The projects are assessed using the continuous evaluation process by presentation, submission of a report, oral and technical presentation.

This course is to be conducted in the second semester.

Course Objectives:

To facilitate the learners to-

1) Provide a suitable and acceptable design solution to meet requirements.
2) Have systematic approach as a team following best practices and engineering processes.
3) Develop their personal skills.
4) Test rigourously the system developed.
5) Consolidate their work in a furnished report.

Course Outcomes:

By taking this course the learner will be able to -

1) Work in a team to develop the knowledge, skills, ethics and attitudes of a professional engineer.
2) Build a reasonably complex, useful and tested project which could be a product or service using appropriate tools, technologies.
3) Construct quality documents for entire Software Development Life Cycle.
4) Defend and justify effectively the work done, learning achieved, learning experience, and usefulness of product or service.

Evaluation Criteria:

The project work of the team will be assessed by the Project Guide. The guide will review the work done throughout the duration of the course. The Final semester oral examination will be conducted by examiners where the project group has to present their work using presentations.

Assessment should be done on the basis of the following points:

- The quality of oral, written presentations.
- Fitness of project to problem statement.
- Innovations, well thought contributions in giving a solution, meeting requirements, use of technology and algorithms.
- The process including the project software engineering, teamwork and documentation.
- Extent to which tools and technologies have been applied.

CE 4204 Project based online course

Teaching Scheme
Lecture : 2 Hrs /week

Examination Scheme
In Semester: 50 marks
Credits: 02

Summary:

This course will be undertaken by the students as a part of their preparation for conducting their final year Btech project. All group members belonging to the final year Btech project group should do the course. The project guide will play the crucial role in deciding the online course to be undertaken by the project group members. The student shall register and complete the project based online course preferably in semester- I but may complete the same till the end of semester-II.

PECE 4201 – Parallel Computing

Teaching Scheme
Lecture: 3 Hrs/week

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Course Objectives:

The major objectives of the course are to facilitate the learner to:

1. Understand the various aspects of the parallel processing.
2. Familiarize with the fundamental concepts, techniques and tools of parallel computing.
3. Identify advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing.
4. Evaluate the performance measures of different parallel communication operations.
5. Identify mapping of applications to high-performance computing systems.
6. Understand the advanced trends and techniques in High Performance Computing.

Course Outcomes:

By taking this course, students will be able to:

1. Distinguish between sequential and parallel architecture.
2. Apply different decomposition and communication techniques to approach parallel solution of the given application.
3. Apply parallel Programming constructs for Shared Address Space Platform.
4. Solve various examples of Advanced Parallel Algorithms.
5. Summarize the advanced techniques in Parallel Computing.

Unit 1-Introduction to parallelism **(07)**

Need of Parallel Architectures, Supercomputers, Parallel Application, Communication Architecture, Shared Address Space, Message Passing, Data Parallel Processing, Parallel Architectures, Trends in Microprocessor Architecture, Superscalar Processing, Very Large Instruction Word Processing, Dichotomy of Parallel Platforms.

Unit 2-Principles of Parallel Algorithm Design **(08)**

Concept of Decomposition, Tasks, Dependency Graphs, Granularity, Concurrency and Task Interaction, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Interconnection Networks for Parallel Computers.

Unit 3-Basic Communication Operations and Programming Using the Message Passing Paradigm **(08)**

Basic communication operations, Communication Costs in Parallel Machines, One-to-All Broadcast and All-to-One Reduction operations, All-to-All Broadcast and Reduction, , Scatter and Gather. Principles of Message Passing Programming, MPI routines.

Unit 4-Programming Shared Address Space Platforms **(08)**

Thread Basics, The POSIX Thread API, The OpenMP Programming Model, Specifying Concurrent Tasks in OpenMP, Synchronization Constructs in OpenMP, OpenMP Library Functions, Evolution of Multicore solution, CUDA Hardware, Managing GPU memory, CUDA Kernel Function.

Unit 5-Advanced Parallel Algorithms **(07)**

Dense matrix algorithms- Matrix Vector Multiplication, Matrix Matrix Multiplication, Sorting -Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Quicksort, Parallel Depth-First Search, Parallel Best-First Search

Unit 6-Recent Trends in Parallel Processing **(07)**

Basics of Cluster and Grid Computing, Petascale Computing, High Performance Computing in Data Analytics, Quantum Computing. Parallelization tools.

Text books:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, '**Introduction to Parallel Computing**', *Addison-Wesley (India)(Second edition)(2003)*, ISBN: 0-201-64865-2.
2. David Culler Jaswinder Pal Singh, '**Parallel Computer Architecture: A hardware/Software Approach**', *Morgan Kaufmann Publishers (India)(1999)*, ISBN 978-1-55860-343-1.

Reference Books:

1. Kai Hwang, '**Scalable Parallel Computing**', *McGraw Hill (1998)*, ISBN:0070317984.

2. Shane Cook, '**CUDA Programming: A Developer's Guide to Parallel Computing with GPUs**', *Morgan Kaufmann Publishers Inc.(2013)* ISBN: 9780124159884.

3. Jason sanders, Edward Kandrot, '**CUDA by Example**', *Addison-Wesley*, ISBN-13: 978-0-13-138768-3.

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PECE 4201 COMPILER CONSTRUCTION

Teaching Scheme
Lectures: 3 Hrs/week
Credits: 3

Examination Scheme
In-sem : 50 Marks
End-sem : 50 marks

Course Objectives:

To facilitate the learners -

1. To perform white box probing of compilers.
2. To discuss the effectiveness of optimization.
3. To learn and use tools for automatic compiler generation.

Course Outcomes:

By taking this course, the learner will be able to -

1. Apply an algorithm for lexical analysis and token generation for simple programming language;
2. Construct a parser for a small context-free grammar.
3. Create symbol table and intermediate code for a simple programming language.
4. Apply the code optimization and code generation algorithms to get the machine code for the optimized code.

Unit 1: Introduction to System Programming **(06)**

Components of System Software, Language Processing Activities, Fundamentals of Language Processing, Structure of an assembler, Design of Two pass assembler, Single Pass Assembler, Linkers and Loader, Dynamic Link Libraries

Unit 2: Introduction to Compilation and Lexical Analysis **(08)**

What is a Compiler, what is the Challenge, Compiler Architecture, Front end and Back end model of compiler, Cross compiler, Incremental compiler, Bootstrapping. Concept of Lexical Analysis, Regular Expressions, Deterministic finite automata (DFA), Non- Deterministic finite automata (NFA), Converting regular expressions to DFA, Converting NFA to DFA, Hand coding of Lexical analyzer, Introduction to LEX Tool and LEX file specification

Unit 3: Syntax Analysis **(08)**

Context Free Grammars (CFG), Concept of parsing, Parsing Techniques, Top-Down Parsers: Introduction, Predictive Parsing - Removal of left recursion, Removal of left factoring, Recursive Descent Parsing, Predictive LL(k) Parsing Using Tables, Bottom Up parsing: Introduction, Shift-Reduce Parsing Using the ACTION/GOTO Tables, Table Construction, SLR(1), LR(1), and LALR(1) Grammars, Practical Considerations for LALR(1) Grammars, Introduction to YACC Tool & YACC file specification

Unit 4: Semantic Analysis **(06)**

Need of semantic analysis, Abstract Parse trees for Expressions, variables, statements, functions and class declarations, Syntax directed definitions, Syntax directed translation schemes for declaration processing, type analysis, scope analysis , Symbol Tables (ST),Organization of ST for block structure and non-block structured languages, Symbol Table management, Type Checkers: type checking for expressions, declarations (variable, type, function, recursive), statements

Unit 5: Intermediate Code Generation **(06)**

Intermediate languages, Design issues, Intermediate representations: three address, postfix & abstract syntax trees, Intermediate code generation for declaration, assignment, iterative statements, case statements, arrays, structures, conditional statements and Boolean expressions. Model of a program in execution, Stack and static allocation, Activation records

Unit 6: Code Generation and Code Optimization **(08)**

Issues in the design of code generation, Target machine description, Basic blocks & flow graphs, Expression Trees, Unified algorithms for instruction selection and code generation., Sethi Ullman algorithm for expression trees , Aho Johnson algorithm, Different models of machines , order of evaluation, register allocation. Introduction to optimization, Principal sources of optimization, Machine Independent Optimization, Machine dependent Optimization, Various Optimizations: Function preserving transformation, Common Sub-expressions, Copy propagation, Dead-code elimination, Loop Optimizations, Code Motion, Induction variables and reduction in strength, Peephole Optimization, Redundant –instruction elimination

Text Books:

1. Aho, Sethi, Ulman, Lam, **"Compilers: Principles, Techniques and Tools"**, *Pearson, 2nd Edition, ISBN 978-93-325-1866-7*
2. Dhamdhere D., **"Systems Programming and Operating Systems"**, *2nd Edition, ' McGraw Hill, 1999, ISBN 0 - 07 - 463579 – 4.*

Reference Books:

1. Andrew Appel, **"Modern Compiler Implementation in C"**, *Cambridge*
2. Kenneth C. Louden, **"Compiler Construction: Principles and Practice"**, *Cengage Learning, ISBN-13:978-0534939724*
3. J. R. Levine, T. Mason, D. Brown, **"Lex & Yacc"**, *O'Reilly, 2000, ISBN 81-7366 –061-X*

PECE 4201 Java Full Stack Technologies

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits : 3

Prerequisites: Data Structures and Algorithms II (CE 2201)

Course Objectives:
To facilitate the learner to -

1. Get exposure to full stack development in Java technologies.
2. Develop familiarity with the client side Java technologies.
3. Gain comprehensive knowledge about Java server side technologies for enterprise application development in practice.
4. Get familiar with the web services based approach for real-life application development.
5. Get acquainted with the database development technologies in Java.

Course Outcomes:
By taking this course, the learner will be able to -

1. Choose suitable client side Java technologies.
2. Analyze Java server side technologies for enterprise application development.
3. Identify the need and analyze the characteristics of web services paradigm.
4. Analyze the role of Java database development technologies to realize their suitability for application development.

Unit 1: Client Side Web Technologies **(07)**

n-tier architecture, HTML, JavaScript (JS), Document Object Model (DOM), Introduction to JQuery, Asynchronous JavaScript And XML (AJAX).

Unit 2: Server Side Java Web Technologies **(07)**

Introduction to server side technology, Java Servlets, Java Server Pages (JSP), JSP tags.

Unit 3: AngularJS **(06)**

Overview, Model View Controller (MVC) architecture, directives, controllers, modules, forms.

Unit 4: Java 2 Enterprise Edition (J2EE) Technologies **(08)**

Introduction to J2EE technologies, Enterprise Java Beans (EJB), Java Messaging Service (JMS), Remote Method Invocation (RMI).

Unit 5: Java Web Services **(07)**

Web Services: Overview, Java Web services based on SOAP and REST,
Case studies: Facebook API.

Unit 6: Java Database Programming and Hibernate **(07)**

Java Database Connectivity (JDBC), JPA (Java Persistence API).
Hibernate: Overview of Hibernate, architecture, Hibernate Object/Relational Mapping.

Text books:

1. Kogent Learning Solutions Inc., **'Web Technologies: HTML, JS, PHP, Java, JSP, ASP.NET, XML, AJAX, Black Book'**, *DreamTech Press*, ISBN: 978-81-7722-997-4, 2015.
2. Kogent Learning Solutions Inc., **'Java Sever Programming Java EE6 Black Book'**, *DreamTech Press*, ISBN: 978-81-7722-936-3, 2013.
3. William Crawford, Jim Farley, **'Java Enterprise in a Nutshell'**, *O'Reilly*, ISBN-13: 978-0596101428, 3rd Edition, 2005.

References books:

1. Shyam Seshadri and Brad Green, **'AngularJS Up and Running'**, *O'Reilly*, ISBN: 978-93-5110-801-6, 2014.
2. Kevin Mukhar, Chris Zelenak, James L. Weaver and Jim Crume, **'Beginning Java EE5: From Novice to Professional'**, *Apress*, ISBN-13: 978-8181284020, 2006.
3. Jim Keogh, **'The Complete Reference J2EE'**, *McGraw Hill Education*, ISBN: 978-0-07-052912-0, 2012.

Web References:

1. https://learn.jquery.com
2. https://docs.angularjs.org/guide/concepts

PECE 4201: Deep Learning

Teaching Scheme
Lectures : 3 Hrs / week

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks
Credits : 3

Prerequisites :

Artificial Intelligence and Machine Learning (CE3202)

Course Objectives :

To facilitate the learners to -
1. Understand building blocks of Deep Neural Networks.
2. Understand various optimization algorithms used for training Deep Neural Networks.
3. Understand the working of Convolution Neural Network (CNN), Recurrent Neural Network (RNN), GRUs, Long Short Term Memory (LSTMs).
4. Have knowledge of Deep Architectures for solving various applications.

Course Outcome :
By the end of this course, students should be able to -
1. Apply the fundamental mathematical concepts to Deep Learning.
2. Interpret the basics Neural Networks for understanding of deep learning.
3. Apply the concepts of neural networks to design Convolution Neural Network and Recurrent Neural Network.
4. Apply available Deep Learning solutions to real time applications.

Unit 1 : Machine learning Recap **(06)**
Linear Algebra, Prababilities and Information theory, Basics of Machine Learning: Model Selection and Train/Validation/Test Sets, Bias Variance trade off, Overfitting, Regularization, Confusion matrix, Precision, Recall, F-score, ROC, K-fold cross validation

Unit 2 : Introduction to Deep Learning **(06)**
Limitations of Machine Learning, History of Deep Learning, How does Deep Learning works? Advantages of Deep Learning, Applications of Deep Learning, Perceptrons, Sigmoid neurons

Unit 3 : Basics of Neural Networks **(08)**
Feed-forward neural network, Multi-Layer Dense Architecture, Activation Functions, Loss Function, Dropout, Stochastic Optimization: mini-batch gradient descent, Back Propagation, Gradients, hyper-parameters, over-fitting, regularization

Unit 4 : Convolution Neural Network (CNN) **(07)**
Architecture: convolution Pooling Layers, Padding, Use of CNNs for classification, use for data compression, semantic segmentation, Image denoising, object detection

Unit 5 : Recurrent Neural Network (RNN) **(08)**
Architecture, Gates, Use for time series data (anomaly detections), Use for text (sentiment) classification problem, generate new text, Introduction to GRUs, LSTMs

Unit 6 : Advanced Deep Learning **(07)**

Deep Learning applications in Computer Vision / NLP / Text Mining / Big Data / IoT using ImageNet, AlexNet, VGG Net, ResNet etc.

Introduction to Generative Adversarial Networks, Deep Reinforcement Learning.

References

Text Books

1. Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press Ltd. ISBN:9780262035613, 0262035618

2. Deep Learning – A Practitioner's approach, Josh Patterson and Adam Gibson, O'Reilly Publication, 1st edition August 2017 ISBN : 9789352136049

Reference Books

1. Fundamentals of Deep Learning: Designing Next Generation intelligence Alogrithms, Nikhil Baduma, Nicholas Locascio, O'Reilly Publication, ISBN 10: 9352135601 , ISBN 13: 978-9352135608

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OE 4102 - Introduction to Natural Language Processing

Teaching Scheme
Lecture: 3 Hrs/week

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Course Objectives:

To facilitate the learner to:

1. Understand various aspects of Natural Language Processing.
2. Learn Phonological, Morphological, Syntactic and Semantic processing.
3. Understand issues related to ambiguity of Natural Language.
4. Understand the advanced applications of Natural Language Processing.

Course Outcomes:

By taking this course, the learner will be able to:

1. Explain importance of Natural Language Processing.
2. Identify the fundamental concepts and techniques of Natural Language Processing.
3. Analyze ambiguous structure of Natural Language.
4. Summarize the advanced applications of Natural Language Processing.

Unit 1-Introduction to Natural Language Understanding **(06)**

The Study of Language, Applications of Natural Language Understanding, Evaluating language Understanding Systems, Different levels of Language Analysis.

(07)

Speech Sounds and Phonetic Transcription, Articulatory Phonetics, The Vocal Organs, Place of Articulation of Consonants, Manner of Articulation of Consonants, Vowels, Syllables, Phonological Categories and Pronunciation Variation, Phonetic Features, Predicting Phonetic Variation, Factors Influencing Phonetic Variation.

Unit 3-Fundamentals of Morphology **(08)**

Concept of Morphology, Survey of English Morphology, Inflectional Morphology, Derivational Morphology, Cliticization, Non-Concatenative Morphology, Agreement, Finite-State Morphological Parsing, Construction of Finite-State Lexicon, Finite-State Transducers(FST), Sequential Transducers and Determinism, Finite-State Transducers for Morphological Parsing, Transducers and Orthographic Rules, Word and Sentence Tokenization.

Unit 4-Fundamentals of Syntax **(06)**

The elements of Noun Phrases, Verb Phrases, Adjective Phrases, Adverbial Phrases and Simple Sentences, Grammars and Sentence Structure, Construction of a Good Grammar, A Top-Down Tagging.

(08)

Word Senses, Relations Between Senses, WordNet, Word Sense Disambiguation, The Need for Discourse Structure, Segmentation and Cue Phrases, Discourse Structure and Reference, Relating Discourse Structure and Inference, Discourse Structure, Tense, and Aspect, Managing the Attentional Stack, Concept of Pragmatics

(07)

Machine Translation, Sentiment Analysis, Question Answering Systems, Cross Lingual Information Retrieval, Natural Language Interface to Database, Extractive and Abstractive Summarization Systems, Indian Language WordNets.

Text books:

1. Jurafsky, David, James H. Martin, '**Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition**', *Pearson Education Limited, Dorling Kindersley(India) Pvt. Ltd. (Indian Subcontinent Version)*(2014), ISBN: 987-93-325-1814-4.
2. James Allen, '**Natural Language Understanding**', *Pearson Education Limited, Dorling Kindersley(India) Pvt. Ltd. (Indian Subcontinent Version)(2007)*, ISBN: 987-81-317.

Reference Books:

1. Manning, Christopher D., Hinrich Schütze, '**Foundations of Statistical Natural Language Processing**', *Cambridge Publication(1999)*, ISBN: 0262133601.
2. Steven Bird, ewan Klein, and Edward Loper, '**Natural Language Processing with Python**', *O'Reilly Media*, 2009.

OE 4201 : e-Business
(Open Elective-III)

Teaching Scheme
Lectures : 3 Hrs / week

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks
Credits : 3

Prerequisites : No Prerequisites

Course Objectives :

To facilitate the learners to -

1. Understand the technological, economic and social phenomena behind rapid changes in the e-businesses
2. Have a good working knowledge of e-business concepts, applications and technologies
3. Understand the e-business models and infrastructure
4. learn how e-business concepts are applied to different fields, such as: education, banking, tourism and so on
5. Inspire with online business ideas and motivate them to apply in the real life.
6. Study the new trends in e-business, e-commerce

Course Outcome :

By the end of this course, students should be able to -

1. Compare and select appropriate e-business model
2. Apply different principles and practices of designing and developing e-business systems
3. Design efficient and secured website for the online business
4. Apply necessary back end system components required for successful e-business implementations
5. Implement intelligence in building e-business by integrating BI and KM

Unit I: Introduction **(07)**
E-commerce and e-business, advantages of e-business in growth of a business, Transition from traditional business to e-business, features of e-business technology, e-business models, IT Infrastructure requirements of e-business **Case Study :** Various e-business models

Unit II : Building e-business Websites **(7)**
Issues involved in designing a website, designing in-house websites, steps involved in website development, e-business and website development solutions, Advantages of using an e-business solution, selection of a suitable e-business solution, security issues involved in websites, tracking and analysing website traffic data. Digital Marketing **Case Study**

Unit III : e-Business Infrastruture / Back end Systems **(7)**

Back end system support requirements - security, scalability, availability, adaptability, manageability, maintainability, assurance, interoperability, load balancing; internet technology, World Wide Web, Internet software; Content management, **Case Study**

Unit IV : e-security & online payment systems **(7)**

e-Business security policy, risks and risk assessment, practice guidelines to e-security, legal framework and enforcement, ethical, social and political issues in e-business

Performance characteristics of online payment systems, online payment methods, security and risk handling in online payments, fraud detection in online payments, IT Act 2000, digital signatures, digital certificates, and PKI; **Case Study**

Unit V : Knowledge management & BI for strategic e-business **(8)**

From information processing to knowledge world, aligning knowledge with business, knowledge management platforms, state of knowledge and measuring parameters; knowledge industry, knowledge strategy, and knowledge workers

Business and Intelligence - applications and importance of business intelligence, implementation of intelligence, building BI systems, selecting BI tools, integrating BI and KM, decision-making and BI, **Case Study**

Unit VI : Launching an e-Business and e-business trends **(6)**

Launching a successful e-business – requirement analysis, managing Web site development, search engine optimization, Evaluate Web sites on design criteria.

Future and next generation of enterprise e-business, challenges and new trends, ethical and regulatory issues

References

Text Books	
1	Papazoglou, Michael and Pieter Ribbers, "E-Business : Organizational and Technical Foundations", John Wiley, 2nd Edition (Sept 2011)
2	Parag Kulkami, Sunita Jahirabadkar, Pradeep Chande, "E-Business", Oxford University Press (May 2012)
Reference Books	
1	Daniel Amor, "The E-business (R)evolution", Prentice Hall PTR (2000)
2	Kenneth Laudon, Carol Guercio, "E-commerce : Business, Technology, Society", Prentice Hall, 4th Edition (January 2008)
3	Kalakota Ravi, Marcia Robinson, "E-Business 2.0 – Roadmap for Success", Pearson Education, 2nd Edition (2004)

B.Tech. Computer Engineering Semester 1
OE 4102 : Big Data and Analytics
(Open Elective-II)

Teaching Scheme
Lectures : 3 Hrs / week

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks
Credits : 3

Prerequisites : No Prerequisites

Course Objectives :

To facilitate the learners to -

1. Understand the concepts, challenges and techniques of Big data and Big data Analytics
2. Introduce the concepts of Hadoop, Map Reduce framework and R for Big data analytics
3. Teach students in applying skills and tools to manage and analyze the big data

Course Outcome :

By the end of this course, students should be able to -

1. Design and manage a big data application using Hadoop technology framework
2. Collect, manage, store, query, and analyze various form of big data using Map-Reduce and other Big Data tools
3. Apply Big Data Analytics tools for business decisions and strategy definition
4. Implement solutions to some of the open big data problems using R
5. Compare various Data Analytic Methods and trends

Course Contents

Unit I: Introduction **(08)**
Database Management Systems, Structured Data, SQL. Big data overview, characteristics of Big Data, Applications of Big data. Unstructured data, NOSQL, Advantages of NOSQL, Comparative study of SQL and NOSQL.

Unit II : Big Data Architectures, Hadoop **(06)**
Challenges Enabling real time big data processing, Hadoop - Introduction, Building blocks of hadoop, Installing and Configuring Hadoop

Unit III: Map Reduce **(07)**
components of Hadoop, HBASE, HIVE, Map Reduce Working, the Mapper and Reducer, InputFormats and OutputFormats, Introduction to HBASE, Sqoop, Spark

Unit IV: Big data Analytics **(07)**
Data Analytical Architecture, drivers of Big Data, Emerging Big Data Ecosystem and new approach. Data Analytic Life Cycle: Discovery, Data preparation, Model Planning, Model Building, Communicate Results, Opearationalize. Case Study: GINA

Unit V : Analytics using R **(08)**

R Fundamental : Math, Variables, Strings, Vectors, Factors, Vector operations; Data structures in R : Arrays & Matrices, Lists, Data frames; R programming fundamentals : Conditions and loops, Functions in R, Objects and Classes; Working with data in R : Reading CSV and Excel Files, Reading text files, Writing and saving data objects to file in R

Unit VI : Data Analytic Methods and trends **(06)**

Statistical Methods, Machine learning methods – supervised, unsupervised; recommendation systems, Big data Visualization, Open source Tools / Techniques / Languages (R, Python etc.)

References

Text Books	
1	Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing (November 2013)
2	Data Science and Big Data Analytics, Wiley, 1st Edition (January 2015)
3	Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System concepts", McGraw Hill Education, 6th Edition (December 2013)
Reference Books	
1	Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", MC Press (November 2012)
2	Viktor Mayer-Schönberger, Kenneth Cukier, "Big Data: A Revolution that will transform how we live, work, and think", Hodder And Stoughton (October 2013)
3	J.Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big Data for Dummies", 1st Edition (April 2013)
4	Tom White, "Hadoop: The Definitive Guide", O'Reilly, 3rd edition (June 2012)

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