

IV/IV B.Tech IT Syllabus of Admitted Batch 2020-2024

UG PROGRAMME – B.TECH (IT)

W.E.F. Admitted Batch 2020-2021

DEPARTMENT OF INFORMATION TECHNOLOGY



ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(UGC AUTONOMOUS)

(Affiliated to Andhra University, Approved by AICTE & Accredited by NBA)

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| FOURTH YEAR SEMESTER – I | | | | | | | | | | | | |
|--------------------------|---------------------------------|----------|-----------|----------|-----------|----------|-----------|-----------|-----------------|----------------|-------------|-----------|
| Code | Course | Category | L | T | P | E | O | Total | Sessional Marks | External Marks | Total Marks | Credits |
| IT411 | Open Elective-4 | OE | 3 | 0 | 0 | 1 | 2 | 6 | 40 | 60 | 100 | 3 |
| IT412 | Professional Elective-4 | PE | 3 | 0 | 0 | 1 | 2 | 6 | 40 | 60 | 100 | 3 |
| IT413 | Professional Elective-5 | PE | 3 | 0 | 0 | 1 | 2 | 6 | 40 | 60 | 100 | 3 |
| IT414 | Cryptography & Network Security | PC | 3 | 0 | 0 | 1 | 3 | 7 | 40 | 60 | 100 | 3 |
| IT415 | Foundation on Data Science | PC | 2 | 1 | 0 | 1 | 2 | 6 | 40 | 60 | 100 | 3 |
| IT416 | Data Science Applications Lab | PC | 0 | 0 | 3 | 0 | 3 | 6 | 50 | 50 | 100 | 1.5 |
| IT417 | Elective Lab-2 | SC | 0 | 1 | 3 | 0 | 3 | 7 | 50 | 50 | 100 | 2.5 |
| IT418 | Project Phase-I | PR | 0 | 0 | 4 | 0 | 4 | 8 | 100 | | 100 | 2 |
| IT419 | Internship in Industry-II | PR | - | - | - | 0 | 2 | 2 | 100 | - | 100 | 2 |
| TOTAL | | | 14 | 2 | 10 | 5 | 23 | 54 | 500 | 400 | 900 | 23 |
| YEAR SEMESTER – II | | | | | | | | | | | | |
| Code | Course | Category | L | T | P | E | O | Total | Sessional Marks | External Marks | Total Marks | Credits |
| IT421 | Open Elective-5 | OE | 3 | 0 | 0 | 1 | 2 | 6 | 40 | 60 | 100 | 3 |
| IT422 | Project Phase-II | PR | 0 | 0 | 16 | 0 | 16 | 32 | 100 | 100 | 200 | 8 |
| TOTAL | | | 3 | 0 | 16 | 1 | 18 | 38 | 140 | 160 | 300 | 11 |

| YEAR - SEM | IV/IV SEM 1 |
|--------------------------------|------------------------------------|
| ELECTIVE-STREAM | PE-IV |
| Stream 1: Networks | Cloud Computing |
| Stream 2: Data Engineering | Deep Learning |
| Stream 3: Management | Intellectual Property Rights |
| Stream 4: Security & Embedded | Digital Forensics |
| Stream 5: Software Engineering | Software Project Management |
| ELECTIVE-STREAM | PE-V |
| Stream 1: Networks | Storage Area Networks |
| Stream 2: Data Engineering | Natural Language Processing |
| Stream 3: Management | Principles of Economics Management |
| Stream 4: Security & Embedded | Malware Analysis |
| Stream 5: Software Engineering | Design Patterns |
| | Elective lab 2 |
| | Mobile Application development lab |
| | Matlab |
| | Statistical Programming with R Lab |

**Note: Open Elective-4 will float by the Central
Open Elective-5 will be NPTEL/Assessment Test**

SEMESTER-1

CLOUD COMPUTING

Professional Elective-4

COURSE CODE IT412 A

L P T E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Fundamentals of Databases, Basics of Security and Privacy

Course Objectives

1. Get into insights of essential characteristics of cloud computing, architecture, and applications.
2. Understand the underlying principle of cloud virtualization, cloud storage, data management, and data visualization.
3. Understand different cloud programming platforms and tools to develop and deploy applications on the cloud.

Course Outcomes

After completion of this course, the students will be able to:

- CO 1:** Illustrate the principles and paradigm of Cloud Computing.
- CO 2:** Explore the Service Models and the role of Virtualization Technology.
- CO 3:** Categorize the Architectural Designs, and Manage the Resources of a cloud.
- CO 4:** Apply security aspects, design and build a cloud service.

Mapping of Course Outcomes with POs and PSOs

| COs/POs-PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 2 | 2 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | | 1 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | | 1 | 3 | 2 |
| CO3 | 1 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | | 1 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | | 2 | 3 | 2 |

UNIT-I Introduction to Cloud Computing (Text Book 1)

8 Lectures

Evolution of Cloud Computing System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Desired Features of Cloud Computing, Challenges and Risks, Benefits and Disadvantages of Cloud Computing, Layers and Types of Cloud; Desired Features of a Cloud.

Learning outcomes: At the end of this unit, the students will be able to

- Understand features and tasks that can be performed by the cloud.
- Describe and differentiate types of cloud.

UNIT-II Cloud Infrastructure and Virtualization (Text Book 1)

12 Lectures

Infrastructure as a Service (IaaS); On-demand Provisioning; Elasticity in Cloud; Platform as a Service (PaaS); Software as a Service (SaaS); XaaS Examples of IaaS, SaaS, and PaaS

Providers; Types of Cloud: Public, Private and Hybrid Clouds.

Cloud Resource Virtualization - Introduction to virtualization Different approaches to virtualization Hypervisors Machine Image Virtual Machine (VM) Process VM vs System VM Resource Virtualization: Server, Storage, Network Full Virtualization vs Para Virtualization Operating System Support for Virtualization Virtual Machine (resource) Provisioning and Manageability VM Placement, VM Migration

Learning outcomes: At the end of this unit, the students will be able to

- Define virtualization.
- Understand the notion of IaaS, PaaS, and SaaS.

UNIT-III Architectural Design (Text Book 1)

8 Lectures

Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning, and Platform Deployment, Global Exchange of Cloud Resources. Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards.

Learning outcomes: At the end of this unit, the students will be able to

- Explain the layered architecture of cloud.
- Explore cloud standards.

UNIT-IV Cloud Security (Text Book 1)

12 Lectures

Cloud Security: Security Overview, Cloud Security Challenges, and Risks, Software-as-a-Service Security, Cloud computing security architecture: Architectural Considerations, General Issues Securing the Cloud, Securing Data, Data Security, Application Security, Virtual Machine Security,

Identity and Presence, Identity Management and Access Control, Autonomic Security Establishing Trusted Cloud computing, Secure Execution Environments, and Communications, Identity Management and Access control Identity management, Access control, Autonomic Security Storage Area Networks, Disaster Recovery in Clouds.

Learning outcomes: At the end of this unit, the students will be able to

- Describe requirements for security.
- Explore IAM (Identity Access Management)

UNIT-V Case-Studies (Text Book 2)

5 Lectures

Cloud-Based Case-Studies: Amazon EC2 (Virtualization), S3 (Storage), VPC (Virtual Private Cloud), IAM (Security), Cloud Watch (Deployment, Management service).

Learning outcomes: At the end of this unit, the students will be able to

- Describe features like storage and security.
- Explore well-known cloud services.

Text Books

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley (Unit-I to IV)
2. Dan C Marinescu, Cloud Computing, Theory, and Practice, MK Elsevier (Unit-V)

References

1. Mastering Cloud Computing by Rajkumar Buyya, C. Vecchiola& S. Thamarai Selvi McGraw Hill Publication (Unit-I to IV)
2. Miller Michael, “Cloud Computing: Web-Based Applications that Change the Way You Work and Collaborate Online”, Pearson Education India (Unit-I to IV)
3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing – A Practical Approach, Tata McGraw Hill Education (Unit-I to IV)

Online Resources

1. <https://www.geeksforgeeks.org/cloud-computing/>
2. https://www.tutorialspoint.com/cloud_computing/cloud_computing_virtualization.htm
3. <https://www.javatpoint.com/cloud-computing-architecture>

DEEP LEARNING
(Professional Elective-IV)

COURSE CODE IT412 B
L T P E O
3 0 0 1 2

CREDITS3
Sessional Marks:40
End Exam Marks:60
End Exam: 3Hours

Prerequisite(s): Probability, Linear Algebra, Knowledge of machine learning concepts.

Course Objectives

1. To present the mathematical, statistical and computational challenges of building neural networks.
2. To acquire the knowledge on fundamental concepts of deep learning.
3. To enable the students to know deep learning techniques to support real-time applications.

Course Outcomes

After completion of the course, the students will be able to:

- CO 1:** Demonstrate the mathematical foundation of neural network.
- CO 2:** Analyze the Learning Networks in modeling real-world systems.
- CO 3:** Identify the appropriate architectures and applications to train the deep models in different domains.
- CO 4:** Apply optimization strategies for large-scale applications.

Mapping of Course Out comes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 2 | | | | 1 | | 1 | 1 | 1 | | 1 | 3 | 2 |
| CO2 | 2 | 3 | 2 | | | | | 2 | 2 | 2 | | 1 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 3 | 3 | 1 | 2 | 3 | 3 | 1 | 1 | 1 | 3 | 2 |
| CO4 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | | 1 | 3 | 2 |

UNIT-I

9Lectures

Introduction to Deep Learning: Basics of Deep Learning. History of Deep Learning, Basic of neural network, McCulloch Pitts Neuron, Bayes' Rule.

Foundations of Neural Networks and Deep Learning: Scalars, Vectors, Thresholding Logic, Variance and Covariance, Perceptrons, PCA, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Cost Function, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks, Back propagation.

Learning outcomes: At the end of this unit, the students will be able to

- Describe basics of mathematical foundation that will help the learner to understand the concepts of Deep Learning.
- Understand and describe model of deep learning

UNIT-II

9Lectures

Deep Learning Models: Building Blocks of Deep Learning, Architectures of Deep Learning: Unsupervised Pre trained Networks, Convolution Neural Networks (CNN's), Boltzmann machine introduction, Restricted Boltzmann Machines.

Deep Learning Models: Autoencoders, Recurrent Neural Networks. Recursive Neural Tensor Nets, Deep Belief Nets.

Learning out comes: At the end of this unit, the students will be able to

- Understand and learn the various deep learning models.
- Able to apply the appropriate model.

UNIT-III

9Lectures

Introduction to various CNN Architectures: Convolutional Neural Networks: LeNet-5, Alex Net, VGG Net.

Recurrent Neural Networks: Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs.

Learning outcomes: At the end of this unit, the students will be able to

- Distinguish the concepts of CNN and RNN.
- Able to apply the appropriate architecture to train the models.

UNIT-IV

9Lectures

Generative modeling algorithms: Generative Adversarial Networks, Discriminator.

Applications: Diverse applications: Image captioning, visual question answering, Reinforcement Learning basics, Q-learning, Deep Reinforcement Learning (Deep Q-learning) and Network Visualization.

Learning outcomes: At the end of this unit, the students will be able to

- Able to train the model using GAN
- Solve the Real time problems using suitable model.

UNIT-V

9Lectures

Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms.

Optimization Strategies: Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the various strategies.
- Able to apply the suitable optimization strategy.

Text Books

1. Neural Networks and Deep Learning: A Textbook Book by Charu C. Aggarwal (Unit-2: Ch-2, 4, 6, 7; Unit-3: Ch-3,7 & 8; Unit-4: Ch-10)
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016 (Unit-1: Ch-2, 3, 4, 5 & 6; Unit-5: Ch-8).

Reference Books

1. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.
2. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
3. Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O'Reilly, Shroff Publishers, 2019.

ONLINE RESOURCES

1. <http://www.saying.ren/slides/opt4dl>
2. <https://deeplearningtutorials.readthedocs.io/en/latest/lenet>
3. <http://neuralnetworksanddeeplearning.com/index.html>
4. <https://www.deeplearningbook.org/>

CHANGE OF SYLLABUS:

| Previous Unit No (R19) | Current Unit No (R20) | Changes Incorporated |
|-------------------------------|------------------------------|--|
| Unit-1 | Unit-1 | <u>Topics included</u> <ul style="list-style-type: none">• cost function 10% concepts relevant to Deep Learning are included |
| Unit-2 | Unit-2 | <u>Topics included</u> <ul style="list-style-type: none">• Boltzmann machine introduction 5% concepts relevant to Deep Learning are included |
| Unit-3 | Unit-3 | <u>Topics ignored</u> <ul style="list-style-type: none">• Res Net. 2% concepts relevant to Deep Learning are excluded |
| Unit-4 | Unit-4 | <u>Topics included</u> <ul style="list-style-type: none">• Reinforcement Learning basics, Q-learning, Deep Reinforcement Learning (Deep Q-learning) 10% concepts relevant to Deep Learning are included |
| Unit-5 | Unit-5 | <u>Topics ignored</u> <ul style="list-style-type: none">• Optimization Strategies 2% concepts relevant to Deep Learning are excluded |
| Overall change: 29% | | |

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/Entrepreneurship |
|---------------------------|--------------------|-----------------------------|---|--|
| DEEP LEARNING | IT413 | R19 (2022) | Google Net, Res Net, Deep Reinforcement Learning, Network Visualization. | Employability |

INTELLECTUAL PROPERTY RIGHTS

(Professional Elective-IV)

COURSE CODE IT412 C

L P T E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

PREREQUISITE(S): Not required.

Course Objectives

1. Understand intellectual property rights and law of copy rights.
2. Procedure to apply various patents for innovative ideas and products.
3. Aware various trade laws in the field of business.

Course Outcomes

After completion of this course, the students will be able to:

CO-1: Analyse the importance of Intellectual property rights and its usage.

CO-2: Illustrate various international laws in trade policies.

CO-3: Identify the international trade secrets trade secret litigation.

CO-4: Analyse international trade and copy right laws

Mapping of Course Outcomes with POs and PSOs

| COs/POs- PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 |
| CO2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 |
| CO3 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 |
| CO4 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 |

UNIT I (Textbook 1)

10 Lectures

Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the importance of intellectual property rights.
- Understand the types of intellectual property.

UNIT II (Textbook 1 & 3)

10 Lectures

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes. Geographical Indications: Concept, definition, significance in business, registration of GI, GI and Trade Marks.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the purpose of trademarks
- Identify Trademark rights and Geographical Indications.

UNIT III (Textbook 1 & 2)

9 Lectures

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of

copy right, international copy right law.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the fundamentals of copy right law.
- Analyse copy right ownership issues.

UNIT IV (Textbook 1)

9 Lectures

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation

Learning outcomes: At the end of this unit, the students will be able to

- Understand Trade secret law
- Analyse trade secret litigation

UNIT V (Textbook 2)

9 Lectures

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international trade mark law.

Learning outcomes: At the end of this unit, the students will be able to

- Analyse the patent law
- Analyse the copyright law

Text Books

1. Deborah, E. Bouchoux, Cengage learning, Intellectual property right,
2. Prabuddha Ganguli, Intellectual property right – Unleashing the knowledge economy, Tata Mc Graw Hill Publishing Company Ltd.
3. The protection of geographical indication (Law and Practice) 2nd Edition, by Michael Blakeney, 2019, ISBN: 9781788975407.

References

1. A guide to filing a design patent application. USPTO, 2009.
2. How to make patent drawings yourself: prepare formal drawings required by the U.S. Patent Office. By Jack Lo and David Pressman. Nolo Press, 2007.

DIGITAL FORENSICS

(Professional Elective-IV)

COURSE CODE IT412 D

L P T E O

3 0 0 1 2

CREDITS: 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Cyber Security

Course Objective:

1. To understand the basic digital forensics techniques for conducting the forensic examination on different digital devices.
2. To understand how to examine digital evidences such as the data acquisition, identification analysis.

Course Outcomes:

After completion of this course, the students will be able to:

CO-1: Define the concept of ethical hacking and its associated applications in Information Communication Technology (ICT) world.

CO-2: Underline the need of digital forensic and role of digital evidences.

CO-3: Illustrate the methodology of incident response and various security issues in ICT world and identify digital forensic tools for data collection.

CO-4: List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools.

Mapping of Course Outcomes with POs and PSOs

| COs/POs-PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | | | 3 | 2 | 3 | | | | 2 | 2 | 2 |
| CO2 | 3 | 2 | 1 | 1 | | 3 | 2 | 3 | | | | 2 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | | | | 3 | 3 | 2 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | | | | 3 | 2 | 2 |

UNIT –I Introduction to forensics (Text book-I)

8 Lectures

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the fundamentals of digital forensics.
- Identify legal procedures in relation to cyber-crime.

UNIT – II Investigations (Text book-I)

8 Lectures

Understanding Computing Investigations–Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the procedures for conducting investigations.
- Conduct investigations in relation to cyber-crime.

UNIT – III Data Acquisition and its tools (Text book-I)**10 Lectures**

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Case study on disk analysis tools- Autopsy/the Sleuth Kit, volatility

Learning outcomes: At the end of this unit, the students will be able to

- Handle data acquisition tools.
- Analyze several formats of data during a forensic case

UNIT – IV Case Analysis (Text book-I)**10 Lectures**

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

Case study on Digital forensic tool kit –FTK toolkit(FTK user guide book)

Learning outcomes: At the end of this unit, the students will be able to

- Idealize a crime scene.
- Analyze an crime scene and collecting evidences.

UNIT – V Digital forensics tools (Text book-II)**10 Lectures**

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Learning outcomes: At the end of this unit, the students will be able to

- Understand various tools in relation to cyber forensics.
- Analyze several crime related to E-mail.

Text Books:

1. Warren G. Kruse II and Jay G. Heiser, “Computer Forensics: Incident Response essentials”, Addison Wesley, 2002.(unit-1,2,3&4)
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., “Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5. (unit-5)

Reference Books:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.
2. FTK User guide book

SOFTWARE PROJECT MANAGEMENT

Professional Elective-IV

COURSE CODE: IT413 E

L P T E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks :60

End Exam: 3 Hours

Pre-Requisite(s): Software models and Software testing

Course Objectives:

This course is aimed at introducing the primary important concepts of project management related to managing software development projects.

1. They will also get familiar with the different activities involved in Software Project Management.
2. They will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

Course Outcomes:

After completion of the course, the student will be able to:

CO-1: Determine the principles of software project management.

CO-2: Demonstrate cost estimation.

CO-3: Analyse risk management and control the project.

CO-4: Estimate the Quality of software project.

Mapping of Course Outcomes with POs and PSOs

| COs/POs-PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 2 | 2 | 2 | 2 | 2 | - | 1 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | - | 1 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | - | 2 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO4 | 2 | 2 | 2 | 2 | 2 | 3 | - | 1 | 3 | 3 | 3 | 2 | 3 | 3 |

UNIT-I:

8 Lectures

Project evaluation and project planning :Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost- benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Learning outcomes: At the end of this unit student will be able to learn

- Identify the importance of project management control
- Summarize the use of Risk evaluation

UNIT-II: 8 Lectures

Project life cycle and effort estimation : Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points

Learning outcomes: At the end of this unit student will be able to learn

- Summarize the Agile methods to produce shorter development cycles.
- Listing Cost estimation techniques.

UNIT-III: 10 Lectures Activity planning and risk management: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring .

- Measuring internal product attributes.
- Identify the importance of CRM method.

UNIT-IV: 10 Lectures Staffing in software projects : Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

Learning outcomes: At the end of this unit student will be able to learn

- Estimate goods
- Dealing problems of current estimation methods

UNIT-V: 10 Lectures Software Project Management: General management, introduction to software project management, Conventional software management, project initiation, feasibility study, project planning, project evaluation, resource allocation, project monitoring, project control, case studies

Learning outcomes: At the end of this unit student will be able to learn

- Apply different techniques to Monitoring the project
- Measure the software quality

Text Books:

1. Software Project Management -Bob Hughes, Mike Cotterell and Rajib Mall: – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

Reference Books:

1. “Effective Software Project Management” SRobert K. Wysocki – Wiley Publication, 2011.
2. “Software Project Management”-Walker Royce: Addison-Wesley, 1998.

STORAGE AREA NETWORKS

(Professional Elective – V)

COURSE CODE: IT413 A

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite: Basic knowledge of Computer Networks and various types of networks and Network Layers.

Course Objective:

1. Ability to demonstrate storage area networks and their products and to provide the mechanisms for backup/recovery.

Course Outcomes:

After completion of this course, the students will be able to:

CO 1: Describe Storage Area Networks characteristics and components.

CO 2: Become familiar with the SAN application environment, network storage and topologies

CO 3: Identifying the issues and down time's in relation with the SAN failure

CO 4: Analyze and understand the security and monitoring aspects in SAN's

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 1 | | | 1 | | 1 | | | 1 | | | 2 | 1 | |
| CO2 | 2 | | 2 | 2 | | 1 | | | 1 | | | 2 | 2 | |
| CO3 | 2 | | | 2 | | 1 | | | 1 | | | 2 | 2 | |
| CO4 | 2 | | | 3 | | 1 | | 2 | 1 | | | 2 | 2 | |

UNIT I

15 Lectures

Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications.

UNIT II

10 Lectures

Concept of RAID and its components , Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system Evolution of networked

storage, Architecture, components, and topologies of FC- SAN, NAS, and IP-SAN , Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfills the need , Understand the appropriateness of the different networked storage options for different application environments

UNIT 3

10 Lectures

List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures.

UNIT 4:

10 Lectures

Architecture of backup/recovery and the different backup/recovery topologies replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities.

Unit 5:

10 Lectures

Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center. Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain Virtualization technologies, block-level and file-level virtualization technologies and processes.

Text Books:

1. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.

Reference Books:

1. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.
2. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002

NATURAL LANGUAGE PROCESSING

(Professional Elective – V)

COURSE CODE: IT413 B

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Statistics, FLAT

Course Objectives

1. Learn the basics of natural language processing and understand various steps in it.
2. Introduce the fundamentals of language processing from the algorithmic viewpoint.
3. Discuss various issues that make natural language processing a hard task.
4. Discuss some well-known applications of natural language processing

Course Outcomes

After completion of this course, the students will be able to:

CO-1: Describe the fundamental concepts and techniques of natural language processing.

CO-2: Analyse syntactically and semantically to avoid ambiguity.

CO-3: Generate and translate various languages.

CO-4: Analyse large volume text data generated from a range of real-world applications.

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 1 | | | 2 | 1 | 1 | 1 | 1 | | | 1 | 3 | 2 |
| CO2 | | 3 | | 1 | 2 | | | 1 | 1 | | | 1 | 3 | 2 |
| CO3 | 2 | 2 | 1 | 1 | 2 | | | 1 | | | | 1 | 3 | 2 |
| CO4 | | 3 | 2 | 2 | 2 | | | 1 | 1 | | | 1 | 3 | 2 |

UNIT I

9 Lectures

Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art, Some Brief History

Regular Expressions: Basic Regular Expression Patterns, Disjunction, Grouping, and Precedence, Advanced Operators, Regular Expression Substitution

Finite State Automata: Using FSA to recognize sheeptalk, Formal Languages, Non-deterministic FSAs, Using NFSA to accept strings, Recognition as search, Relating deterministic and non-deterministic automata, Regular languages and FSAs

Learning outcomes: At the end of this unit, the students will be able to

- have an overview on key concepts of language processing
- realize the need for natural language processing

UNIT II

9 Lectures

N-grams: Counting words in corpora, Simple N-grams, Training and Test sets, Evaluating N-grams, Smoothing, Interpolation, Backoff

Part-of-Speech Tagging: English Word Classes, Tagsets for English, Part-of-speech tagging, Rule-based part-of-speech tagging, HMM part-of-speech tagging, Transformation-based tagging, Evaluation and Error Analysis

Learning outcomes: At the end of this unit, the students will be able to

- Explore the N-grams and understand smoothing, interpolation
- Understand different types of part-of-speech tagging

UNIT III

9 Lectures

Formal Grammars of English: Constituency, Context-Free Grammars, Grammar equivalence and normal form, Finite-state and context-free grammars, Dependency grammars, Spoken language syntax

Parsing with CFG: Parsing as search, Ambiguity, Search in the face of ambiguity, Dynamic programming parsing methods, Partial parsing

Learning outcomes: At the end of this unit, the students will be able to

- Understand grammar rules for English
- Apply different parsing methods

UNIT IV

9 Lectures

Statistical parsing: Probabilistic context-free grammars, Probabilistic CKY parsing, Learning PCFG rule probabilities, Improving PCFGs, Probabilistic lexicalized CFGs, Evaluating parsers

Lexical Semantics: Word Senses, Relations between senses, WordNet, Event participants, Primitive decomposition

Learning outcomes: At the end of this unit, the students will be able to

- Understand the importance of statistical parsing
- Understanding lexical semantics

UNIT V

9 Lectures

Computational Lexical Semantics: Word sense disambiguation, Supervised word sense disambiguation, WSD evaluation, baselines, ceilings, dictionary and thesaurus methods, Word similarity

Applications: Question answering and summarization, Machine translation

Learning outcomes: At the end of this unit, the students will be able to

- Understand computational lexical semantics
- Explore real world applications

Text Books

1. Daniel Jurafsky, James H. Martin, Speech and Language Processing, Pearson publications, 2nd Edition.

References

1. Machine Learning for Text by Charu C. Aggarwal, Springer, 2018 edition
2. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT press, 1999
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition, 2009
4. Roland R. Hausser, Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Paperback, MIT press, 2011

Change of syllabus:

| Previous Unit No (R19) | Current Unit No (R20) | Changes Incorporated |
|-------------------------------|------------------------------|---|
| Unit-3 | Unit-3 | <u>Topics ignored</u> <ul style="list-style-type: none">• Some grammar rules for English, Treebanks |
| Unit-4 | Unit-4 | <u>Topics ignored</u> <ul style="list-style-type: none">• Problems with PCFG. |
| Overall change: 3% | | |

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/Entrepreneurship |
|-----------------------------|--------------------|-----------------------------|---|--|
| Natural Language Processing | IT422 | 2022 | HMM part-of-speech tagging WordNet Machine Translation | Skill development |

PRINCIPLES OF ECONOMICS MANAGEMENT

(Professional Elective V)

COURSE CODE: IT413 C

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisites: Linear and non-linear data structures, working experience of any one structured programming language

Course Objective:

1. The course is intended to identify and analyze the optimal quantity and pricing decisions of firms in different market structures, and understand the basic principles of management.

Course Outcomes:

After completion of this course, the students will be able to:

CO-1: Analyze how elasticity affects revenue.

CO-2: Relate production function and cost function.

CO-3: Analyze the optimal quantity and pricing decisions of firms in different market Structures (perfect competition, monopoly, monopolistic competition) to achieve profit maximization.

CO-4: Describe the basic principles of management: planning, organizing, controlling, and directing

CO-5: Analyze ethical dilemmas faced by business and managers

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| CO2 | | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 |
| CO3 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | 2 |
| CO4 | | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | 2 |

UNIT I

9 Lectures

Introduction to Economics: Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics Theory of Demand & Supply: law of demand, law of supply, equilibrium between demand & supply Elasticity: elasticity of demand, price elasticity, income elasticity, cross elasticity

Theory of production: production function, meaning.

Learning Outcomes: At the end of this unit, the students will be

- skilled in critical thinking and decision-making, supported by economic principles and best practices in business.

UNIT II

9 Lectures

Cost: meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost, Break even analysis: meaning, explanation, numerical. Markets: meaning, types of markets & their characteristics (Perfect Competition, Monopoly,

Monopolistic Completion, Oligopoly) National Income: meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP.

Learning Outcomes: At the end of this unit, the students will be able to

- Students will have the ability to use data to inform economic and business decision making.

Unit III

9 Lectures

Basic economic problems: Poverty-meaning, absolute & relative poverty, causes, measures to reduce Unemployment: meaning, types, causes, remedies, Inflation: meaning, types, causes, measures to control Money: meaning, functions, types, monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools Banking: meaning, types, functions, Central Bank- RBI: its functions, concepts: CRR, bank rate.

Learning Outcomes: At the end of this unit, the students will be able to

- Students will be able to comprehend economics-related writing.

Unit IV

9 Lectures

Introduction to Management: Definitions, Nature, Management, Difference between Management & administration, skill, types and roles of managers, Management Principles: Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory,

Learning Outcomes: At the end of this unit, the students will be able to

- Students will be able to put together quantitative reports as well as to evaluate reports put together by others.

Unit V

9 Lectures

Functions of Management; Planning, Organizing, Staffing, Directing, Controlling (meaning, nature and importance) Organizational Structures; meaning, principles of organization, types- formal and informal, line, line & staff, matrix, hybrid (explanation with merits and demerits), span of control, departmentalization, chain of command, centralization and decentralization

Learning Outcomes: At the end of this unit, the students will be able to

- Work effectively in teams and to address strategic and organizational challenges.

Text Books:

1. Engineering Economics, R.Paneerselvam, PHI publication

Reference Books:

1. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning
2. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.
3. Modern Economic Theory, By Dr. K. K. Dewett & M. H. Navalur, S. Chand Publications

Web Resources:

1. <https://www.managementstudyguide.com/principles-managerial-economics.htm>
2. <https://www.sciencedirect.com/book/9780323998628/principles-of-economics-and-management-for-manufacturing-engineering>

MALWARE ANALYSIS

(Professional Elective V)

COURSE CODE: IT413 D

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam:3 Hours

Prerequisite: Basic knowledge of Computer Networks and various types of attacks.

Course Objective:

1. The goal of malware analysis is to gain an understanding of how a specific piece of malware functions so that defenses can be built to protect an organization's network.

Course Outcomes:

After completion of this course, the students will be able to:

CO1: Analyze the nature of malware, its capabilities, and how it is combated through detection and classification

CO2: Apply the tools and methodologies used to perform static and dynamic analysis on unknown executables.

CO3: Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysis techniques in future malware samples.

CO4: Broad understanding of the social, economic, and historical context in which malware occurs.

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | | 1 | | 1 | 2 | 2 | 1 | 2 | | 3 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 2 |
| CO4 | | | | | | 3 | 3 | 3 | 3 | 3 | | 3 | 3 | 2 |

UNIT 1:

9 Lectures

Introduction to malware, OS security concepts, malware threats, evolution of malware, malware types, viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs, malware analysis, static malware analysis, dynamic malware analysis.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand what exactly malware is?
- Analyze malware.

UNIT 2:

9 Lectures

Basic Static Analysis: Antivirus Scanning, Fingerprint for Malware, Portable Executable File Format, The PE File Headers and Sections.

Malware Analysis In Virtual Machines: The Structure of a Virtual Machine.

Introduction to x86 architecture: Memory, instructions, opcodes, operands, registers,

functions, stack. - The difference between source code and compiled code.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand how to analyze malware
- Know about various tools to analyze the malware.

UNIT 3:

9 Lectures

Dynamic Analysis: Live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, api-calls, registries, network activities. Anti-dynamic analysis techniques anti-vm, runtime-evasion techniques , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching

Learning Outcomes: At the end of this unit, the students will be able to

- Understand What dynamic analysis and what are different techniques to handle them.
- Trace and debug the malware.

UNIT 4:

9 Lectures

Malware Functionality: Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand how to analyze malware
- Know about various tools to analyze the malware.

UNIT 5:

9 Lectures

Malware Detection Techniques: Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant inferences.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand how to detect various malwares.
- Apply different techniques to detect various malware.

Text Book:

1. Practical malware analysis The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6, 2012 2

References Books:

1. Computer viruses: from theory to applications by Filiol, Eric Springer Science & Business Media, 2006
2. Android Malware by Xuxian Jiang and Yajin Zhou, Springer ISBN 978-1-4614-7393-0, 2005
3. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN:978-0-07-159119-5, 2010 Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015

List of open source software/learning websites:

- <http://www.malware-analyzer.com>
- <http://resources.infosecinstitute.com/malware-analysis-basic-dynamic-techniques/#gref>
- <http://www.remux.org>

DESIGN PATTERNS

(Professional Elective V)

COURSE CODE: IT413 E

L P T E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks:60

End Exam: 3Hours

Pre-Requisite(s): Database Management System

Course Objectives

1. Understand the concept of Design patterns and its importance.
2. Understand the behavioural knowledge of the problem and solutions.
3. Relate the Creational, Structural, behavioural Design patterns.
4. Apply the suitable design patterns to refine the basic design for given context..

Course Outcomes

After completion of the course, the student will be able to:

CO-1: Identify the appropriate design patterns to solve object oriented design problems.

CO-2: Develop design solutions using creational patterns.

CO-3: Apply structural patterns to solve design problems.

CO-4: Construct design solutions by using behavioural patterns.

Mapping Of Course Outcomes With Pos And Psos

| CO's/PO's - PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 2 | 1 | 1 | 3 | | | | 2 | 2 | | 2 | 2 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 3 | | | | 2 | 2 | | 2 | 2 | 1 |
| CO3 | 3 | 2 | 1 | 1 | 3 | | | | 2 | 2 | | 2 | 2 | 1 |
| CO4 | 3 | 2 | 1 | 1 | 3 | | | | 2 | 2 | | 2 | 2 | 1 |

UNIT-I:

8 Lectures

Introduction: What is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, Catalog of Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

Learning Outcomes: At the end of this unit student will be able to learn

- Listing contents of Catalog of design patterns.
- Determine Object granularity and specify object interface.

UNIT-II:

10 Lectures

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation, Summary. Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

Learning Outcomes: At the end of this unit student will be able to learn

- Identify the importance of structural patterns
- Review the importance of prototype pattern

UNIT-III:

10 Lectures

Structural Patterns Part I: Adapter, Bridge, Composite. Structural Patterns Part II: Decorator, Facade, Flyweight, Proxy.

Learning Outcomes: At the end of this unit student will be able to learn

- Summarizes the implementation issues when applying the bridge pattern
- Use of observer, state, strategy in behavioural pattern.

UNIT-IV:

10 Lectures

Behavioral Patterns Part I: Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns Part II: Mediator, Memento, Observer..

Learning Outcomes: At the end of this unit student will be able to learn

- Summarizes the implementation issues when applying the Chain pattern
- Identify the importance of Mediator in behavioural patterns

UNIT-V:

10 Lectures

Behavioral Patterns Part III (Cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

Introduction to Micro Services: Introduction and usage of micro services.

Learning Outcomes: At the end of this unit student will be able to learn

- Outline the importance of behavioural pattern.
- Summarize the importance of design patterns.

Text Books:

1. Design Patterns By Erich Gamma, Pearson Education, 2015.

Reference Books:

2. Head First Design Patterns By Eric Freeman-Oreilly-sp
3. Meta Patterns designed by Wolf gang, Pearson.

CRYPTOGRAPHY & NETWORK SECURITY

COURSE CODE: IT414

L T P E O

3 0 0 1 3

CREDITS: 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3Hours

Prerequisite(S): Mathematical Foundations

Course Objectives:

1. Learn fundamentals of cryptography and its application to network security.
2. Understand network security threats, security services, and countermeasures. Including basic encryption techniques, cryptographic algorithms, authentication and digital signature, public key infrastructure, access control, security models, as well as their applications to IP security, Web security, trusted operating systems.
3. Understand vulnerability analysis of network security.
4. Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.

Course Outcomes:

After completion of this course, the students will be able to:

CO-1: Identify some of the standard algorithms to encrypt and decrypt information.

CO-2: Develop strategies to protect organization information assets from common attacks.

CO-3: Identify how authentication is implemented in wireless systems

CO-4: Acquire knowledge on the role of a “professional computing practitioner” with particular regard to an understanding of legal and ethical issues.

Mapping of Course Outcomes with POs and PSOs

| COs/POs-PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO 9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | 3 | 3 | | 3 | 2 | | | | | | | | | |
| CO2 | 3 | 2 | 3 | | | 2 | | | | | | 2 | | |
| CO3 | 1 | 1 | 2 | 3 | 1 | | | | | | 2 | | | |
| CO4 | 1 | | 1 | | | | | 3 | | | | | | |

UNIT –I

12Periods

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Mathematics of Cryptography: Integer Arithmetic, the extended Euclidean Algorithm, Modular Arithmetic, Matrices, Linear Congruence. Algebraic Structures, Basics of Groups, Rings, Primes- Euler’s Phi-Function, Fermat’s Little Theorem, Euler’s Theorem, Chinese Remainder Theorem.

Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and

asymmetric key cryptography, stenography, key range and key size, possible types of attacks

Learning outcomes: At the end of this unit, the students will be able to

- Learn the different types of attacks.
- Learn the different cryptographic techniques.

UNIT – II

(10 Periods)

Symmetric key Ciphers: Introduction, Algorithm modes and types, An overview of symmetric key cryptography, Modern Block Ciphers and Components of Modern Block Ciphers, Algorithms- DES, AES, Differential and Linear Cryptanalysis.

Asymmetric key Ciphers: Principles of public key crypto systems, Algorithms(RSA, Diffie-Hellman), Key Distribution, Diffie-Hellman Key exchange algorithm.

Learning outcomes: At the end of this unit, the students will be able to

- Learn the different Public key cryptographic techniques.
- Learn the different Private key cryptographic techniques.

UNIT – III

(10Periods)

Message Integrity, Message Authentication Algorithms and Hash Functions: Message integrity, Authentication requirements, Message authentication codes, Hash Functions, Secure hash algorithm (SHA-256, 512), HMAC, Digital signatures.

Authentication Applications: Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication.

Learning outcomes: At the end of this unit, the students will be able to

- Learn the different Message authentication techniques.
- Learn the different authentication applications.

UNIT – IV

(8Periods)

E-Mail Security: E-mail System, Pretty Good Privacy, S/MIME

IP Security: IP security overview, IP Security architecture, Authentication Header, Encapsulating security payload.

Learning outcomes: At the end of this unit, the students will be able to

- Learn the different security at application layer.
- Learn the difference between PGP and S/MIME.

UNIT – V

(10Periods)

Web Security: Web security considerations, SSL Message Formats, Secure Socket Layer and Transport Layer Security, Secure electronic transaction

Intruders, virus and Firewalls: Intruders, Intrusion detection, password management, virus and related threats, Countermeasures, Firewall design principles, types of firewalls

Learning outcomes: At the end of this unit, the students will be able to

- Learn the different security at Transport layer
- Learn the different intruders and firewalls

Text Books:

1. William Stallings, Cryptography And Network Security, 4th Edition, (Pearson Education/PHI).
2. Cryptography and Network security, Atul Kahate, Tata McGraw-Hill Pub company Ltd., NewDelhi.

References:

1. Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., NewDelhi
2. Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi
3. Network Security: The Complete Reference by Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg Tata McGraw-Hill.

Change of Syllabus

| Previous Unit No (R19) | Current Unit No (R23) | Changes Incorporated |
|-----------------------------------|------------------------------|---|
| Unit-1 | Unit-1 | <u>Topics included</u> Euler's Phi-Function, Fermat's Little Theorem, Euler's Theorem, Chinese Remainder Theorem. 10% concepts relevant to cryptography are included |
| Unit-2 | Unit-2 | <u>Topics ignored</u> <ul style="list-style-type: none">• IDEA, Blowfish, RC4, ECC 2% concepts relevant to cryptography are excluded |
| Unit-3 | Unit-3 | <u>Topics included</u> <ul style="list-style-type: none">• Secure hash algorithm (SHA-256, 512) <u>Topics ignored</u> <ul style="list-style-type: none">• Functions, Whirlpool, CMAC 5% concepts relevant to cryptography are included |
| Unit-4 | Unit-4 | <u>Topics ignored</u> <ul style="list-style-type: none">• Combining security associations. 2% concepts relevant to cryptography are excluded |
| Unit-5 | Unit-5 | <u>Topics ignored</u> <ul style="list-style-type: none">• Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections. 2% concepts relevant to cryptography are excluded |
| <u>Overall change: 21%</u> | | |

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/Enterprenuership |
|---------------------------------|--------------------|-----------------------------|--|--|
| CRYPTOGRAPHY & NETWORK SECURITY | IT414 | R15 | Attacks on Computers and Computer Security, Cryptography: Concepts and Techniques, Symmetric key Ciphers, Asymmetric key Ciphers, Message Integrity, Message Authentication Algorithms and Hash Functions, E-Mail Security, IP Security, Web Security, Intruders, virus and Firewalls, Database Security | Mapping with Employability |

FOUNDATION ON DATA SCIENCE

COURSE CODE IT415

L T P E O

2 1 0 1 2

CREDITS3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Probability and Statistics, Algorithms, Python Programming

Course Objectives

1. To identify the types of data, understand about how to collect the data, manage the data.
2. Familiarize the student about the concepts of data visualization and formal inference procedures.
3. Demonstrate the applications of data science, technologies for visualization.

Course Outcomes

After completion of this course, the students will be able to:

CO-1: Apply explorative data analysis for solving real world business problems, and effectively present results using data visualization techniques

CO-2: Apply social network analysis techniques and financial modelling techniques for the given problem.

CO-3: Apply principles of Data Science for the analysis of the given business problem and build recommendation engine.

CO-4: Apply classification and regression algorithms to build machine intelligence.

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |
| CO3 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |
| CO4 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |

UNIT-I Introduction

9 Lectures

Introduction: What is Data Science, Statistical Inference, Exploratory Data Analysis, and Data Science Process: Statistical thinking in the Age of Big Data, Exploratory Data Analysis, The Data science process.

Learning outcomes: At the end of this unit, the students will be able to

- understand the basic concepts of data science
- Understand the data science process.

UNIT-II Algorithms

9 Lectures

Machine Learning Algorithms: Three basic algorithms Linear Regression, k-Nearest Neighbour's (K-NN), k-means,

Spam Filters, Naïve Bayes, and Wrangling: Naïve Bayes, comparing Naïve Bayes to k-NN

Learning outcomes: At the end of this unit, the students will be able to

- Comparing the three basic machine learning algorithms

UNIT-III Financial Modeling

9 Lectures

Logistic Regression: Classifiers, M6D Logistic Regression Case Study Time stamps and Financial Modeling: Timestamps, Financial Modeling

Learning outcomes: At the end of this unit, the students will be able to

- Apply Logistic regression classifier for binary classification problem
- Understand Financial Modelling

UNIT-IV Visualization

9 Lectures

Recommendation Engines: Building a User-Facing Data Product at Scale: A Real World Recommendation Engine.

Data Visualization and Fraud Detection: Marks Data Visualization Projects, Data Science and Risk.

Learning outcomes: At the end of this unit, the students will be able to

- Implement Recommendation Engine
- Understand data visualization projects

UNIT-V Social Networks

9 Lectures

Social Networks and Data Journalism: Social Network Analysis at Morning Analytics, social network analysis, terminology from social networks, morning side analytics, Data Journalism

Learning outcomes: At the end of this unit, the students will be able to

- understand the various concepts of social network analysis
- understand data journalism

Text Books

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline, O'Reilly,2013.

References

1. Python Data Science Handbook: Essential Tools for Working with Data, from Shroff/O'Reilly; First edition (1 January 2016)
2. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v2.1, Cambridge University Press, 2014.

Change of Syllabus:

No Change

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/Entrepreneurship |
|-----------------------------|-------------|----------------------|--|---|
| Foundations of Data Science | IT415 | 2022 | Three basic algorithms Linear Regression, k-Nearest Neighbour's (K-NN), k-means, A Real World Recommendation Engine. | skill development |

DATA SCIENCE APPLICATIONS LAB

COURSE CODE IT416

LTPEO

00303

CREDITS 1.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3 hours

Prerequisite(S): Statistics, Python programming language

Course Objectives

1. To be able to formulate machine learning problems corresponding to different applications.
2. To understand a range of machine learning algorithms along with their strengths and weaknesses.
3. To be able to apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes:

After completion of this course, the students will be able to:

CO-1: The implementation procedures for the ensemble and clustering machine learning algorithms

CO-2: Creating static, animated, and interactive visualizations using Matplotlib.

CO-3: Identify and apply Machine Learning algorithms to solve classification and regression problems.

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |
| CO3 | 3 | 2 | 1 | 1 | 3 | | | 1 | 1 | 1 | | 1 | 3 | 1 |

| S. No. | Program | Course Outcomes |
|--------|--|-----------------|
| 1 | Introduction to Python Libraries- Numpy, Pandas, Matplotlib, Scikit, Bokeh Data Visualization using Bar Graph, Pie Chart, Box Plot, Histogram, Line Plots, scatter plots Case Study: Analyze sports data and answer the following questions: a) Which country played the most matches. b) Top 3 countries who won the most matches. c) which country played most matches in home ground d) How was the performance of any country e) Team which toured most foreign country f) Month in which matches are played | CO2 |
| 2 | Perform Data exploration and pre-processing in Python. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data. | CO2 |

| S. No. | Program | Course Outcomes |
|--------|--|-----------------|
| 3 | Write a program to demonstrate Regression analysis with residual plots on a given data set. | CO3 |
| 4 | Write a program to implement the Naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. | CO3 |
| 5 | Implement regularized Linear regression | CO3 |
| 6 | Build Machine Learning models using Ensembling techniques: Bagging, Stacking CO1and Boosting | CO1 |
| 7 | Write a program to demonstrate the working of the decision tree-based ID3algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. | CO3 |
| 8 | Build model using VM with different kernels | CO3 |
| 9 | Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions using Python ML library classes. | CO3 |
| 10 | Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CV file. Compare the results of various "k" values for the quality of clustering. Determine the value of K using Elbow method. | CO1 |

Text Books

1. Python for Data Analysis, October 2012 Publisher(s): O 'Reilly Media,
2. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline, 'Reilly, 2013.

Change of Syllabus:

No Change

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/ Skill development/ Entrepreneurship |
|-------------------------------|-------------|----------------------|---|---|
| Data Science Applications Lab | IT416 | R19 | <ul style="list-style-type: none"> • Data exploration • Implement the Naive Bayesian classifier • Demonstrate Regression analysis • Ensembling techniques • ID3 algorithm • Implement k-Nearest Neighbour algorithm • Implement k-Means clustering algorithm | Skill development |

MOBILE APPLICATION DEVELOPMENT LAB

(Elective Lab-2)

COURSE CODE: IT417 A

L P T E O

0 3 1 0 0

CREDITS 2.5

Sessional Marks: 50

End Exam Marks: 50

Exam: 3 Hours

Prerequisite:

Object oriented concepts, Java Programming, Database Concepts

Course Objectives:

1. Understand the basic concepts App Development
2. Be familiar with Android system and user interface

Course Outcomes:

After completion of this course, the students will be able to:

1. Demonstrate the basic concepts of Android Programming
2. Design and develop interfaces and basic applications
3. Develop and deploy Applications and web based apps.

Mapping of course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |

UNIT I:

6 Lectures

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file

Learning outcomes: At the end of this unit, the students will be able to

- Analyze fundamental advantages of java or Kotlin Programming
- Install and Use Android Studio IDE to perform basic applications.

UNIT II:

9 Lectures

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

Learning outcomes: At the end of this unit, the students will be able to

- Implement Activities, Services and Intents for Android Applications.
- Apply Broadcasts for Intents and apply permissions for apps.

UNIT III:

9 Lectures

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Learning outcomes: At the end of this unit, the students will be able to

- Design and implement interfaces for Applications.
- Analyze and design layouts and Animations for applications.

UNIT IV:

9 Lectures

Data Storage: Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Learning outcomes: At the end of this unit, the students will be able to

- Analyze API & SQLITE Databases, content providers.
- Manage different networks and developing and deployment of apps.

UNIT V:

9 Lectures

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

Learning outcomes: At the end of this unit, the students will be able to

- Testing of Android application and Publishing.
- Manage different resources in a hierarchy.

Text Books:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)

Reference Books:

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
3. R3. Android Application Development All in one for Dummies by Barry Burd, Edition:

Lab Programs:

WEEK 1:

1. a) Create an Android application that shows Hello + name of the user and run it on an emulator. **CO1**
(b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button. **CO1**

WEEK 2:

2. Create a screen that has input boxes for User Name, Password, and Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout. **CO2**

WEEK 3:

3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener. **CO2**

WEEK 4:

4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents. **CO3**
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification. **CO3**

WEEK 5:

6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message. **CO3**

WEEK 6:

7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user. **CO3**

WEEK 7:

9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc. **CO3**

WEEK 8:

11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts. **CO3**
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time. **CO3**
13. Create an application that shows the given URL (from a text field) in a browser **CO3**

Change of Syllabus:

Syllabus was same as R19 but the requirement is Android Studio/Kotlin.

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/Entrepreneurship |
|--------------------|-------------|----------------------|--|---|
| MCAD Lab | IT417 PE A | | Understanding Anatomy of Android Application, Android Manifest file, Context, Activities, Services, Intents, Android Manifest File, User Interface Screen elements, Designing User Interfaces, Android Data and Storage APIs, SQLite, Testing Android applications, Publishing Android application, Managing Application resources | Employability |

MATLAB
(Elective Lab-2)

COURSE CODE IT417 B
L T P E O
0 1 3 0 0

CREDITS 2.5
Sessional Marks: 50
End Exam Marks: 50
End Exam: 3 Hours

Prerequisite: Students are expected to be able to open command prompt window or terminal window, edit a text file, download and install software, and understand basic programming concepts.

Course Objectives:

1. To use Programming Environment
2. To use graph plots
3. To develop m files
4. To define control statements
5. To develop Manipulating Text

Course Outcomes:

After completion of this course, a student will be able to:

CO-1: Demonstrate Programming Environment

CO-2: Express proficiency in graph plots and Develop programs using m files

CO-3: Design programs using control statements and Develop applications using Manipulating Text

Articulation Matrix (CO - PO / PSO Mapping):

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |

Unit I

Lectures 6

Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy. Programming Environment: Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

Learning outcomes: At the end of this unit, the students will be able to

- Analyse fundamental advantages of MATLAB Programming over the other programming languages.
- Install Code and Use MATLAB Programming Language to perform basic tasks. Solve, test basic problems.

Unit II

Lectures 9

Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save.

Learning outcomes: At the end of this unit, the students will be able to

- Apply critical programming language concepts through graphs.
- Implement Built in functions.
- Manipulate programs by using waveforms.

Unit III

Lectures 9

Procedures and Functions: Arguments and return values, M-files, formatted console. Input-output String handling.

Learning outcomes: At the end of this unit, the students will be able to

- Familiarize the usage Arguments and return values to enhance the problem solving.
- Implement M-files.

Unit IV

Lectures 9

Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop.

Learning outcomes: At the end of this unit, the students will be able to

- Familiarize the usage of statements

Unit V

Lectures 9

Manipulating Text: Writing to a text file, Reading from a text file, Randomizing and sorting a list, searching a list.

GUI Interface: Attaching buttons to actions, Getting Input, Setting Output.

Learning outcomes: At the end of this unit, the students will be able to

- Implement Manipulating Text
- Familiarize the GUI Interface

Text Book:

1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004.

References:

1. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.
2. E. Isaacson and H. B. Keller. Analysis of Numerical Methods. Dover Publishing, 1994.

Lab Experiments:

1. Write a program to assign the following expressions to a variable A and then to print out the value of A. (WEEK 1- C01)
 - a. $(3+4)/(5+6)$
 - b. $(0.0000123 + 5.67 \times 10^{-3}) \times 0.4567 \times 10^{-4}$
2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius. (WEEK 2- C01)
3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:
 - a. 2, 4, 6, 8, 10

- b. 1/2, 1, 3/2, 2, 5/2
 c. 1, 1/2, 1/3, 1/4, 1/5
 d. 1, 1/4, 1/9, 1/16, 1/25. (WEEK 3- C01)
4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill. (WEEK 4-CO1)
 5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order. (WEEK 5-CO2)
 6. The —identity matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I. (WEEK 6-CO2)
 7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,...,√Nth entries, i.e. those numbers which have indices that are square numbers. (WEEK 7-CO2)
 8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2). (WEEK 8-CO2)
 9. The seeds on a sunflower are distributed according to the formula below. Plot a small circle at each of the first 1000 co-ordinates:

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180} \pi n$$
 (WEEK 9-CO2)
 10. Calculate 10 approximate points from the function $y=2x$ by using the formulae:
 - i. $x_n = n$
 - ii. $y_n = 2n + \text{rand} - 0.5$ (WEEK 10-CO2)
 11. Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit. (WEEK 11-CO3)
 12. Calculate and replay 1 second of a sine wave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called "ex35.wav". Plot the first 100 samples. (WEEK 12-CO3)
 13. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end. (WEEK 13-CO3)
 14. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics. (WEEK 14-CO3)

Change of Syllabus:

No Change

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/Entrepreneurship |
|---------------------------|--------------------|-----------------------------|---|--|
| MATLAB | IT417 PE B | 2022-2023 | Graph Plots, Functions & Control Statements | Skill development |

Statistical Programming with R Lab

(Elective Lab-2)

COURSE CODE: IT417 C

L T P E O

0 1 3 0 3

CREDITS 2.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3 Hours

Prerequisites: Basics of Mathematics, Probability and Statistics

Course Objective

This course provides a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving practical problems in the real world

Course Outcomes

CO1: Manipulate data within R and to create simple graphs and charts used in introductory statistics

CO2: Perform and interpret different distribution using R

CO3: Carry out hypothesis testing and calculate confidence intervals; Perform linear regression models for data analysis

Mapping of Course Outcomes with POs and PSOs

| CO's/PO's- PSO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |

Unit-I:

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II:

R Programming Structures, Control Statements, Loops, - Looping Over Non-vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-III:

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files

UNIT-IV:

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function - Customizing Graphs, Saving Graphs to Files.

UNIT-V:

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA. Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

Text Books:

- 1) The Art of R Programming, A K Verma, Cengage Learning.
- 2) R for Everyone, Lander, Pearson
- 3) The Art of R Programming, Norman Matloff, No starch Press.

Reference Books:

- 1) R Cookbook, Paul Teetor, Oreilly.
- 2) R in Action, Rob Kabacoff, Manning

WEB REFERENCES:

Online Resources:

1. <https://www.r-tutor.com/elementary-statistics>
2. <https://www.edx.org/learn/r-programming>
3. <https://www.javatpoint.com/r-tutorial>

List of Programs:**Syllabus**

Cycle1: Introduction to R Programming (CO-1)

Cycle 2: Getting Used to R: Describing Data (CO-1)

- Viewing and Manipulating Data
- Plotting Data
- Reading in Your Own Data

Cycle 3: Visualizing Data (CO-1)

- Tables, charts and plots, Visualizing Measures of Central Tendency, Variation, and Shape. Box plots, Pareto diagrams. How to find the mean, median, standard deviation and quantiles of a set of observations.
- Students may experiment with real as well as artificial data sets.

Cycle 4: Probability Distributions. (CO-2)

- Generate and Visualize Discrete and continuous distributions using the statistical environment. Demonstration of CDF and PDF uniform and normal, binomial Poisson distributions.
- Students are expected to generate artificial data using and explore various distribution and its properties. Various parameter changes may be studied.

Cycle 5: Densities of Random Variables (CO-2)

- Off the Shelf Distributions in R
- Matching a Density to Data
- More About Making Histograms

Cycle 6: Binomial Distribution (CO-2)

- Study of binomial distribution. Plots of density and distribution functions. Normal approximation to the Binomial distribution.

Cycle 7: Building Confidence in Confidence Intervals (CO-3)

- Populations Versus Samples
- Large Sample Confidence Intervals
- Simulating Data Sets
- Evaluating the Coverage of Confidence Intervals

Cycle 8: Perform Tests of Hypotheses (CO-3)

- How to perform tests of hypotheses about the mean when the variance is known. How to compute the p-value. Explore the connection between the critical region, the test statistic, and the p-value

Cycle 9: Correlation (CO-3)

- How to calculate the correlation between two variables. How to make scatter plots. Use the scatter plot to investigate the relationship between two variables

Cycle 10: Estimating a Linear Relationship (CO-3)

- A Statistical Model for a Linear Relationship
- Least Squares Estimates
- The R Function lm
- Scrutinizing the Residuals

Cycle 11: Analysis on Time series Data (CO-3)

- Consider the annual rainfall details at a place starting from January 2012. Create an R time series object for a period of 12 months and plot it.
- Analyzing COVID-19 data
- Multivariate Time series

TEXTBOOK/S:

1. Maria Dolores Ugarte , Ana F. Militino , Alan T. Arnholt “Probability and Statistics with R” 2nd Edition on, CRC Press, 2016.
2. P. Dalgaard. Introductory Statistics with R, 2nd Edition. (Springer 2008)

Change of Syllabus:

100% changed as per the guidelines provided by External BoS Members

1.1.3 of NAAC

| Name of the Course | Course Code | Year of Introduction | Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development | Mapping with Employability/Skill development/ Entrepreneurship |
|---|--------------------|-----------------------------|--|---|
| Statistical Programming with R Lab | IT 417 PE C | 2022 | Installing R, functions, R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes, Factors and Tables, Calculating a Probability, Functions for Statistical Distributions, Simulation, code profiling, Statistical Analysis with R, data manipulation. | Employability |

HONORS

CYBER LAWS AND ETHICS

(Honors)

Course Code :

L T P E O

3 1 0 1 2

CREDITS 4

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Pre- Requisites: Human Values and Professional Ethics (HVPE)

Course Objectives:

A successful student will fulfill the following course objectives:

1. Identify and manage ethical issues related to the use and advancement of Information and Communication Technology (ICT).
2. Discuss the social impacts of computers in information technology.
3. Students will be given a broad overview of relevant topics to include free speech, privacy, security and the law.
4. Understand the ethical issues associated with confidentiality and privacy as they relate to information technology.

Course Outcomes:

At the end of the course student should be able to:

CO 1: Familiarize the concept and perspectives of cyber ethics.

CO 2: Critically analyze ethical issues related to ICT associated with confidentiality and privacy as they relate to information technology.

CO 3: Acquire the knowledge on different kinds of cyber-crimes and familiarize the intellectual property disputes in cyberspace regulating commerce.

CO 4: Understand the impact of cyber ethics on online communities, virtual reality and artificial intelligence.

Mapping of course outcomes with program outcomes:

| COs | POs | | | | | | | | | | | | PSOs | |
|-----|-----|---|---|---|---|---|---|---|---|----|----|----|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 |
| CO1 | 1 | 1 | | 1 | | 2 | 1 | 3 | 1 | 2 | 1 | 2 | 2 | 2 |
| CO2 | 1 | 2 | 1 | 2 | | 2 | 2 | 3 | 1 | 2 | 1 | 3 | 2 | 2 |
| CO3 | 2 | 2 | 1 | 1 | | 1 | 1 | 3 | 1 | 1 | | 2 | 2 | 2 |
| CO4 | 2 | 2 | | 2 | | 1 | 1 | 3 | 1 | 1 | | 2 | 2 | 2 |

SYLLABUS

Unit-1:

Introduction to Cyber ethics: Concepts, Perspectives, and Methodological Frameworks:

Defining Key Terms: Cyber ethics and Cyber Technology, The Cyber ethics Evolution: Four Developmental Phases in Cyber Technology, Are Cyber ethics Issues Unique Ethical Issues?, Cyber ethics as a Branch of Applied Ethics: Three Distinct Perspectives, A Comprehensive Cyber ethics Methodology, A “Disclosive” Method for Cyber ethics, A Comprehensive Strategy for Approaching Cyber ethics Issues.

Learning outcomes: At the end of the unit the students are able to

- 1) Understand the importance of cyber ethics and how it was evolved.
- 2) Understand the concept and perspective of cyber ethics

Unit-2:

Privacy and Cyberspace: Privacy in the Digital Age: Who Is Affected and Why Should We Worry?, What Is Personal Privacy?, Why Is Privacy Important?, Gathering Personal Data: Surveillance, Recording, and Tracking Techniques, Analyzing Personal Data: Big Data, Data Mining, and Web Mining, Protecting Personal Privacy in Public Space, Privacy Legislation and Industry Self-Regulation, A Right to “Be Forgotten” (or to “Erasure”) in the Digital Age.

Learning outcomes: At the end of the unit the students are able to

- 1) Understand the ethical issues associated with confidentiality and privacy as they relate to information technology.

Unit-3:

Security in Cyberspace: Security in the Context of Cyber technology, Three Categories of Cyber security, Cloud Computing and Security, Hacking and “The Hacker Ethic”, Cyber terrorism, Information Warfare (IW).

Cybercrime and Cyber-Related Crimes: Cybercrimes and Cyber criminals, Hacking, Cracking, and Counter Hacking, Defining Cybercrime, Three Categories of Cybercrime: Piracy, Trespass, and Vandalism in Cyberspace, Cyber-Related Crimes, Technologies and Tools for Combating Cybercrime, Programs and Techniques Designed to Combat Cybercrime in the United States, National and International Laws to Combat Cybercrime, Cybercrime and the Free Press: The Wikileaks Controversy.

Learning outcomes: At the end of the unit the students are able to

- 1) Acquire the knowledge on cyber related crimes and technologies.

Unit-4:

Intellectual Property Disputes in Cyberspace: What Is Intellectual Property?, Copyright Law and Digital Media, Patents, Trademarks, and Trade Secrets, Jurisdictional Issues Involving Intellectual Property Laws, Philosophical Foundations for Intellectual Property Rights.

Regulating Commerce and Speech in Cyberspace: Introduction and Background Issues: Some Key Questions and Critical Distinctions Affecting Internet Regulation, Digital Rights Management (Drm), E-Mail Spam, Free Speech vs. Censorship and Content Control in Cyberspace, Pornography in Cyberspace.

Learning outcomes: At the end of the unit the students are able to

- 1) Familiarize yourself with laws, digital media, patents, trademarks, trade secrets related to computer ethics and individual conduct in cyberspace.

- 2) Explain Digital Rights Management and E- Mail spam.

Unit-5:

The Digital Divide, Democracy, and Work: The Digital Divide, Cyber Technology and the Disabled, Cyber Technology and Race, Cyber Technology and Gender, Cyber technology, Democracy, and Democratic Ideals, the Transformation and the Quality of Work.

Online Communities, Virtual Reality, and Artificial Intelligence: Online Communities and Social Networking Services, Virtual Environments and Virtual Reality, Artificial Intelligence (AI), Extending Moral Consideration to AI Entities.

Learning outcomes: At the end of the unit the students are able to

- 1) Understand the impact of cyber ethics on online communities, virtual reality and artificial intelligence.

Textbook:

Tavani, H.T. (2010). *Ethics and technology: Controversies, questions and strategies in ethical computing* (3rd ed.) Massachusetts, John Wiley & Sons Inc. ISBN: 978-0-470-50950-0

References:

- 1) Blackley, J. A., Peltier, J., & Peltier, T. (2003) *Information Security Fundamentals, 1st ed.* Boca Raton, FL. Auerbach Publications. ISBN: 0849319579/9780849319570
- 2) American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th edition). Washington, DC: Author. ISBN: 1-4338-0561-8

CLOUD NETWORKING

(Honors)

Course Code :

L T P E O

3 1 0 1 2

CREDITS 4

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

COURSE OBJECTIVES:

1. Gain fluency in end-to-end transport algorithms that provide higher-level reliability and performance capabilities, based on simpler lower-layer functions.
2. Determine which lower-layer network protocols and components are appropriate for a wide variety of given application requirements.
3. Describe common attacks and apply appropriate defenses at multiple layers of the Internet architecture.
4. Gain practical experience with network programming by using and implementing realistic network infrastructure protocols and software, including routing protocols and TCP.
5. Understand the network stack of a cloud network – network virtualization, physical interconnection of servers, routing, congestion control, and application-level techniques.
6. Engineer networked applications for higher performance and reliability.

COURSE OUTCOMES:

By the end of the course, you will be able to:

CO 1: Understand the layered architecture of the Internet and the components of the fast-path data plane of multi-hop and multi-domain networks.

CO 2: Understand Switch Fabric Technology, Congestion Management, Traffic management.

CO 3: Understand the network stack of a cloud network.

CO 4: Analyse a (small) cloud network and evaluate its performance

Course Articulation Matrix (CO-PO Mapping)

| COs | POs | | | | | | | | | | | | PSOs | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 2 | 3 | 2 | | | | 2 | | | | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 2 | | | | 2 | | | | 2 | 3 | 2 |
| CO3 | 2 | 3 | 3 | 2 | | | | 2 | | | | 2 | 3 | 2 |
| CO4 | 2 | 2 | 3 | 2 | | | | 2 | | | | 2 | 3 | 2 |

SYLLABUS

Unit-1:**10h**

Introduction to cloud networking: Networking Basics, Cloud Data Center, Characteristics of Cloud Networking, The Data Center Evolution, Computer Networks, Ethernet, Movement to the Cloud.

Unit-2:**12h**

Switch Fabric Technology: Switch Fabric Architecture, Shared bus architecture, Shared memory architecture, Crossbar switch, Switch Fabric Topologies, Congestion Management, Flow Control, Traffic Management.

Unit-3:**10h**

Networking Topologies: Traditional Multitiered Enterprise Network, Data Center Network Switch Type, Flat Data Center Networks, Rack Scale Architectures, Ethernet Data Rate Standards, Virtual Local Area Networks, Improving Network Bandwidth

Unit-4:**10h**

Server Virtualization and Networking: VM Overview, Virtual Switching, PCI Express, VM Migration, Multi-tenant Environments, Traditional Network Tunneling Protocols, VXLAN, NVGRE.

Unit-5:**12h**

Software-Defined Networking: Data Center Software Background, OpenStack, OpenFlow, Network Function Virtualization, SDN Deployment.

Textbook:

1. Cloud Networking Understanding Cloud-based Data Center Networks by Gary Lee
“Computer Networks: A Systems Approach,” by Larry L. Peterson and Bruce S. Davie (5th ed., 2011).

REINFORCEMENT LEARNING

(Honors)

Course Code :

LTPEO

31012

CREDITS 4

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Python, Machine Learning

Course Objectives

1. To decide the sequence of actions to perform in an uncertain environment in order to achieve some goals that may not necessarily seem beneficial in near future but are optimal for getting better long term reward.

Course Outcomes

After completion of the course, the students will be to:

CO 1: Structure a reinforcement learning problem

CO 2: Apply basic RL algorithms for simple sequential decision making problems in uncertain conditions

CO 3: Evaluate the performance of the solution

CO 4: Interpret state-of-the-art RL research and communicate their results

Mapping of Course Outcomes with POs and PSOs

| COs/POs-PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|---|
| CO1 | 3 | 1 | 1 | 1 | 1 | 1 | | | | | | | 1 | 3 | 2 |
| CO2 | 1 | 3 | 3 | 1 | 2 | 1 | | | | | | | 1 | 3 | 2 |
| CO3 | 1 | 3 | 3 | 1 | 2 | | | | | | | | 1 | 3 | 2 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 1 | | | | | | | 1 | 3 | 2 |

Unit-1

8 Periods

Introduction

Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning.

Probability Primer:

Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation, Concepts of joint and multiple random variables, joint, conditional and marginal distributions, Correlation and independence.

Unit-2

Markov Decision Process

8 Periods

Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process

(MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.

Unit-3

Prediction and Control by Dynamic Programming

8 Periods

Overview of dynamic programming for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, proof of contraction mapping property of Bellman expectation and optimality operators, proof of convergence of policy evaluation and value iteration algorithms, DP extensions.

Unit-4

Monte Carlo Methods for Model Free Prediction and Control

8 Periods

Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling

Unit-5

TD Methods

8 Periods

Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants

Text Books

1. Reinforcement Learning: An Introduction, Richard S. Sutton and Andrew G. Barto, 2nd Edition.
2. Probability, Statistics, and Random Processes for Electrical Engineering", 3rd Edition, Alberto Leon-Garcia.

References

1. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy.
2. Machine Learning, Tom M. Mitchell, MGH, 1997.
3. Introduction to machine Learning, 2nd ed, Ethem Alpaydin, PHI

Online Resources

1. http://cse.iitkgp.ac.in/~adas/courses/rl_aut2021/rl_aut2021.php
2. <https://nptel.ac.in/courses/106106143>

Note: This course is related to Employability/Skill development.