**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA, G.B. NAGAR**
**(AN AUTONOMOUS INSTITUTE)**

**Affiliated to**

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW**

# Evaluation Scheme & Syllabus

For

## Bachelor of Technology
## Computer Science and Engineering (Data Science)
### Fourth Year

**(Effective from the Session: 2024-25)**

# NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA

**(AN AUTONOMOUS INSTITUTE)**

## Bachelor of Technology

## Computer Science and Engineering (Data Science)

## Evaluation Scheme

**SEMESTER -VII**

| Sl. No. | Subject Codes | Subject Name | Type of subject | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | CT | TA | TOTAL | PS | TE | PE | | |
| | **WEEKS COMPULSORY INDUCTION PROGRAM** | | | | | | | | | | | | | |
| 1 | ACSML0702 | Deep Learning | Mandatory | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 2 | | Departmental Elective-V | Departmental Elective | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 3 | | Open Elective-II | Open Elective | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 4 | | Open Elective-III | Open Elective | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 5 | ACSML0752 | Deep Learning Lab | Mandatory | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 6 | ACSE0759 | Internship Assessment-III | Mandatory | 0 | 0 | 2 | | | | 50 | | | 50 | 1 |
| | | *Massive Open Online Courses (For B.Tech. Hons. Degree) | *MOOCs | | | | | | | | | | | |
| | | **GRAND TOTAL** | | | | | | | | | | | **700** | **14** |

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year B. Tech Students (Semester-VII)**

| S. No. | Subject Code | Course Name (Big Data) | University / Industry Partner Name | No of HOURS | Credits |
|---|---|---|---|---|---|
| 1 | AMC0227 | Deep Learning for Developers | Infosys Wingspan (Infosys Springboard) | 34h 51m | 2.5 |
| 2 | AMC0278 | Natural Language Processing using Python | Infosys Wingspan (Infosys Springboard) | 15h 45m | 1 |
| 3 | AMC0279 | Spring Boot and Angular-React Stack -DevOps Tools and Capstone Project | Infosys Wingspan (Infosys Springboard) | 107h 50m | 4 |
| 4 | AMC0327 | Java Web Services JWS Training | Infosys Wingspan (Infosys Springboard) | 19h 25m | 1.5 |

**PLEASE NOTE: -**

- **Internship (3-4 weeks) shall be conducted during summer break after semester-VI and will be assessed during Semester-VII**

**Abbreviation Used:**

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses

# List of Departmental Electives

| Subject Codes | Subject Name | Type of Subject | Bucket Name | Branch | Semester |
|---|---|---|---|---|---|
| ACSE0712 | RPA Implementation | Departmental Elective-V | CRM-RPA | DS | 7 |
| ACSAI0712 | Natural Language Processing | Departmental Elective-V | Data Analytics | DS | 7 |
| ACSE0713 | Web Development using MERN Stack with DevOps | Departmental Elective-V | Full Stack Development | DS | 7 |
| ACSE0711 | Game Programming | Departmental Elective-V | Mobility Management | DS | 7 |

# NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA
**(AN AUTONOMOUS INSTITUTE)**

## Bachelor of Technology
## Computer Science and Engineering (Data Science)
## Evaluation Scheme
**SEMESTER -VIII**

| Sl. No. | Subject Codes | Subject Name | Type of Subject | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | CT | TA | TOTAL | PS | TE | PE | | |
| 1 | | Open Elective-IV | Open Elective | 2 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 2 |
| 2 | ACSE0859/ ACSE0858 | Capstone Project/Industrial Internship | Mandatory | 0 | 0 | 20 | | | | 200 | | 300 | 500 | 10 |
| | | *Massive Open Online Courses (For B.Tech. Hons. Degree) | *MOOCs | | | | | | | | | | | |
| | | **TOTAL** | | | | | | | | | | | **650** | **12** |

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year B. Tech Students (Semester-VIII)**

| S.No. | Subject Code | Course Name | University/Industry Partner Name | No. of Hours | Credit |
|---|---|---|---|---|---|
| 1 | AMC0328 | Spring Security | Infosys Wingspan (Infosys Springboard) | 8h 38m | 0.5 |
| 2 | AMC0329 | Introduction to Apache Spark Streaming | Infosys Wingspan (Infosys Springboard) | 32h | 2.5 |
| 3 | AMC0235 | Data Analysis using Pig | Infosys Wingspan (Infosys Springboard) | 16h | 1 |
| 4 | AMC0320 | Microsoft Power BI | Infosys Wingspan (Infosys Springboard) | 11h 32m | 0.5 |

**Abbreviation Used:**

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses

# NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA
**(AN AUTONOMOUS INSTITUTE)**

## Bachelor of Technology
## Computer Science and Engineering (Data Science)

**AICTE Guidelines in Model Curriculum:**

A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 HOURS =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits.

# B. TECH FOURTH YEAR

| Course code | ACSML0702 | L T P | Credits |
|---|---|---|---|
| Course title | DEEP LEARNING | 3 0 0 | 3 |

**Course objective:** To be able to learn unsupervised techniques and provide continuous improvement in accuracy and outcomes of various datasets with more reliable and concise analysis results.

**Pre-requisites:** Python, Basic Modeling Concepts.

**Course Contents / Syllabus**

| UNIT-I | INTRODUCTION | 8 HOURS |
|---|---|---|

**Model Improvement and Performance:** Curse of Dimensionality, Bias and Variance Trade off, Overfitting and underfitting, Regression - MAE, MSE, RMSE, R Squared, Adjusted R Squared, p-Value, Classification - Precision, Recall, F1, Other topics, K-Fold Cross validation, RoC curve, Hyper-Parameter Tuning Introduction – Grid search, random search, Introduction to Deep Learning.

**Artificial Neural Network:** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: Single layer and Multilayer feed forward networks, recurrent networks. Various learning techniques; Perception and Convergence rule, Hebb Learning. Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm.

| UNIT-II | CONVOLUTION NEURAL NETWORK | 8 HOURS |
|---|---|---|

What is computer vision? Why Convolutions (CNN)? Introduction to CNN, Train a simple convolutional neural net, Explore the design space for convolutional nets, Pooling layer motivation in CNN, Design a convolutional layered application, Understanding and visualizing a CNN, Transfer learning and fine-tuning CNN, Image classification, Text classification, Image classification and hyper-parameter tuning, Emerging NN architectures.

| UNIT-III | DETECTION & RECOGNITION | 8 HOURS |
|---|---|---|

Padding & Edge Detection, Strided Convolutions, Networks in Networks and 1x1Convolutions, Inception Network Motivation, Object Detection, YOLO Algorithm.

| UNIT-IV | RECURRENT NEURAL NETWORKS | 8 HOURS |
|---|---|---|

Why use sequence models? Recurrent Neural Network Model, Notation, Back-propagation through time (BTT), Different types of RNNs, Language model and sequence generation, Sampling novel sequences, Vanishing gradients with RNNs, Gated Recurrent Unit (GRU), Long Short-Term Memory (LSTM), Bidirectional RNN, Deep RNNs

| UNIT-V | AUTOENCODERS IN DEEP LEARNING | 8 HOURS |
|---|---|---|

Auto-encoders and unsupervised learning, Stacked auto-encoders and semi-supervised learning, Regularization - Dropout and Batch normalization.

**Course outcome:** After completion of this course students will be able to

| | | |
|---|---|---|
| CO 1 | Analyze ANN model and understand the ways of accuracy measurement. | K4 |

| | | |
|---|---|---|
| CO 2 | Develop a convolutional neural network for multi-class classification in images. | K6 |
| CO 3 | Apply Deep Learning algorithm to detect and recognize an object. | K3 |
| CO 4 | Apply RNNs to Time Series Forecasting, NLP, Text and Image Classification. | K3 |
| CO 5 | Apply Lower-dimensional representation over higher-dimensional data for dimensionality reduction and capture the important features of an object. | K3 |

**Text books:**

1. Zurada and Jacek M, "Introduction to Artificial Neural Systems", West Publishing Company, 1992, ISBN: 9780534954604
2. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
3. Simon Haykin, "Neural Networks and Learning Machines" Third Edition
4. Deep Learning", I Goodfellow, Y Bengio and A Courville, 1st Edition 2016
5. Introduction to Machine Learning with Python ", by Andreas C. Müller, Sarah Guido
6. R2. Deep Learning with Python by François Chollet 1st Edition

**Reference Books:**

1. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola "Dive into Deep Learning", Release 0.17.4
2. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Arti□Russell, S. and Norvig, N. Arti Intelligence. 2003.

**NPTEL/ Youtube/ Faculty Video Link:**

| | |
|---|---|
| **Unit 1** | (371) Lec-1 Introduction to Artificial Neural Networks - YouTube<br>(3) Deep Learning(CS7015): Lec 8.1 Bias and Variance - YouTube<br>(3) Mod-10 Lec-39 Assessing Learnt classifiers; Cross Validation; - YouTube<br>(3) Lec-1 Introduction to Artificial Neural Networks - YouTube<br>(3) Lec-2 Artificial Neuron Model and Linear Regression - YouTube<br>(3) Evaluation and Cross-Validation - YouTube |
| **Unit 2** | (3) Lecture 1 \| Introduction to Convolutional Neural Networks for Visual Recognition - YouTube<br>(3) Lecture 2 \| Image Classification - YouTube<br>(3) Lecture 3 \| Loss Functions and Optimization - YouTube<br>(3) Hyperparameter optimization - YouTube<br>(3) Deep Learning(CS7015): Lec 11.3 Convolutional Neural Networks - YouTube |
| **Unit 3** | (3) C4W3L09 YOLO Algorithm - YouTube<br>(3) Edge Detection - YouTube<br>(3) Neural Networks - Networks in Networks and 1x1 Convolutions - YouTube |
| **Unit 4** | (3) Backpropagation in CNNs - YouTube<br>(3) Deep RNNs and Bi- RNNs - YouTube<br>(3) Deep Learning(CS7015): Lec 13.4 The problem of Exploding and Vanishing Gradients - YouTube<br>(3) Deep Learning(CS7015): Lec 14.2 Long Short Term Memory(LSTM) and Gated Recurrent Units(GRUs) - YouTube |
| **Unit 5** | (3) Deep Learning(CS7015): Lec 7.1 Introduction to Autoncoders - YouTube<br>(3) Deep Learning(CS7015): Lec 9.5 Batch Normalization - YouTube<br>(3) Deep Learning(CS7015): Lec 7.3 Regularization in autoencoders (Motivation) - YouTube |

| B. TECH FOURTH YEAR | | | |
|---|---|---|---|
| **Course code** | **ACSML0752** | **L T P** | **Credit** |
| **Course title** | **DEEP LEARNING LAB** | **0 0 2** | **1** |
| **Suggested list of Experiments** | | | |
| **Sr. No.** | **Name of Experiment** | | **CO** |
| 1 | Write a program Print Dimensions of dataset | | CO1 |
| 2. | Write a program to Calculate of Accuracy Values. | | CO1 |
| 3. | Write a program to Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. | | CO1 |
| 4. | Write a program to Compose Matrix Shape and Tensor Shape. | | CO2 |
| 5. | Write a program to showing Accessing and Manipulation of tensors. | | CO2 |
| 6. | Write a program to understand the mechanism of practically training a binary classifier. | | CO2 |
| 7. | Implement with a program showing Access and manipulation of tensors. | | CO2 |
| 8. | Write a program to show Regression Data Sampling. | | CO2 |
| 9. | Write a program to Combat Overfitting. | | CO1 |
| 10. | Write a program Print Dimensions of dataset. | | CO2 |
| 11. | Write a program to Calculate of Accuracy Values. | | CO2 |
| 12. | Write a program to Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. | | CO1 |
| 13. | Write a program to build a simple autoencoder based on a fully-connected layer in Keras. | | CO3 |
| 14. | Implement Long Short-Term Memory Networks using sample data. | | CO1 |
| 15. | Write a program showing Automatic Image Captioning with Keras ---Facial Recognition. | | CO3 |
| **Lab Course Outcome:** After completion of this course students will be able to | | | |
| CO1 | Develop python programs to work on Data sets and Implement Artificial Neural Network Techniques. | | K6 |
| CO2 | Explore different types of tensor and perform exploratory data analysis on different data sets. | | K4 |
| CO3 | Apply Automatic Image Captioning with Keras ---Facial Recognition. | | K3 |

# B. TECH FOURTH YEAR

| Course code | ACSE0712 | L T P | Credits |
|---|---|---|---|
| Course title | RPA IMPLEMENTATION | 3 0 0 | 3 |

**Course objective:** This course is designed to give a thorough understanding and practical skills in developing and deploying software robots for Robotic Process Automation (RPA).

**Pre-requisites:** Basic Knowledge of C Programming

**Course Contents / Syllabus**

| UNIT-I | DATA MANIPULATION | 8 HOURS |
|---|---|---|

Introduction to Data Manipulation, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data Recording and Advanced UI Interaction; Recording Introduction, Basic and Desktop Recording, Web Recording, Input/output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques.

| UNIT-II | SELECTORS | 8 HOURS |
|---|---|---|

Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image, Text & Advanced Citrix Automation, Introduction to Image & Text Automation, Image-based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices using tab for Images Starting Apps.

| UNIT-III | DATA TABLES AND AUTOMATION | 8 HOURS |
|---|---|---|

Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table Basics Data Manipulation in Excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF.

Email Automation: Email Automation, Incoming Email automation, Sending Email automation.

| UNIT-IV | DEBUGGING AND EXCEPTION HANDLING | 8 HOURS |
|---|---|---|

Debugging Tools, Strategies for solving issues, Catching errors.

Orchestrator: Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.

| UNIT-V | ROBOTIC FRAMEWORK | 8 HOURS |
|---|---|---|

Re-Framework template, Re-Framework template works, Use Re-Framework to automate your own processes. .NET Classes and Objects.

**Course outcome:** After completion of this course students will be able to:

| | | |
|---|---|---|
| CO 1 | Apply basic concepts and methods from design engineering to explore creative solutions of real-world problems. | K3 |
| CO 2 | Learn Robotic Process Automation, and massive career opportunity in this field. | K2 |
| CO 3 | Implement the knowledge of RPA tools, functions in various industries and perform, control various tasks using RPA bots. | K3 |
| CO4 | Gain expertise in Desktop, Web & Citrix Automation and use RE-Framework to build a structured business automation process. | K2 |
| CO 5 | Develop a real-world workflow automation project and will be able to debug a workflow. | K6 |

| **Textbooks:** |
| --- |
| 1) Vaibhav Jain, “Crisper Learning: For UiPath”, Latest Edition, Independently Published, 2018. |
| 2) Alok Mani Tripathi, “Learning Robotics Process Automation”, Latest Edition, Packt Publishing ltd, Birmingham. March 2018 |
| **Reference Books/E-Books:** |
| 1) Kelly Wibbenmeyer, “The Simple Implementation Guide to Robotic Process Automation (RPA)”, Latest Edition, iUniverse Press. |
| 2) https://www.uipath.com/hubfs/ebook-its-time-to-automate.pdf |
| **Links:** |
| https://www.youtube.com/watch?v=6QoCG6YIPVo&list=PL41Y-9S9wmyJarNN2KnB4XudpT1yE1kVd |
| https://www.youtube.com/watch?v=YOHFgrOvPTM&list=PL41Y-9S9wmyLvF6Ou0oPhg6MrFWSw7sn4 |
| https://www.youtube.com/watch?v=QMBuyLMjOhM&list=PL41Y-9S9wmyIYX6kciM8DboVYymsv2y6K |
| https://www.youtube.com/watch?v=KE9raKNTkfI&list=PL41Y-9S9wmyLeXL1DY9j-XepNb_vg9N8t |
| https://www.youtube.com/watch?v=2rjr8QhD9oc&list=PL41Y-9S9wmyJi2zmWY77yPZrdVI7ab3Ja |

# B. TECH FOURTH YEAR

| Course code | ACSAI0712 | L T P | Credits |
|---|---|---|---|
| Course title | NATURAL LANGUAGE PROCESSING | 3 0 0 | 3 |

**Course objective:** The course aims to provide an understanding of the foundational concepts and techniques in NLP. The focus is on providing application-based knowledge.

**Pre-requisites:** Programming Skills, Data Structures, Algorithms, Probability and Statistics, Machine Learning.

**Course Contents / Syllabus**

| UNIT-I | OVERVIEW OF NATURAL LANGUAGE PROCESSING | 8 HOURS |
|---|---|---|

Definition, Applications and emerging trends in NLP, Challenges. Ambiguity.

NLP tasks using NLTK: Tokenization, stemming, lemmatization, stop-word removal, POS tagging, Parsing, Named Entity Recognition, coreference resolution.

| UNIT-II | REGULAR EXPRESSIONS | 8 HOURS |
|---|---|---|

Data Preprocessing: Using Python - Convert to lower case, handle email-id, HTML tags, URLs, emojis, repeat characters, normalization of data (contractions, standardize) etc.

Vocabulary, corpora, and linguistic resources, Linguistic foundations: Morphology, syntax, semantics and pragmatics, Language models: Unigram, Bigram, N-grams.

| UNIT-III | TEXT ANALYSIS AND SIMILARITY | 8 HOURS |
|---|---|---|

Text Vectorization: Bag-of-Words model and vector space models, Term Presence, Term Frequency, TF-IDF

Textual Similarity: Cosine similarity, Word Mover's distance, Word embeddings: Word2Vec, GloVe.

| UNIT-IV | TEXT CLASSIFICATION & NLP APPLICATIONS | 8 HOURS |
|---|---|---|

Text classification: Implement of applications of NLP using text classification- Sentiment Analysis, Topic modelling, Spam detection.

High Level NLP applications: Machine translation: Rule-based and statistical approaches, Text summarization Dialog systems, conversational agents and chatbots.

| UNIT-V | ADVANCED NLP TECHNIQUES | 8 HOURS |
|---|---|---|

Sequential data, Introduction to sequence models - RNN and LSTM, Attention Mechanism, Transformer, Transformer-based models: BERT, GPT, T5, Introduction to Hugging Face Transformers, Case studies.

**Course outcome:** After completion of this course students will be able to:

| | | |
|---|---|---|
| CO 1 | Appreciate the emerging trends and challenges in NLP and perform the basic NLP tasks using some NLP library. | K2 |
| CO 2 | Apply regular expressions for data cleaning and understand the fundamental concepts and theories underlying NLP. | K3 |
| CO 3 | Extract features and find similarity in text data. | K3 |

| | | |
|---|---|---|
| CO4 | Implement NLP techniques to design real-world NLP applications | K3 |
| CO 5 | Apply advanced techniques like sequential modelling and attention mechanism to develop NLP applications | K4 |

## Textbooks:

1)Daniel Jurafsky, James H. Martin, "Speech and Language Processing", Second Edition, Pearson Education, 2009 ISBN 0131873210.
2)James Allen, Natural Language Understanding, 2nd edition, 1995 Pearson Education ISBN 13: 9780805303346.
3)Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective,1st edition1995, Prentice ISSBN 9788120309210

## Reference Books:

1)Christopher D.Manning and Hinrich Schutze,, "Foundations of Statistical Natural Language Processing" , MIT Press, 1999 Second Edition, ISBN No. 0-262-13360-l.
2)T. Winograd, Language as a Cognitive Process, 1st edition, 1983 Addison- Wesley ISBN 020108-571-2
3)L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Knowledge Representation, 2nd edition, 2000 AAAI Press ISBN-13: 978-0262590211

## Links:

1) https://realpython.com/nltk-nlp-python/
2) https://www.coursera.org/lecture/python-text-mining/basic-nlp-tasks-with-nltk-KD8uN
3) https://www.coursera.org/lecture/nlp-sequence-models/learning-word-embeddings-APM5s
4) https://www.coursera.org/projects/regular-expressions-in-python
5) https://www.coursera.org/learn/python-text-mining/lecture/sVe8B/regular-expressions

| B.TECH FOURTHYEAR | | |
|---|---|---|
| **Subject Code: ACSE0713** | | **L T P<br>3 0 0** |
| **Subject Name:Web Development using MERN Stack with DevOps** | | **Credits<br>3** |
| **Course Objective:** This course focuses on how to design and build static as well as dynamic web pages and interactive web applications. Students can understand how to put them together to create a MERN stack application. | | |
| **Pre- requisites:** Student should have the knowledge of HTML, CSS and ES6 | | |
| **Course Contents/Syllabus** | | |
| **Unit-1** | **Introduction to React JS:**<br>Overview of frameworks, NPM commands, React App, Project Directory Structure, React Component Basic, Understanding JSX, Props and State, Stateless and Stateful Components, Component life cycle, Hooks, react-router vs react-router-dom, | **8 Hours** |
| **Unit-2** | **Connecting React with mongodB:**<br>Google Material UI, AppBar, Material UI's Toolbar, NavBar, Material UI Buttons, SQL and Complex Transactions, Dynamic Schema, create Index (), get Indexes () & drop Index (), Replication, Statement-based vs. Binary Replication,<br>Auto-Sharding and Integrated Caching, Load balancing, Aggregation, scalability. | **8 Hours** |
| **Unit-3** | **Node js & Express Framework:**<br>Introduction, Environment Setup, serving static resources, template engine with vash and jade, Connecting Node.js to Database, Mongoose Module, Creating Rest APIs, Express Framework, MVC Pattern, Routing, Cookies and Sessions, HTTP Interaction, User Authentication | **8 Hours** |
| **Unit-4** | **Evolution of DevOps:**<br>DevOps Principles, DevOps Lifecycle, DevOps Tools, and Benefits of DevOps,<br>SDLC (Software Development Life Cycle) models, Lean, ITIL and Agile Methodology, Agile vs DevOps, Process flow of Scrum Methodologies, Project planning, scrum testing, sprint Planning and Release management, Continuous Integration and Delivery pipeline. | **8 Hours** |
| **Unit-5** | **CI/CD concepts (GitHub, Jenkins, Sonar):**<br>GitHub, Introduction to Git, Version control system, Jenkins Introduction, Creating Job in Jenkins, adding plugin in Jenkins, Creating Job with Maven & Git, Integration of Sonar, Dockers, Containers Image: Run, pull, push containers, Container lifecycle, Introduction to Kubernetes. | **8 Hours** |
| **Course Outcomes –** | | |
| **CO1** | Apply the knowledge of ES6 that are vital to implement react application over the web. | K3 |
| **CO2** | Implement and understand the impact of web designing by database connectivity with Mongodb . | K3 |
| **CO3** | Explain, analyze and apply the role of server-side scripting language like Nodejs and Express js framework | K4 |
| **CO4** | Identify the benefits of DevOps over other software development processes to Gain insights into the DevOps environment. | K2 |
| **CO5** | Demonstrate popular open-source tools with features and associated terminology used to perform Continuous Integration and Continuous Delivery. | K3 |
| **Textbooks:** | | |

1. Kirupa Chinnathambi, “Learning React”, 2nd Edition 2016, Addison Wesley Publication.
2. Mohan Mehul, “Advanced Web Development with React”, 2nd Edition 2020, BPB Publications.
3. Dhruti Shah, “Comprehensive guide to learn Node.js”, 1st Edition, 2018 BPB Publications.
4. Jennifer Davis, Ryn Daniels, “Effective DevOps: Building, Collaboration, Affinity, and Tooling at Scale”,1st Edition, 2016, O'Reilly Media Publication.
5. John Edward Cooper Berg, “DevOps. Building CI/CD Pipelines with Jenkins, Docker Container, AWS (Amazon Web Services) ECS, JDK 11, Git and Maven 3, Sonar, Nexus”, Kindle Edition,2019, O'Reilly Media Edition.

## Reference Books:

1. Anthony Accomazzo, Ari Lerner, and Nate Murray, “Fullstack React: The Complete Guide to ReactJS and Friends”, 4th edition, 2020 International Publishing.
2. David Cho, “Full-Stack React, Type Script, and Node: Build cloud-ready web applications using React 17 with Hooks and GraphQL”, 2nd edition, 2017 Packt Publishing Limited.
3. Richard Haltman & Shubham Vernekar, “Complete node.js: The fast guide: Learn complete backend development with node.js”5th edition, 2017 SMV publication.
4. Glenn Geenen, Sandro Pasquali, Kevin Faaborg, “Mastering Node.js: Build robust and scalable real-time server-side web applications efficiently” 2nd edition Packt,2017 Publishing Limited.
5. Greg Lim,” Beginning Node.js, Express & MongoDB Development, kindle edition,2019 international publishing.
6. Daniel Perkins, “ReactJS Master React.js with simple steps, guide and instructions” 3rd edition, 2015 SMV publication.
7. Peter Membrey, David Hows, Eelco Plugge, “MongoDB Basics”, 2nd edition ,2018 International Publication.

## Links: NPTEL/You Tube/Web Link:

https://youtu.be/QFaFIcGhPoM?list=PLC3y8-rFHvwgg3vaYJgHGnModB54rxOk3
https://youtu.be/pKd0Rpw7O48
https://youtu.be/TlB_eWDSMt4
https://youtu.be/QFaFIcGhPoM

https://youtu.be/Kvb0cHWFkdc
https://youtu.be/pQcV5CMara8
https://youtu.be/c3Hz1qUUIyQ
https://youtu.be/Mfp94RjugWQ
https://youtu.be/SyEQLbbSTWg

https://youtu.be/BLl32FvcdVM
https://youtu.be/fCACk9ziarQ
https://youtu.be/YSyFSnisip0
https://youtu.be/7H_QH9nipNs
https://youtu.be/AX1AP83CuK4

https://youtu.be/2N-59wUIPVI
https://youtu.be/hQcFE0RD0cQ
https://youtu.be/UV16BbPcMQk
https://youtu.be/fqMOX6JJhGo

https://youtu.be/m0a2CzgLNsc
https://youtu.be/1ji_9scA2C4
https://youtu.be/tuIZok81iLk
https://youtu.be/IluhOk86prA
https://youtu.be/13FpCxCClLY

# B. TECH FOURTH YEAR

| Course code | ACSE0711 | L T P | Credits |
|---|---|---|---|
| Course title | GAME PROGRAMMING | 3 0 0 | 3 |

**Course objective:** The objective of this course is to understand the basic concepts of Game design and development. The course will help to build the programming skills needed to turn ideas into games.

**Pre-requisites:** None

**Course Contents / Syllabus**

| UNIT-I | 3D GRAPHICS FOR GAME PROGRAMMING | 8 HOURS |
|---|---|---|

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Character Animation, Physics-based Simulation, Scene Graphs.

| UNIT-II | GAME ENGINE DESIGN | 8 HOURS |
|---|---|---|

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

| UNIT-III | GAME PROGRAMMING | 8 HOURS |
|---|---|---|

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

| UNIT-IV | GAMING PLATFORMS AND FRAMEWORKS | 8 HOURS |
|---|---|---|

2D and 3D Game development, Game engines -Unity. Game Development & Documentation, Game Idea Visualization and Story Telling, Introduction to Unity interface.

| UNIT-V | GAME DEVELOPMENT | 8 HOURS |
|---|---|---|

Developing 2D and 3D interactive games using Unity – Isometric and Tile Based Games, Puzzle games, Single Player games, multi-Player games. Use of 3D Game Kit to create 3D platform gameplay and puzzles in Unity.

**Course outcome:** After completion of this course students will be able to:

| | | |
|---|---|---|
| CO 1 | Create VR experiences by setting up environments, interactions, and immersive elements using modern concepts of Game design. | K2 |
| CO 2 | Propose and design the processes and use mechanics for games. | K3 |
| CO 3 | Create 3D scenes with Unity and experiment with various user interface techniques that are used in VR AR applications. | K6 |
| CO4 | Create a 2D and 3D game in Unity and arrange Game programming platforms. | K6 |
| CO 5 | Evaluate and use emerging technologies and tools for creating interactive Games. | K5 |

## Textbooks:


1. Shaffrfy Mike Mc and Graham David, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Gregory Jason, “Game Engine Architecture”, CRC Press / A K Peters, 2009
3. Eberly David H., “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer

Graphics" 2nd Editions, Morgan Kaufmann, 2006.

## Reference Books:


1. Adams Ernest and Rollings Andrew, "Fundamentals of Game Design", 2nd edition Prentice Hall/ New Riders,2009.
2. Lengyel Eric, "Mathematics for 3D Game Programming and Computer Graphics", 3rd edition, Course
3. Schell Jesse, The Art of Game Design: A book of lenses, 1st Editions, CRC Press, 2008.


## Links:

Unit 1: Install the Unity Hub and Editor

How to download and install Unity Editor using Unity Hub
https://learn.unity.com/tutorial/publish-your-first-mobile- runnergame
https://learn.unity.com/tutorial/platformer-mod-add-speed-and-bounce-pads#5d5af56dedbc2a005fb9216c
https://learn.unity.com/tutorial/quick-start?uv=2019.4&courseId=5c616a81edbc2a0021b1bd11&projectId=5c514897edbc2a001fd5bdd0#5c7f8528edbc2a002053b740 https://learn.unity.com/project/3d-game-kit?uv=2019.4&courseId=5c616a81edbc2a0021b1bd11

Unit2: https://learn.unity.com/project/3d-game-kit-lite

Unit3: https://learn.unity.com/tutorial/3d-game-kit-reference-guide
https://learn.unity.com/tutorial/next-steps-certifications-game-jams-and-beyond?courseId=6046c239edbc2a2720f9983b

Unit4:
https://learn.unity.com/tutorial/week-1-player-control-may-17-21?courseId=6046c239edbc2a2720f9983b
https://learn.unity.com/tutorial/week-2-basic-gameplay-may-24-28?uv=2020.3&courseId=6046c239edbc2a2720f9983b

Unit5: https://learn.unity.com/project/unit-3-oi?uv=2019.4&courseId=5edebd48edbc2a444960263e
https://docs.unity3d.com/Manual/index.html

https://msl.cs.uiuc.edu/vr/vrbook.pdf