



Deccan Education Society's

Fergusson College
(Autonomous) Pune

NEP 2020-Based Curriculum For

M. Sc. II - Data Science

With effect from Academic Year

2024-2025

M.Sc. Data Science II Programme Structure

Semester	Paper Code	Paper Title	Type	Credits
III	CSD-601	Neural Networks & Deep Learning	Theory	4
	CSD-602	Data Science Case Studies	Theory	4
	CSD-603 OR	Forefronts in Data Science	Theory	4
	CSD-604	MOOCs		
	CSD-610	Research Project	Project	4
	CSD-620	Practical – V	Practical	2
	CSD-621	Practical – VI	Practical	2
	Total Semester Credits			
IV	CSD-651 OR	Applied Analytics	Theory	4
	CSD - 652	MOOCs		
	CSD-660	Research Project	Project	6
	CSD-670	Practical – VII	Practical	2
	CSD-671	On The Job Training / Industrial Training	Practical	8
	Total Semester Credits			
Total PG-II Credits				40

Teaching and Evaluation (Only for FORMAL education courses)

Course Credits	No. of Hours per Semester Theory/Practical	No. of Hours per Week Theory/Practical	Maximum Marks	CE 40 %	ESE 60%
1	15 / 30	1 / 2	25	10	15
2	30 / 60	2 / 4	50	20	30
3	45 / 90	3 / 6	75	30	45
4	60 / 120	4 / 8	100	40	60

Eligibility: As per the rules and regulations of Savitribai Phule Pune University (SPPU)

S.Y. M.Sc. Semester III

CSD-601	Neural Networks & Deep Learning	Credits: 04 Hours: 60
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	Identify different techniques in deep learning and describe their importance and application ranges.	
CO2	Discuss the deep learning techniques.	
CO3	Implement the algorithms in deep learning and apply the knowledge in Various domains.	
CO4	Analyze the different types of data and map suitable techniques that suit the data.	
CO5	Assess and criticize the model developed on the basis of different Performance measures.	
CO6	Build an optimized and efficient model to solve the problem statement.	

Unit	Details	Lectures
I	Foundations of Neural Network and Deep Learning <ol style="list-style-type: none"> 1. Introduction to deep learning 2. Machine learning Vs Deep Learning 3. Basics of Neural Network 4. Perceptron and Multilayer Perceptron 5. Types of Neural Network: ANN,CNN,RNN,LSTM 6. Applications of Neural Network 7. Necessary activation functions 8. Notion of Partial and total Derivatives and functions 9. Weights and weight sharing, loss function, partial ordering 	8
II	Deep Learning Networks <ol style="list-style-type: none"> 1. Working with Tensorflow, Keras ,Pytorch 2. Backpropagation in Feed-forward Networks 3. Feed Forward for Classification and Regression 	8
III	Convolutional Neural Networks <ol style="list-style-type: none"> 1. Introduction to Convolutional Networks 2. Understanding Convolution, Pooling and Strides 3. Different Classic CNN Architectures 4. Training neural networks with various optimization algorithms. 5. CNN architectures (e.g., AlexNet, VGG, ResNet) 6. CNN with MNIST Dataset and also with other datasets 7. Application of CNN in Computer Vision:Image 	14
IV	Improving the Deep Neural Networks <ol style="list-style-type: none"> 1. Regularization: L1, L2, Dropout 2. Early Stopping 3. Optimization for Training Deep Models Hyperparameter Tuning 	10
V	Recurrent Neural Networks <ol style="list-style-type: none"> 1. Introduction 2. Difference between RNN and Feedforward Neural Network 3. Recurrent Neuron and RNN Unfolding 4. Types of RNN 5. Architecture of RNN 6. Tackling Vanishing Gradient Problem 7. Long Short-Term Memory 8. Building a RNN 9. Evaluating the RNN 10. Improving the RNN 11. Tuning the RNN. 12. Applications of RNNs (e.g., text generation, language translation) 	15
VI	Deep Learning Case Studies	5

References:

1. Nikhil Baruma, Fundamentals of Deep Learning, O'Reilly publication, 2019.
2. Seth Weidman, Deep Learning from Scratch-Building with Python from First Principles, O'Reilly publication, 2019.
3. Bharat Ramsundar, Peter Eastman, Patrik Walters, Vijay Pande, Deep Learning for the Life Sciences, O'Reilly publication, 2019.
4. Sudharsan Ravichandiran, Hands-on Deep Learning Algorithms with Python, Packt Publication 2019.
5. Christopher Bishop, Pattern Recognition and Machine Learning, Springer. 2006. [CB- 2006].
6. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Interscience. 2nd Edition. 2001.
7. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer. 2001.
8. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
9. Ian Goodfellow, Yoshua Benjio, Aaron Courville, Deep Learning, The MIT Press
10. Aggarwal, Charu C., "Neural Networks and Deep Learning", Springer International Publishing, 1st Edition.

Web references

1. www.deeplearning.ai
2. www.tensorflow.org

S.Y. M.Sc. Semester III		
CSD-602	Data Science Case Studies	Credits: 04 Hours:60
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	Define steps for solving case studies of different domains.	
CO2	Illustrate analytical tool's features for problem solving, filtering data and Visualization.	
CO3	Apply the data manipulation and transformation techniques for preparing the data ready for processing.	
CO4	Analyze data with the help of visualization and predict results.	
CO5	Evaluate model performance and communicate results.	
CO6	Build a comprehensive end to end project.	

Unit. No.	Title of Unit and Contents	No. of Lectures
I	<p>Brief Introduction to Data Science</p> <ol style="list-style-type: none"> 1. What is Data Science 2. Why Now? - The importance of Data Science in today's business environment. 3. Difference between Data Science, Business Intelligence and Data Analysis 4. Real World Applications of Data Science 5. Popular Tools and Languages to Apply Data Science 6. A Typical Data Science Team 7. Team Structures 	8
II	<p>Analysis, Prediction and Visualization</p> <ol style="list-style-type: none"> 1. Generating Charts and plots to better understand the 2. Output 3. Interpretation 4. Prediction 5. Conclusion 	8
III	<p>Communicate Results</p> <ol style="list-style-type: none"> 1. Creating Dashboards in Tableau 2. Creating a Story in Tableau 3. Creating Dashboards in MS Excel 4. Generate High End Presentations in MS PowerPoint 	8
IV	<p>The Data Science Workflow</p> <ol style="list-style-type: none"> 1. Understand the steps in the life cycle of a Data Science project 2. Theoretical Vs Applied Data Science 	10
V	<p>Case Study</p> <ol style="list-style-type: none"> 1. Problem Statement – Domain and scope of the study 2. Data Source 3. Data Preparation 4. Choice of Model 5. Model Building 6. Type of tools to use 7. Analysis 8. Presentation 	26

References:

1. Microsoft Excel Data Analysis and Business Modeling, By Wayne L. Winston, Published by Microsoft Press 2019
 1. Ryan Sleeper, Practical Tableau, O'Reilly publication, 2019.

2. Python Data Science Hand Book -

<https://tanthiamhuat.files.wordpress.com/2018/04/pythondatasciencehandbook.pdf>

S.Y. M.Sc. Semester III		
CSD-603	Forefronts in Data Science	Credits: 04 Hours:60
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	Outline different terms and concepts in Data science.	
CO2	Explain the importance of different steps in data processing to get the desired result.	
CO3	Implement different models and concepts in Data Science.	
CO4	Analyze different visualizations to display the result.	
CO5	Measure and test the performance of different models in different domains.	
CO6	Develop and deploy models to solve different problems.	

Unit. No.	Title of Unit and Contents	No. of Lectures
I	Introduction <ol style="list-style-type: none"> 1. Data science Concept 2. Different Methodology 3. Cloud and Data Science 4. Data Preparation, Data Transformation 5. Data visual representation 6. Machine learning Concept and algorithm 	20

II	Technology Used in Data Science <ol style="list-style-type: none"> 1. Technology Implementation method with data 2. Exploring and Preparing auto data 3. Validating automotive data 4. Visualize preliminary data wrangling results 5. Run summary statistics on the results 6. Exploring visualization tool for data 7. Implementation of ML concept 	20
III	Various Domain based Case study implementation with technology	20

References:

1. AI Sweigart, Automate the Boaring Stuff with Python, November 2019
2. Jeff Leek, The Elements of Data Analytic Style, Leanpub publications, published on 2015-03-02
3. Roger D. Peng and Elizabeth Matsui, The Art of Data Science, Leanpub publications. 2015 - 2016
4. Advice and Insights from 25 Amazing Data Scientists, The Data Science Handbook, Leanpub publications. 2015 – 2016
5. Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms c 2014.

Web References

1. <https://www.packtpub.com/in/data/complete-data-wrangling-and-data-visualization-in-r- video>
2. <https://www.edureka.co/blog/importance-data-science-cloud-computing/#:~:text=Data%20science%20and%20cloud%20computing,a%20need%20for%20 Data%20Scientists.>

S.Y. M.Sc. Semester III		
CSD-610	Research Project	Credits: 04 Hours:120
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	Carry out a substantial research-based project / able to plan a research design including the sampling, observational, statistical and operational designs if any	
CO2	Enable students to do sufficient groundwork in terms of preparing the outline of research plan	

CO3	Develop a thorough research proposal.
CO4	Analyze data and synthesize research findings
CO5	Evaluate the research proposal based on the requirements
CO6	create a logically coherent project report and will be able to defend his / her work in front of a panel of examiners

Research Project Guidelines:

Paper Code	Paper Title	Credits	Total Marks
CSD-610	Research Project I	4	100

Introduction

The NEP 2020 has emphasized on the inclusion of research and development in Higher Education Institutions. As colleges are integral part of knowledge impartment and creation NEP 2020 has introduced the research component to quite substantial degree at post graduate level.

The multidisciplinary, transdisciplinary and translational research culture is expected to be introduced at postgraduate level. Such research project undertaken will obviously enhance the research productivity, collaboration at national and international level in various industries, government as well as community based organizations and agencies.

Objectives

1. To enable the students to undertake research projects that are relevant and important.
2. To apply pre-learnt concepts to design research problem with help of literature survey.
3. To enable students to do sufficient groundwork in terms of preparing the outline of research plan which includes grants, infrastructural requirements and procurement of resources.
4. To allow students the opportunity to develop a thorough research proposal. UGC guidelines to be followed for writing the research proposal.
5. To encourage research culture which includes exploring collaborative project ideas.
6. To give students the opportunity to present their proposal before funding agencies and if possible, procure funding for the project.

Outcome

- I. Students will do the groundwork for research in terms of identifying a relevant research topic (relevance will be decided based on the subject). Identifying the queries and literature review.
- II. Define well formulated specific objectives that help develop the overall research methodology,
- III. By the end of the semester the student is expected compile and communicate the Research Proposal with proper format and if possible have procured funding for the same.

Evaluation

- I In **CSD-610**, the total credits for the research project are 4. Hence internal evaluation will be of 40 marks and external evaluation will be of 60 marks.
- II. Students will be allowed to work individually or in groups (maximum number of students in each

group should not exceed 4).

III. The pattern of evaluation will be as follows:

	Examiner for Internal exam	Examiner for External exam	Nature of evaluation (Internal)	Nature of evaluation (External)
Sem III	Internal guide	External subject expert	Periodic assessment of ideation and proposal development	Student(s) present research proposal

Parameters for assessment

SR. NO.	POINTS / Evaluation Parameters
1	Selection Project Idea/Topic and Originality of the research problem identified
2	Significance of the Work and Literature Review
3	Review A statement of Aims and Objectives
4	Plan of Research Project
5	Thoroughness of the proposal in terms of methodology, apparatus/equipment required and timeline (PERT chart).
6	Regularity of work carried
7	Bibliography

(Based on overall performance and oral presentation/ viva voce for the dissertation)

S.Y. M.Sc. Semester III		
CSD-620	Practical – V (Deep Learning – Practical)	Credits: 02 Hours:60

Course Outcome (COs) On completion of the course, the students will be able to:	
CO1	Describe concepts of deep learning.
CO2	Discuss and compare the functionalities of various frameworks e.g. Pytorch and Tensorflow.
CO3	Apply neural networks (e.g. CNN, RNN etc.) in problem solving.
CO4	Analyze different unstructured data sets and solve them using classification techniques.
CO5	Evaluate model performance based on accuracy, tuning and hyper parameters.
CO6	Construct Deep learning models to solve real life problems.

1	Deep Learning using Keras
2	Deep Learning using Pytorch
3	Deep Learning using Tensorflow
4	Application of CNN in Computer Vision
5	CNN in Image Classification
6	CNN in Object Detection
7	Application of RNN in NLP
8	RNN in Time Series Forecasting
9	Image Gradients and Edge Detection using Neural Network
10	Case Study

References:

1. Sudarshan Ravichandran, Hands-on Deep Learning Algorithms with Python, Packt Publication, 2019
2. Ian Goodfellow, YoshuaBenjio, Aaron Courville, Deep Learning, The MIT Press

Web Reference

- 1 www.deelearning.ai
- 2 www.tensorflow.org

S.Y. M.Sc. Semester III

CSD-621	Practical – VI (Big Data Analytics) through SPARK (Experiential Learning)	Credits: 02 Hours:60
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	Understand the Big Data Platform and its Use cases	
CO2	Provide Concepts and Interfacing with HDFS and Map Reduce	
CO3	Apply hands on Spark programming and Eco System	
CO4	Compare spark analytics on Structured, Unstructured Data.	
CO5	Exposure to Data Analytics with Machine Learning Algorithm using Spark	
CO6	Create Spark use case applications	

Unit	Contents	No. of Hours
I	Introduction to Big Data and Hadoop <ol style="list-style-type: none"> 1. Big Data and its importance – Sources of Big Data – Characteristics of Big Data – Big Data Analytics – Big Data Applications, Hadoop 2. Distributed File System – Map Reduce Paradigm- Hadoop Ecosystem 	12
II	Spark Programming with Python <ol style="list-style-type: none"> 1. Apache Spark Ecosystem - Resilient Distributed Datasets – Spark Architecture -Loading and Storing Data – Transformations – Actions – Key-Value Resilient Distributed Datasets – Local Variables – Broadcast Variables – Accumulators – Partitioning – Persistence. 	12

III	Spark SQL 1. Overview of Spark SQL – Spark Session – Data Frames – Schema of a Data Frame – Operations supported by Data Frames – Filter, Join, GroupBy, Agg operations – Nesting the Operations – Temporary Tables – Viewing and Querying Temporary Tables.	12
IV	Spark Streaming 1. Use Cases for Real time Analytics – Transferring, Summarizing, Analysing Real time data – Data Sources supported by Spark Streaming – Flat files, TCP/IP – Flume – Kafka – Kinesis – Streaming Context – DStreams operations.	12
V	Machine Learning with Spark 1. Linear Regression – Decision Tree Classification – Principal Component Analysis – Random Forest Classification – Text Pre-processing with TF-IDF – Naïve Bayes Classification – K-Means Clustering – Recommendation Engines.	12

References:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2011
3. Tomasz Drabos, “Learning PySpark”, PACKT, 2017.

Suggested Readings

1. Padma Priya Chitturi, “Apache Spark for Data Science”, PACKT, 2017.
2. Holden Karau, “ Learning Spark”. PACKT, 2016.
3. Sandy Riza, “Advanced Analytics with Spark”, O’ Reilly, 2016.
4. Romeo Kienzler, “Mastering Apache Spark”, PACKT, 2017.

Web Resources

1. <https://spark.apache.org/>
2. <https://databricks.com/>

Lab Course in	
Note: - Each Assignment will be based on following concepts	
Sr. No.	Topics Covered
1	Assignment 1: Data Ingestion and Storage
2	Assignment 2: Data Preprocessing and Cleaning

3	Assignment 3: Data Analysis and Mining
4	Assignment 4: Data Visualization
5	Assignment 5: Scalability and Performance Optimization
6	Assignment 6: Case Study and Application

S.Y. M.Sc. Semester IV		
CSD-651	Applied Analytics	Credits: 04 Hours:60
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	To recognize challenges with respect to vast sources of data.	
CO2	To understand the data with respect to its types and assess the quality of data.	
CO3	To identify and apply analytical concepts and methods and gain insights	
CO4	To effectively derive interpretations based on model outcomes and results	
CO5	To frame / construct advanced data analytic models using text, image data	
CO6	Design and develop analytical models based on end user requirements	

Unit	Contents	No. of Hours
I	Cloud Computing: Introduction to Cloud computing, Cloud service methods, IaaS, PaaS, SaaS, fundamentals of cloud Architecture (load	20

	distribution, resource pooling, scalability, load balancing, redundancy, etc),	
II	Introduction of DevOps, CICD. Hands-on practice on either AWS OR Azure OR Google Cloud Platform.	20
III	Cloud Analytics: Introduction, Cloud vs. on-premises solutions, Benefits, Working of Cloud Analytics, Types of Cloud Analytics, Cloud Analytics Case studies	20

Reference Books:

1. Rajkumar buyya, Christian vecchiola, S Thamarai Selvi , “Mastering cloud computing”, Tata McGraw Hill Education Private Limited, 2013
2. Anthony T .Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing a Practical Approach”, Tata McGraw-HILL, 2010 Edition.
3. Barrie sosinsky, “Cloud computing bible, Wiley publishing

S.Y. M.Sc. Semester IV		
CSD-660	Research Project	Credits:06 Hours:180
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	Carry out a substantial research-based project	
CO2	Capacity development to analyze data and process research findings	
CO3	Apply various techniques based on the data to construct models	
CO4	To compile and communicate the findings/conclusions / results obtained in the science community through various means of communication.	
CO5	To enable students to put together a research paper that can be published or presented at conferences.	
CO6	Prepare research findings in terms of research paper and publish the work	

Paper Code	Paper Title	Credits	Total Marks
CSD -660	Research Project II	6	150

Introduction

The research project proposal needs to be implemented by following the given timeline Under the NEP, students are expected to get industry ready by the time they pass out of their Masters' degree course. There is also an emphasis on research so that every student is expected to carry out independent research project as a part of his or her Post Graduate program. The emphasis is on research that is socially applicable, and carried out with scientific rigor. One benchmark of good quality research is publication of the project either in International or National level scientific journals or the presentation of students' research work at International, National or State level conferences. With this broad objective, the following has been proposed for student research projects at Masters Level.

Objectives:

1. To facilitate substantial data collection for the proposed research work
2. To carry out research following ethical aspects of research activities.
3. To compile and communicate the findings/conclusions / results obtained in the science community through various means of communication.
4. To enable students to put together a research paper that can be published or presented at conferences.

Outcome:

- I. Carry out a substantial research-based project
- II. Capacity development to analyze data and process research findings
- III. Use research findings to advance education theory and practice.
- IV. Focus on quality review of the research papers and may be published in peer-reviewed journals or may be presented in conferences / seminars. The research project outcome can be considered for evaluation based on following criteria.
- V. Research Publication in Peer reviewed Scopus / UGC -CARE indexed journal.
- VI. Poster/ Oral Presentation in seminars/ conferences outside the institute
- VII. Poster/ Oral Presentation in seminars/ conferences arranged by the institution.
- VIII. The dissertation will be done as per the guidelines of UGC

Evaluation

- I In **CSD -660**, the total credits for the research project are 6. Hence, internal evaluation will be of 60 marks and external evaluation will be of 90 marks.
- II. Students will be allowed to work individually or in groups, (maximum number of students in each group should not exceed 4).

III. The pattern of evaluation will be as follows:

Parameters for assessment

(Based on overall performance and oral presentation/ viva voce for the dissertation)

	Examiner for Internal exam	Examiner for External exam	Nature of evaluation (Internal)	Nature of evaluation (External)
Sem IV	Internal guide	External subject expert	Periodic assessment of data collection, analysis and report writing	Student(s) present research report. 30 marks to be allotted for publication/presentation at conference

SR. NO	POINTS / Parameters
1	Continuous Assessment of day-to-day work
2	Record keeping/ maintenance of journal
3	Ability design work protocol and troubleshooting
4	Proficiency of Presentation skills and use of audio-visual aids
5	Effective data representation (eg. Graphs, chats etc.)
6	Research Potential of the work, result and interpretation
7	Outline of the study and possible future plans
8	The dissertation report preparation (Scientific writing) and its contents
9	Abilities of satisfactory responses to the queries from the audience
10	Publication potential of the work (25% overall weightage to be given)

S.Y. M.Sc. Semester IV

CSD-670	Practical – VII Natural Language Processing - Enabling Technologies for Data Science (Experiential Learning)	Credits: 02 Hours:60
Course Outcome (COs) On completion of the course, the students will be able to:		
CO1	To incorporate basic data pre-processing procedures on text.	
CO2	Understand key concepts from NLP and linguistics to describe and analyze language	
CO3	To apply statistical tools to develop a model for prediction using a probabilistic approach.	
CO4	To perform topic analysis using semantic analysis	
CO5	Classify texts using machine learning and deep learning	
CO6	To develop appropriate language modeling.	

Unit	Contents	No. of Hours
I	Introduction to Natural Language Processing Basics of NLP NLP tools and approaches	05
II	Data Preprocessing for Language Models Text Vectorization Layer Standardization, Vocabulary Indexing Embedding Word Vectors TF-IDF , Bag of Words Model and Sequential Models	10
III	Computational Phonetics and Speech Processing Speech samples: Speech recognition and Deep Neural Networks Tokenization and Sentence splitting	10
IV	Computational Syntax Part-of-speech tagging, Grammars for natural language, Natural language Parsing	10
V	Computational Semantics Lexical semantics: WordNet and FrameNet , Word Sense Disambiguation Distributional Semantics & Word-Space models , Word/Sentence/Text embeddings	10
VI	Applications and Case studies: Solving Downstream Tasks: Document classification, Sentiment Analysis, Named Entity Recognition, Semantic Textual Similarity, Prompting Pre-Trained Language Models, Network Embedding	10
VII	Large Language Model Approaches Working with large language models , Use Case Examples in LLM	05

References:

1. Daniel Jurafsky and James H. Martin “Speech and Language Processing”, Prentice Hall, 2009.
2. Christopher D.Manning and Hinrich Schutze, “Foundation of Statistical Natural Language Processing”,

MITPress, 1999.

3. Ronald Hausser, “Foundations of Computational Linguistics”, Springer-Verleg, 1999.
4. James Allen, “Natural Language Understanding”, Benjamin/Cummings Publishing Co. 1995.

SUGGESTED READINGS:

1. James Pustejovsky and Amber stubbs, “Natural language Annotation for machine learning”, Shroff Publishers,2012.
2. Daniel M. Bikel, “Multilingual Natural language processing”, Pearson, 2012. 3. Emily M. Bender, “Linguistic Fundamentals for Natural language processing”, Margon & Claypool Pub., 2013.
4. Hobson Lane, “Natural language processing in action”, Manning Pub.,2013.

Web Resources:

<https://www.deeplearning.ai/resources/natural-language-processing/>

S.Y. M.Sc. Semester IV		
CSD-671	On The Job Training / Industrial Training	Number of Credits: 08 Hours: 240
Course Outcome (COs)		
On completion of the course, the students will be able to:		
CO1	Identify and demonstrate the broad role and importance of the technologies required in the industry and explain the organizational structure of the company	
CO2	Provide a foundation with hands-on experience making them employment ready for preparing the student for working efficiently and productively in industrial commercial establishments.	
CO3	Apply different methods and approaches with respect to problem solving in respective domain areas.	
CO4	Demonstrate and showcase skills in implementation of projects	
CO5	Evaluate the student performance based on training and project based parameters	
CO6	Build a comprehensive end-to-end project.	

Objectives:

1. To make the students get an insight into the actual work culture of the I.T. industry.
To make the students aware of the skills and technologies needed to work in the I.T. industry.
2. Understanding the Organizational Structure of the company.

Introduction:

On-the-job training (OJT)/ Industrial Training (IT) is one of the most influential and well-established ways of teaching students the skills and knowledge needed to work in a professional environment. OJT often can facilitate a smooth transition from university to the industry/ market. As a result, several organizations give OJT to students before appointing them to full-time job positions. The newly introduced course structure in the NEP2020 envisages imparting strong knowledge, skills to improve the job potential of the students by providing experiential learning opportunities, values, and a research

oriented vibrant higher education ecosystem for sustainable development. With these perspectives, in the NEP 2020 guidelines, OJT/ Internship/ Field work is made mandatory in the curriculum of all post graduate programmes.

Internships includes working with government or private organizations, higher education institutions, universities, research and development, labs/research organizations/non-government organizations, enterprises, centers involved in research, innovativeness and entrepreneurship, business organizations, local industry, artists, craftspeople, and similar other entities for providing opportunities to students for active engagement in on-site experiential learning.

It helps students get direct experience in using tools, software, techniques, equipment used, gain experience in data collection from the relevant field, conducting surveys etc. in a live environment and experience the work culture.

During an OJT program, students work under the supervision of experienced professionals and are given tasks and responsibilities that are relevant to their field of study. They are also given feedback and guidance on their performance, which allows them to improve their skills and knowledge. OJT programs can vary in length, depending on the industry and the requirements of the program. Successful completion of the OJT can improve the employment potential of the students or can also get an opportunity to continue their work as a research project in subsequent semesters. Internships can be mutually beneficial for the intern as well as the internship providing organization. The internship providing organizations provide training with an objective to create a pipeline of great future employees.