RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FOUR YEAR BACHELOR OF TECHNOLOGY (B.TECH.) DEGREE COURSE

SEMESTER: EIGTH (C.B.C.S.)

BRANCH: COMPUTER SCIENCE AND ENGINEERING

Subject:	Social Networks		Subject Code:	BTECHCSE802T	
Load	Credit	Total Marks	Internal Marks	University Marks	Total
03 Hrs (Theory)	03	100	30	70	100

Aim : To understand social networks and use of tools for social network analysis.

Prerequisite(s): Discrete Mathematics

Course Objective/Learning Objective:

1	To understand highly interconnected and hence more complex social networks
2	To represent connected social networks in form of graph
3	To apply graph theory, sociology, game theory
4	To use tools and extract statistics from social networks

Course Outcome:

At the end of this course Student are able to:

CO1	Learn social networks , its types and representation
CO2	Understand weak ties, strong and weak relationships , homophily and calculate
CO3	Analyse links
CO4	Understand Power Laws and Rich-Get-Richer Phenomena
CO5	Understand Small World Phenomenon

Week 1: Introduction

Week 2: Handling Real-world Network Datasets

Week 3: Strength of Weak Ties

Week 4: Strong and Weak Relationships (Continued) & Homophily

Week 5: Homophily Continued and +Ve / -Ve Relationships

Week 6: Link Analysis

Week 7: Cascading Behaviour in Networks

Week 8: Link Analysis (Continued)

Week 9: Power Laws and Rich-Get-Richer Phenomena

Week 10: Power law (contd..) and Epidemics

Week 11: Small World Phenomenon

Week 12: Pseudocore (How to go viral on web)

Unit I: **(08 Hrs)**

Salesforce Administration:-

INTRODUCTION TO SALESFORCE:-

Cloud Computing ,Services of Cloud computing,Types of Cloud,What is Salesforce?,Salesforce Products,How to create Salesforce developer edition account, Walkthrough Salesforce.com platform.

CONFIGURATION AND CUSTOMIZATION:-

Salesforce:Data types,field types and components.

Apps in Salesforce(Standard Apps,Custom Apps),Steps to Create a SalesforceApp, Salesforce tabs,Types of Tab Visibility.Users & User Licenses.

Salesforce Objects, fields & Field Dependency, Profiles & Roles

Unit II: **(07 Hrs)**

Relationships In Salesforce, Validation Rule& formula , Approval process , Flows and Process Builder,Page Layouts, Reports and Dashboards.

WorkFlow:DefineWorkflow,Workflow Rules,Components of Workflow(action , criteria),How to configure Workflow Rule Criteria?, Setup workflow tasks & Email Alerts & Field Updates,Time dependent workflows.

Unit III: **(07 Hrs)**

AUTHORIZATION & SHARING DATA:-

Profiles ,Permission Sets, Org-Wide Defaults , Role Hierarchies, Sharing Rules , Manual Sharing , Record Types

DATA MANAGEMENT :- Import and Export Data, Data Loader.

Unit IV: **(07 Hrs)**

INTRODUCTION TO APEX:-Collections (List,Map,Set),DML Operations,SOQL And SOSL, Controllers In APEX

Apex Triggers: Overview On Triggers,Trigger Events:Before Triggers,After Triggers,Insert Triggers,Update Triggers,Delete Triggers,Undelete Triggers

Trigger context variables,Recursive Triggers.Governor Limits

Unit V: **(07 Hrs)**

ASYNCHRONOUS APEX:Future Method ,Queueable Apex, Scheduled Apex

Batch APEX: Iterable Class, QueryLocator, GetQueryLocator, Start Method, Execute Method, Finish Mehtod, BatchableContext.

Test Class: StartTest,StopTest, Test Class on Apex class and Triggers

References:

- https://onlinecourses.nptel.ac.in/noc23_cs19/preview
- Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010
- (available for free download).
- Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.

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FOUR YEAR BACHELOR OF TECHNOLOGY (B.TECH.) DEGREE COURSE
SEMESTER: EIGHTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE AND ENGINEERING

Subject:	Reinforcement Learning			Subject Code:	BTECHCSE802T
Load	Credit	Total Marks	Internal Marks	University Marks	Total
03 Hrs (Theory)	03	100	30	70	100

Aim : The goal of the course is to introduce the basic mathematical foundations of reinforcement learning, as well as highlight some of the recent directions of research.

Prerequisite(s): Learnings & Neural Networks

Course Objective/Learning Objective:

1	It aims to model the trial-and-error learning process that is needed in many problem situations where explicit instructive signals are not available.
2	It has roots in operations research, behavioral psychology and AI.
3	The goal of the course is to introduce the basic mathematical foundations of reinforcement learning.
4	It highlight some of the recent directions of research

Course Outcome:

At the end of this course Student are able to:

CO1	Understand Bandit algorithm and its mathematical formulation.
CO2	Use dynamic programming for reinforcement learning
CO3	Perform function approximation and apply LSM
CO4	Fit Q, DQN & Policy Gradient for Full RL
CO5	Use combinatorial models for complex problems

Week 1 Introduction
Week 2 Bandit algorithms – UCB, PAC
Week 3 Bandit algorithms –Median Elimination, Policy Gradient
Week 4 Full RL & MDPs
Week 5 Bellman Optimality
Week 6 Dynamic Programming & TD Methods
Week 7 Eligibility Traces
Week 8 Function Approximation
Week 9 Least Squares Methods

Week 10 Fitted Q, DQN & Policy Gradient for Full RL

Week 11 Hierarchical RL

Week 12 POMDPs

References

- https://archive.nptel.ac.in/courses/106/106/106106143/
- R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press. 1998.

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SEMESTER: EIGTH (C.B.C.S.)

BRANCH: COMPUTER SCIENCE AND ENGINEERING

Subject:	GPU Architectures and Programming			Subject Code:	BTECHCSE802T
Load	Credit	Total Marks	Internal Marks	University Marks	Total
03 Hrs (Theory)	03	100	30	70	100

Aim : To understand GPU architecture basics in terms of functional units and then dive into the popular CUDA programming model commonly used for GPU programming.

Prerequisite(s): Programming and Data Structure, Digital Logic, Computer architecture

Course Objective/Learning Objective:

1	To introduce basics of conventional CPU architectures, their extensions for single instruction multiple data processing (SIMD)
2	To understand concept in the form of single instruction multiple thread processing (SIMT) as is done in modern GPUs.
3	To teach architecture specific details
4	To introduce different architecture-aware optimization techniques relevant to both CUDA and OpenCL

Course Outcome:

At the end of this course Student are able to:

CO1	Understand conventional CPU architectures, their extensions for single instruction multiple data processing (SIMD)
CO2	Program in CUDA about data space & synchronization
CO3	Apply optimization on kernals, thtreads etc
CO4	Learn basics of OpenCL
CO5	Design an application using neural networks

Week 1: Review of Traditional Computer Architecture – Basic five stage RISC Pipeline, Cache Memory, Register File, SIMD instructions

Week 2: GPU architectures - Streaming Multi Processors, Cache Hierarchy, The Graphics Pipeline

Week 3: Introduction to CUDA programming

Week 4: Multi-dimensional mapping of dataspace, Synchronization

Week 5: Warp Scheduling, Divergence

Week 6: Memory Access Coalescing

Week 7: Optimization examples : optimizing Reduction Kernels

Week 8: Optimization examples : Kernel Fusion, Thread and Block Coarsening

Week 9: OpenCL basics

Week 10: CPU GPU Program Partitioning

Week 11: Application Design : Efficient Neural Network Training/Inferencing

Week 12: Application Design : Efficient Neural Network Training/Inferencing,cont'd

References:

- https://onlinecourses.nptel.ac.in/noc23_cs61/preview
- "Computer Architecture -- A Quantitative Approach" - John L.Hennessy and David A. Patterson

"Programming Massively Parallel Processors" - David Kirk and Wen-mei Hwu

- Heterogeneous Computing with OpenCL" -- Benedict Gaster,Lee Howes, David R. Kaeli

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SEMESTER: EIGTH (C.B.C.S.)

BRANCH: COMPUTER SCIENCE AND ENGINEERING

Subject:	Predictive Analytics - Regression and Classification			Subject Code:	BTECHCSE803T
Load	Credit	Total Marks	Internal Marks	University Marks	Total
03 Hrs (Theory)	03	100	30	70	100

Aim : To The course will provide an overview of fundamental ideas in statistical predictive models.

Prerequisite(s): Probability and Statistics

Course Objective/Learning Objective:

1	The course will provide an overview of fundamental ideas in statistical predictive models
2	. The objective is to understand how statistical models handle prediction problems.
3	The stress will be on understanding the construction of the models and implementation.
4	It is a core course if students aspire to be Data Scientists.

Course Outcome:

At the end of this course Student are able to:

CO1	To understand predictive models, LSM, Normal equations and GMT
CO2	Understand regression models and infer its statistical inference
CO3	Check model assumptions and bias variance tradeoff.
CO4	Perform regression analysis in various programming languages
CO5	Apply regression models and classification for predictive analysis

Week 1:

- Landscape of the predictive models.
- Least Squares method

Week 2:

- Normal Equations:
- Gauss Markov theorem

Week 3:

- The geometry of Regression Model and Feature Engineering
- Statistical Inference of Regression Coefficient

Week 4:

- Checking Model Assumptions
- Model Comparison with R-squared, RMSE, AIC or BIC

Week 5:

- Model Complexity and Bias-Variance tradeoff
- Feature selection and Dimension Reduction

Week 6:

- Multicollinearity and Variance Inflation Factor
- Regularization with LASSO, Ridge and Elastic Net
- Ridge Regression with Python

Week 7:

- Regression Analysis with Python
- Regression Analysis with R
- Regression Analysis with Julia

Week 8: Major Applications of Regression Models

- Capital Asset Pricing Model
- Bootstrap Regression
- Time Series Forecasting with Regression Model
- Granger Causal model.

Week 9:

- Logistic Regression
- MLE of coefficient of Logistic Regression

Week 10:

- Fit Logistic Regression with optim function in R
- Fit Logistic Regression with glm function in R
- Fit Logistic Regression with sklearn in Python
- Fit Logistic Regression in Julia

Week 11:

- Logistic Regression and Inference
- Discriminant Analysis

Week 12:

- Multinomial Logit Regression
- Generalised Linear Regression
- Poisson Regression
- Negative Binomial Regression

References:

1) https://onlinecourses.nptel.ac.in/noc23_ma46/preview

2)An Introduction to Statistical Learning by James, Witten, Hastie, and Tibshirani, Springer (https://www.statlearning.com/)

3) The Elements of Statistical Learning by Hastie, Tibshirani, and Friedman, Springer (https://hastie.su.domains/Papers/ESLII.pd)

4) Regression and Other Stories by Gelman, Hill, and Vehtari, by Cambridge University Press (https://avehtari.github.io/ROS-Examples/)

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SEMESTER: EIGTH (C.B.C.S.)

BRANCH: COMPUTER SCIENCE AND ENGINEERING

Subject:	Block Chain and its Applications			Subject Code:	BTECHCSE803T
Load	Credit	Total Marks	Internal Marks	University Marks	Total
03 Hrs (Theory)	03	100	30	70	100

Aim: this subject will cover the basic design principles of Blockchain technology and its applications over different sectors. Additionally, the course also provides tutorials on setting up blockchain applications using one of the well-adopted permissionless blockchain platforms - Ethereum, and one permissioned blockchain platform - Hyperledger.

Prerequisite(s): Computer Networks; Operating Systems; Cryptography and Network Security.

Course Objective/Learning Objective:

1	Learn its capability of providing a transparent, secured, tamper-proof solution for interconnecting different stakeholders in a trustless setup.
2	This subject will cover the basic design principles of Blockchain technology and its applications over different sectors.
3	Additionally, the course also provides tutorials on setting up blockchain applications using one of the well-adopted permissionless blockchain platforms - Ethereum, and one permissioned blockchain platform - Hyperledger.
4	Provide its applications.

Course Outcome:

At the end of this course Student are able to:

CO1	Understand basic crypto premitives
CO2	Understand elements and evolution of blockchain
CO3	Understand consensus in permissionless and permissioned models
CO4	Hands on ethereum smart contracts and hyperledgers
CO5	Perform decentralized identity management, interoperability.

Week 1: Introduction to Blockchain Technology and its Importance

Week 2: Basic Crypto Primitives I – Cryptographic Hash

Week 3: Basic Crypto Primitives II – Digital Signature

Week 4: Evolution of the Blockchain Technology

Week 5: Elements of a Blockchain

Week 6: Blockchain Consensus I – Permissionless Models

Week 7: Blockchain Consensus II – Permissioned Models

Week 8: Smart Contract Hands On I – Ethereum Smart Contracts (Permissionless Model)

Week 9: Smart Contract Hand On II – Hyperledger Fabric (Permissioned Model)

Week 10: Decentralized Identity Management

Week 11: Blockchain Interoperability

Week 12: Blockchain Applications

References

1. Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing, 2020, ISBN: 9781839213199, book website: https://www.packtpub.com/product/mastering-blockchain-third-edition/9781839213199

2. Hyperledger Tutorials - https://www.hyperledger.org/use/tutorials

3. Ethereum Development Resources - https://ethereum.org/en/developers

4. Online materials and case studies

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SEMESTER: EIGTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE AND ENGINEERING

Subject:	Computer Vision			Subject Code:	BTECHCSE803T
Load	Credit	Total Marks	Internal Marks	University Marks	Total
03 Hrs (Theory)	03	100	30	70	100

Aim : The course will have a comprehensive coverage of theory and computation related to imaging geometry, and scene understanding. It will also provide exposure to clustering, classification and deep learning techniques applied in this area.

Prerequisite(s): Liner Algebra, Vector Calculus, Data Structures and Programming

Course Objective/Learning Objective:

1	To cover theory and computation related to imaging geometry, and scene understanding.
2	To learn feature extraction and matching
3	To process various parameters in images
4	To expose to clustering, classification and deep learning techniques applied in this area.

Course Outcome:

At the end of this course Student are able to:

CO1	Understand 2-D Projective Geometry, homography
CO2	Understand camera and stereo geometry
CO3	Detect and match features
CO4	Process color and range in images
CO5	Apply clustering, classification and deep learning models

Week 1: Fundamentals of Image processing
Week 2: 2-D Projective Geometry, homography, and Properties of homography
Week 3: Camera geometry
Week 4: Stereo geometry
Week 5: Stereo geometry
Week 6: Feature detection and description
Week 7: Feature matching and model fitting
Week 8: Color processing

Week 9: Range image processing

Week 10: Clustering and classification

Week 11: Dimensionality reduction and sparse representation

Week 12: Deep neural architecture and applications

Books and references

- https://archive.nptel.ac.in/courses/106/105/106105216/
- Multiple View Geometry in Computer Vision: R. Hartley and A. Zisserman, Cambridge University Press.
- Computer Vision: Algorithms & Applications, R. Szeleski, Springer.
- Computer vision: A modern approach: Forsyth and Ponce, Pearson.

Summary of Semester wise credit CSE									
Sr. No.	Semester	Category							TOTAL
		BSC	ESC	HSMC	PCC	PEC	OEC	PROJ	
1	I	9.5	07	03	-	-	-	-	19.5
2	II	9.5	13	-	-	-	-	-	22.5
3	III	04	-	02	17	-	-	-	23
4	IV	03	-	-	20	-	-	01	24
5	V	-	-	02	14	03	-	-	19
6	VI	-	-	02	07	06	03	03	21
7	VII	-	-	-	05	06	03	03	17
8	VIII	-	-	-	-	06	-	08	14
	Total	**26**	**20**	**09**	**63**	**21**	**06**	**15**	**160**

Summary of Semester wise Total Marks (Theory/Practical)				
Sr. No.	**Semester**	**Theory**	**Practical**	**TOTAL**
1	I	600	150	750
2	II	600	150	750
3	III	550	150	700
4	IV	600	200	800
5	V	450	150	600
6	VI	500	150	650
7	VII	400	150	550
8	VIII	200	150	350
	Total	**3900**	**1250**	**5150**