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Shri Vaishnav Institute of Information Technology
Choice Based Credit System (CBCS) in the light of NEP-2020
B.Tech. (CSE-Big Data Analytics/Data Science-IBM)
SEMESTER-VI (2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS601N	DCC	Compiler Design	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

- To introduce the major concept areas of language translation and compiler design
- To enrich the knowledge in various phases of compiler and its use
- To provide understanding of steps of programming necessary for constructing a compiler

Course Outcomes:

- Ability to apply the knowledge of lex tool &yacc tool to develop a scanner & parser
- Ability to design and develop software system for backend of the compiler
- Ability to comprehend and adapt to new tools and technologies in compiler design

Syllabus

Unit – I: **8 HRS**

Introduction: Compiler**,** Compilers analysis of the source program**,** Phases of a compiler**,** Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens.

Unit – II: **10 Hours**

Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

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Unit – III: **9 HRS**

Intermediate Code Generation: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages**,** Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

Unit – IV: **10 HRS**

Code Optimization and Run Time Environments: Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: **9 HRS**

Code Generation: Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:

1. Alfred V. Aho, Jeffrey D Ullman, “Compilers: Principles, Techniques and Tools”, Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

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References:

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

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BTIBM602N	DCC	Artificial Intelligence	60	20	20	30	20	3	0	2	4

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Course Objectives:

The student will have ability to:

1. Understand the evolution and relevance of AI in the world today.
2. Explore opportunities brought by the intersection between human expertise and machine learning.
3. Understand AI technology building blocks, including: natural language processing, machine and deep learning, neural networks, virtual agents, autonomics and computer vision.
4. Develop a deeper understanding of machine learning techniques and the algorithms that power those systems.
5. Engage in role-playing challenge-based scenarios to propose real-world solutions to different industries using AI and design thinking.

Course Outcomes:

1. Describe the field of AI and its subfields machine learning, NLP and computer vision
2. Describe how Watson technology is being applied to solve real world problems
3. List the Watson services available on the IBM Cloud
4. Describe the purpose of training the various Watson services to adapt them to a closed-domain
5. Describe how to build a chatbot by using the IBM Watson Conversation service

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Syllabus:

UNIT–I: AI LANDSCAPE
AI impact in the world today, History and Evolution of AI, AI Explained, AI Technologies, Applications of A.I. Summary & Resources

UNIT–II: AI INDUSTRY ADOPTION APPROACHES
AI Industry Impact, Autonomous Vehicles, SmartRobotics, Future Workforce and AI, Applications of AI. Main focus of AI, Summary & Resources.

UNIT–III: FUTURE TRENDS FOR AI
Artificial Intelligence Trends, Limits of machine and human, AI predictions in the next 5 yearsSummary and Resources.

UNIT–IV: MACHINE LEARNING AND DEEP LEARNING

Explained, Deep learning ecosystem, Experiments, Explain what neural networks are and why they are important in today's AI's field Explain what domain adaptation is and its applications Summary& Resources.

UNIT–V: NATURAL LANGUAGE UNDERSTANDING AND COMPUTER VISION

NLP Overview, NLP Explained, Virtual Agents Overview, Virtual Agents for the Enterprise, Summary and Resources, Computer Vision Overview, AI Vision through Deep Learning, Computer Vision for the Enterprise, Experiments. Summary and Resources

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COMPUTER VISION

Define computer vision, History of computer vision Tools and Service of completed vision, Use cases of computer vision. Describe cognitive system, Summary and Resources.

TEXT BOOKS:

1. IBM TEXT BOOK

REFERENCES:

1. A Modern Approach‖ by Norvig and Russell

LIST OF EXPERIMENTS:

1. SETTING UP YOUR CLOUD ACCOUNT

- Obtain an IBM cloud account
- Apply promotion code
- Uses the various services of IBM Cloud

2. CREATING A MODEL USING MACHINE LEARNING

- Apply Algorithmes
- Train the model
- Test The Model

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3. CREATING AN AI VIRTUAL ASSISTANT
- Create a dialog skill
- Create a virtual assistant
- Load virtual assistant with various dialog skills
- Integrate your assistant

4. CREATE A CHATBOT USING PYTHON
- Use python Library
- Train the ChatBot
- Test The ChatBot

5. CREATE AN APPLICATIN USING OPEN CV
- Understand the Open CV Library
- Train The images and test

6. EDGE DETECTION CONCEPT
- Canny Algorithme
- How to detect the edges

7. BASIC UNDERSTANDING OF Tkinter,CREATE A GUI USING PYTHON
- Create an interface for the project
- Use the buttons and drop down

8. 8.BASIC UNDERSTANDING OF NLTK
- Concept of Tokenization
- Concept of Lematization

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BTIT610N	**DCC**	**Introduction to Computer Networking**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:

1. Understand the general overview of the concepts and fundamentals of computer networks.
2. Understand the various components required to build different networks.
3. Familiarize the students with the standard models for the layered approach to communicationbetween machines in a network and the protocols of the various layers.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate followingknowledge, skills and attitudes.
The students will be able to

1. Understanding basic computer network technology.
2. Understand the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of sub netting and routing mechanisms
4. Familiarity with the essential protocols of computer networks, and how they can be applied innetwork design and implementation.

SYLLABUS

Unit-I **10 HRS**

Introduction: Importance of Computer Networks, Classifications & Types. Layered Architecture: Protocol hierarchy, Interfaces and Services, Connection Oriented

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BTIT610N	**DCC**	**Introduction to Computer Networking**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

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& Connection less Services, ISO- OSI Reference Model, TCP/IP model overview, comparison of TCP/IP and ISO-OSI reference model.

Unit-II **9 HRS**

Data Link Layer &MAC Sublayer: Need, Services Provided, Design issues, Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA, CSMA/CA, CSMA/CD.

Unit-III **8 HRS**

Network Layer: Need, Services Provided, Design Issues, Routing Algorithms, and types of Routing Algorithm, IPv4, IPv6, Classful and classless Addressing, Subnetting, Supernetting.

Unit-IV **7 HRS**

Transport Layer: Need, Design Issues, Multiplexing and Demultiplexing, transport layer services, UDP,UDP Header Format, Principles of reliable data transfer, TCP,Connection Management, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management, SCTP.

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BTIT610N	**DCC**	**Introduction to Computer Networking**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

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Unit-V **8 HRS**

Session layer: Overview, Authentication, Session layer protocols, **Presentation layer:** Overview, Data conversion, Encryption and Decryption, Presentation layer protocols (LPP,Telnet, X.25 packet Assembler/Disassembler), **Application Layer:** Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, FTP.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.

References:

1. Behrouz A.Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
2. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
3. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
4. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

LIST OF EXPERIMENTS:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic Network configuration commands.

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BTIT610N	**DCC**	**Introduction to Computer Networking**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

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5. Write a program for error detection and correction technique.
6. Write a program for framing.
7. Write a program for routing algorithm.
8. Socket Programming.
9. Study about different network simulators.
10. Establish and simulate peer to peer network using packet tracer.
11. Simulate LAN using hub and switch and discuss pros and cons of hub.
12. Router configuration using packet tracer.

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BTIBM612N	**DSE**	**Microservices Architecture and Implementation**	3	0	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Objectives:

Students will acquire knowledge on:

1. Understand the importance of Microservices and describe its need as an Architecture Implementation.
2. Understand strengthen the understanding of basic concepts of Docker and Kubernetess.
3. Understand the Html and its Tags
4. Understand CSS and how we implement in html
5. Be able to Deploy application on docker and Access the Kubernetess

Course Outcomes:

At the end of the mobility period, students will be able to:

1. Make an application using nodejs
2. Run docker commands
3. Deploy container and pods on kubernets.

Syllabus:

UNIT–I

CSS and JavaScript:

Understand JavaScript and DOM and BOM , Understand Server side Application, Understand NoSQL (MongoDb), Deployment of Nodejs application

UNIT–II

Server side nodejs:-Key features of NodeJS, Installation and Configuration, NodeJS Command Line, Sample Project using Node Express command prompt, Nodeclipse plugin, Sample Project

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BTIBM612N	**DSE**	**Micro services Architecture and Implementation**	3	0	2	4	60	20	20	30	20

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using Node clipse, Performing CRUD Operations, Key features of MongoDB, Connection Pooling using NodeJS Mongo driver, Docker architecture, Virtual machines versus containers, about containers.

UNIT–III

Docker: A shipping container for code, Benefits of using containers, Docker basic concepts, Docker shared and layered file systems technology. Deployment of container, Learn the concept of kubernetes, Learn how to run Docker command, Understand pods and cluster Container ecosystem,

UNIT–IV

Kubernetess, Container, orchestration, Kubernetess architecture, Master Node Components, Worker Node Components, Kubernetess Building Blocks, Images, Immutability, Pod, Config Maps & Secrets, Deploying Applications on Kubernetess, Pod Health Checking, Kubectl Commands

UNIT–V

Cloud Application Component Architecture, Benefits of using Kubernetess with IBM Containers, About Microservices ,monolithic application, microservice security, api management and gateways, the future of microservices, microservices governance

TEXT BOOKS:

1. Sam Newman ,"Building Microservices", O'Reilly Media
2. Ajay Sharma,"Microservices Architecture", Kindle Edition
3. IBM Career education Microservices Architecture and Implementation

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BTIBM612N	**DSE**	**Microservices Architecture and Implementation**	3	0	2	4	60	20	20	30	20

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REFERENCES:

1. Eberhard Wolff ,"Microservices — A Practical Guide", Korean translation
2. Martin Kleppmann ,"Designing Data-Intensive Applications", O'Reilly Media

Video Lectures

1. https://www.youtube.com/watch?v=dD2EISBDjWM&list=PLr6-GrHUlVf_ZNmuQSXdS197Oyr1L9sPB
2. https://www.youtube.com/watch?v=0afZj1G0BIE&t=38s
3. https://www.youtube.com/watch?v=Ukg_U3CnJWI&t=15s
4. https://www.youtube.com/watch?v=TlB_eWDSMt4
5. https://www.youtube.com/watch?v=voDummz1gO0
6. https://www.youtube.com/watch?v=lktzQrHQcYU
7. https://www.youtube.com/watch?v=I4zWlW93-V4

LIST OF EXPERIMENTS:

1 Design a static web application using html and CSS.
2 Wap program to define variable ,control structure in JavaScript
3 Define Function in JavaScript and understand message and link.
4 Wap for window in JavaScript and its objects. Create a gauge report and a pie chart repor
5 Design application using nodejs and configure node-eclipse.
6 Connectivity with mongo DB nodejs app
7 Docker Commands
   a. Listing Running Containers

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBM612N	**DSE**	**Microservices Architecture and Implementation**	3	0	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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b. Restarting Stopped Containers
c. Retrieving Log Outputs
d. Container Isolation
e. Creating Docker Images
f. Building a Dockerfile
g. Copying Build Files

8 Kubernetesss Cluster Demo
9 VM Creation in Google Cloud Platform – Demo
10 Minikube on local machine

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BTIBM611N	**DSE**	**Private Cloud Deployment**	3	0	2	4	60	20	20	30	20

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Course Educational Objectives (CEOs):

1. To explore the considerations for designing and planning a private cloud deployment.
2. To understand the principles and best practices for designing a scalable and resilient private cloud infrastructure.
3. To evaluate different management tools and platforms for private cloud environments.
4. To understand the compliance requirements and frameworks relevant to private cloud deployments.
5. To explore the challenges and considerations in migrating applications and data to a private cloud.

Course Outcomes (COs):

The students will be able to

1. Identify the key components and architecture of a private cloud environment.
2. Configure networking and storage resources to support a private cloud environment.
3. Develop strategies for implementing security controls and ensuring compliance in a private cloud.
4. Learn about the governance frameworks and operational practices for managing a private cloud environment.

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Syllabus

UNIT I: Introduction to Private Cloud **6HRS**

Introduction of Cloud Computing, Advantages and Disadvantages of Cloud Computing, Key Components of Cloud Computing, Core Reference Model / Architecture of cloud computing.

UNIT II: Infrastructure for Private Cloud: **8HRS**

Cloud Deployment models, Concepts of private cloud deployment models, Advantages & Disadvantages of Private Cloud Deployment Model, Factors choosing appropriate deployment models. Comparative analysis of various deployment models. Private cloud Infrastructure Hardware & Software needed for Private Cloud Infrastructure.

UNIT III: Private Cloud Management **8HRS**

Cloud Service Delivery models their Pros and Cons, Overview of other services models: Naas, DEaas, Staas, DBaas, Daas, etc. virtualization techniques used in Private Cloud Deployment. Monitoring and Management of performance of Private Cloud.

UNIT IV: Security and Compliance in Private Cloud **8HRS**

Security Challenges and threats associated with Private Cloud Deployment, Techniques for security virtualized environment, Various strategies for implementing security control in Private Cloud. Governance frameworks and operational practices for managing Private Cloud Deployment optimization and cost management in Private Cloud Deployment.

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UNIT V: Cloud Migration and Governance **6HRS**

Planning and Execution of a successful Private Cloud Migration, Challenges and Consideration in migrating application and data seven steps model of migration into cloud. Migration risk and mitigation.

Case Study - Microsoft Azure, Google App Engine, Sales Force and Eucalyptus, Open – Nebula, IBM Smart cloud, and open-source clouds.

Text Books:

1. **IBM Courseware:**

- What is Private Cloud? | IBM
- What is a Private Cloud? - Private Cloud Explained - AWS (amazon.com)
- What is a Private Cloud - Definition | Microsoft Azure

2. **IBM Knowledge Center**

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List of Experiments:

1. Install virtual box / VM ware workstation with different of window OS.
2. Install a C Compiler in the virtual machine created using virtual box and execute any simple program.
3. Install Google App Engine. Create Hello World App and other simple web applications using Python / Java.
4. Find a procedure to transfer the file from one VM to another VM.
5. Find a procedure to launch VM using Trystack (online-Openstack demo version).
6. To study cloud computing deployment models.
7. To study cloud computing service models.
8. To study cloud architecture Anatomy.
9. Find a procedure to attach virtual box to a virtual machine.
10. Find procedure to run the VM of different configuration. Check now many VMs can be utilized at time.

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BTIT608N	**SEC**	**IT Workshop-SciLab/MATLAB**	0	0	2	1	0	0	0	30	20

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Course Objectives:

The student will have ability to:

1. Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB.
2. Learn application of MATLAB and/or SCILAB for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes:

Upon completion of the subject, students will be able to:

1. Understand the need for simulation/implementation for the verification of mathematical functions.
2. Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning.
3. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB/SCILAB.
4. Interpret and visualize simple mathematical functions and operations thereon using plots/display.
5. Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB/SCILAB tools.

SYLLABUS

UNIT–I

INTRODUCTION TO SIMULATION SOFTWARE: About SCILAB/MATLAB, SCILAB/MATLAB System, Starting and Quitting SCILAB/MATLAB. EXPRESSIONS: Variables Numbers, Operators Functions, Expressions.

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UNIT–II

FLOW CONTROL: If, else, and else if, switch and case, for, while, continue, break try - catch, return.

COMMAND WINDOW: The format Function, Suppressing Output, Entering Long Statements, Command Line Editing.

UNIT–III

MATRICES AND ARRAYS: Entering Matrices sum and transpose, subscripts, colon Operator, magic Function.

WORKING WITH MATRICES: Generating Matrices, The load Function, M-Files, Concatenation, Deleting Rows and Columns, Linear Algebra, Arrays Multivariate Data, Scalar Expansion, Logical Subscripting, find Function.

UNIT–IV

SCRIPTS & FUNCTIONS: Scripts, Functions, Global Variables, Passing String Arguments to Functions, eval Function, Function Handles, Vectorization , Pre allocation.

OTHER DATA STRUCTURE: Multidimensional Arrays, Cell Arrays, Characters and Text, Structures

UNIT–V

GRAPHICS: Plotting Process, Editing Process, Preparing Graphs, Basic Plotting Functions, Mesh & Surface Plot, and Image Reading & Writing, Printing graphics. SIMULINK

TEXT BOOKS & REFERENCES:

1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813, 2009.

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2. A Guide to MATLAB: For Beginners & Experienced Users By: Kevin R. Coombes, John E. Osborn, Garrett J. Stuck
3. SCILAB(a Free Software to Matlab),Er. Hema Ramachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011
4. Introduction to SCILAB by Rachna Verma and Arvind Verma
5. SCILAB—A Beginner's Approach by Anil Kumar Verma
6. http://in.mathworks.com/
7. https://www.scilab.org/resources/documentation/tutorials

LIST OF PRACTICALS:

1. Addition, subtraction and multiplication of two matrices.
2. Verify whether the given matrix is singular or non-singular and compute its inverse if applicable.
3. Sorting of 1-D array and searching of an array/matrix. Also, list the set of numbers that obey a common condition in an array/matrix using *find( ).*
4. Solve simultaneous equations (maximum of three) using Cramer's rule. [Simultaneous equations may be obtained by applying KCL or KVL for a circuit and they can be solved for voltages or currents, respectively]
5. a) Show that $\log_{10}(A*B)=\log_{10} A+ \log_{10} B$ and $\log_{10}(A/B)=\log_{10} A-\log_{10} B$
1. b) Plot the voltage across capacitor during charging $V_c=V_0[1-e^{-(t/RC)}]$
6. a) Plot a straight line for the given slope and intercept using different plot attributes.
1. b) Differentiate and integrate y=mx+c, separately, and display the results on the same plot.
7. Plot $y_1=A*\sin(2\pi f_1 t)$, $y_2=B*\cos(2\pi f_2 t)$ and $y_3=A*\sin(2\pi f_1 t)+B*\cos(2\pi f_2 t)$, in time and frequency (after computing DFT or FFT) domains as subplots and infer the results.
8. Integrate and differentiate sin(x) and display the results on the same plot in different colors. Also display sin(x) on the same plot.

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9. Compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.
10. Find all the even and prime numbers between two numbers (range).
11. Demonstrate (a) reading and display image, (b) converting color image to gray and black-and-white and plotting their histograms, and (c) conversion of image file formats.
12. Compare the results of the built-in and user-defined function to compute c*os(x)* [the series $cos(x)=1-(x^2/2!)+(x^4/4!)-(x^6/6!)+\ldots$ can be used]
13. Write a program to compute roots of a quadratic equation $ax^2+bx+c=0$ given a, b and c.

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BTCS607N	**PW**	**Minor Project**	0	0	4	2	0	0	0	60	40

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Course Objectives:

This course is the masters by coursework Minor Project.
A Minor Project is a substantial work of supervised research or development, requiring the equivalent of about four to six months full-time work from start to finish. A Project involves identifying a task or problem, searching, and reviewing relevant literature, a proposed, implemented, and critically analyzed solution to the task or problem, and a written report describing the problem, the relevant literature, the solution, and its relation to other work in the area.

Note: This course includes a work integrated learning experience in which your knowledge and skills will be applied and assessed in a real or simulated workplace context and where feedback from industry and/ or community is integral to your experience.

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

1. Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology
2. Recognize and use research principles and methods applicable to Information Technology.

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- **Critical Analysis:**

You will learn to examine accurately and objectively, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

- analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems.

- Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

- **Problem Solving:**

Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- **Communication:**

You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- **Responsibility:**

You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behaviour in professional and social situations. This

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BTCS607	**PW**	**Minor Project**	0	0	4	2	0	0	0	60	40

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includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

- **Research and Scholarship:**

You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes

Upon successful completion of this course you should be able to:

1. Identify a task or problem relevant to /or IT
2. Search and review of the relevant literature
3. Propose a solution to the task or problem
4. Develop a software and/or algorithmic solution to the task or problem
5. Implement solutions to meet high quality requirements developed by the supervisor
6. Carry out research under supervision
7. Present the research in a written form like that used for published papers
8. Present the research in an oral seminar.

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Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar.

in Class, given that no component shall exceed more than 10 marks.

In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

1. Research project comprising an implemented and critically analyzed solution to the task or problem.
2. Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area.
3. Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as research publication.