Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
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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- **Syllabus is Progess/Process**

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

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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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& 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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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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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

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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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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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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

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

The objective of this course is to teach students about:

1. Introduction to RedHat OpenShift.
2. Get familiarized with OpenShift core concepts
3. Install and configure OpenShift cluster.
4. Deploy containerized application on an OpenShift cluster

Course Outcomes:

At the end of the course, students shall be able to:

1. Understanding Docker images and building custom Docker images.
2. Understanding persistent storage and Network for OpenShift.
3. Understand user and resource access management.
4. Managing application deployments and scaling.

Syllabus:

UNIT-I

Introduction to OpenShift: Introduction to OpenShift, advantages of using OpenShift, OpenShift architecture, understand containers and images, Describe pods and services, Understand projects and users, Builds and image streams, Deployments, Storage concepts, OpenShift networking concepts

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UNIT-II

Installation & Configuration of OpenShift platform: Prepare the servers for installation, Execute the steps to install and configure an OpenShift cluster, Execute post-installation step, Understand the change log in identity provider, Create and manage users and accounts, Deploy an OpenShift router, Deploy an internal registry

UNIT-III

Use of Web Interface and Use of Command Line Interface: Fork a sample repository, Create projects and applications, Verify if the application us running, configuring automated builds, write a code change and manually rebuild images

UNIT-IV

Creating Custom Container Images: Understand basics of a docker file, Design considerations for a custom docker file, building custom images using a docker file

Controlling Access to OpenShift Resources: Understand how to do access control on OpenShift resources, understand secrets and their application, Understand security policies and their application.

UNIT-V

Allocation Persistent Storage: Understand persistent storage concepts such as PVs and PVCs, implement persistent storage for use by the application, understand how persistence is configured for internal registry.

Managing Application Deployments: Understand pod replicas and how to scale them, Understand and control pod scheduling, Manage image, image streams, templates.

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TEXT BOOKS:

1. IBM Career Education

REFERENCE BOOKS:

1. Setting up private cloud platform training Module.

LIST OF PRACTICALS:

1. Execute the steps to install and configure an OpenShift cluster
2. Write a code change and manually rebuild images
3. Create projects and applications
4. Building custom images using a Docker file.

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIT608N	**SEC**	**IT Workshop-SciLab/MATLAB**	0	0	2	1	0	0	0	30	20

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