Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme for Post S.S.C. Diploma Courses

Program Name : Diploma in Information Technology

Program Code : IF | **With Effect From Academic Year: 2017 - 18**

Duration of Program : 6 Semesters | **Duration : 16 Weeks**

Semester : Sixth | **Scheme : I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme												Grand Total
								Theory							Practical					
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total	
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1	Management	MGT	22509	3	-	-	3	90 Min	70*#	28	30*	00	100	40	--	--	--	--	--	--	100
2	Mobile Application Development	MAD	22617	3	-	4	7	3	70	28	30*	00	100	40	25#	10	25	10	50	20	150
3	Emerging Trends in Computer & Information Technology	ETI	22618	3	-	-	3	90 Min	70*#	28	30*	00	100	40	--	--	--	--	--	--	100
4	Wireless and Mobile Networks	WMN	22622	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
	Elective – II (Select Any One)																				
5	Web Based Application Development Using PHP	WBP	22619	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
	Network and Information Security	NIS	22620	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
	Cloud Computing	CCS	22624	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
6	Capstone Project – Execution & Repot Writing	CPE	22060	-	-	4	4	--	--	--	--	--	--	--	50#	20	50~	20	100	40	100
			Total	**15**	**-**	**12**	**27**	--	**350**	--	**150**	--	**500**	--	**125**	--	**125**	--	**250**	--	**750**

Student Contact Hours Per Week: **27 Hrs.** Medium of Instruction: **English**

Theory and practical periods of 60 minutes each. Total Marks : **750**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@ Internal Assessment, # External Assessment, *# On Line Examination, ^ Computer Based Assessment

* Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

~ For the courses having ONLY Practical Examination, the PA marks Practical Part - with 60% weightage and Micro-Project Part with 40% weightage

- **If Candidate not securing minimum marks for passing in the "PA" part of practical of any course of any semester then the candidate shall be declared as "Detained" for that semester.**

MSBTE – Final Copy Dt. 24.09.2019

Program Name : **Diploma in Automobile Engineering / Civil Engineering Group / Electronics Engineering Group / Diploma in Plastic Engineering / Diploma in Production Engineering /Diploma in Fashion & Clothing Technology/ Computer Engineering Group**

Program Code : **AE/CE/CR/CS/ DE/EJ/ET/EN/EX/EQ/IS/IC/IE/PG/PT/DC/ CO/CM/CW/IF**

Semester : **Sixth**

Course Title : **Management**

Course Code : **22509**

1. RATIONALE

An engineer has to work in industry with human capital and machines. Therefore, managerial skills are essential for enhancing their employability and career growth. This course is therefore designed to provide the basic concepts in management principles, safety aspects and Industrial Acts.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Use relevant managerial skills for ensuring efficient and effective management.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a. Use basic management principles to execute daily activities.
b. Use principles of planning and organising for accomplishment of tasks.
c. Use principles of directing and controlling for implementing the plans.
d. Apply principles of safety management in all activities.
e. Understand various provisions of industrial acts.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	-	3	90 Min	70*#	28	30*	00	100	40	--	--	--	--	--	--

(*#) Online Theory Examination.

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the Cos.(#): Online examination*

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *- Practical;* ***C*** *– Credit,* ***ESE*** *- End Semester Examination;* ***PA*** *- Progressive Assessment*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

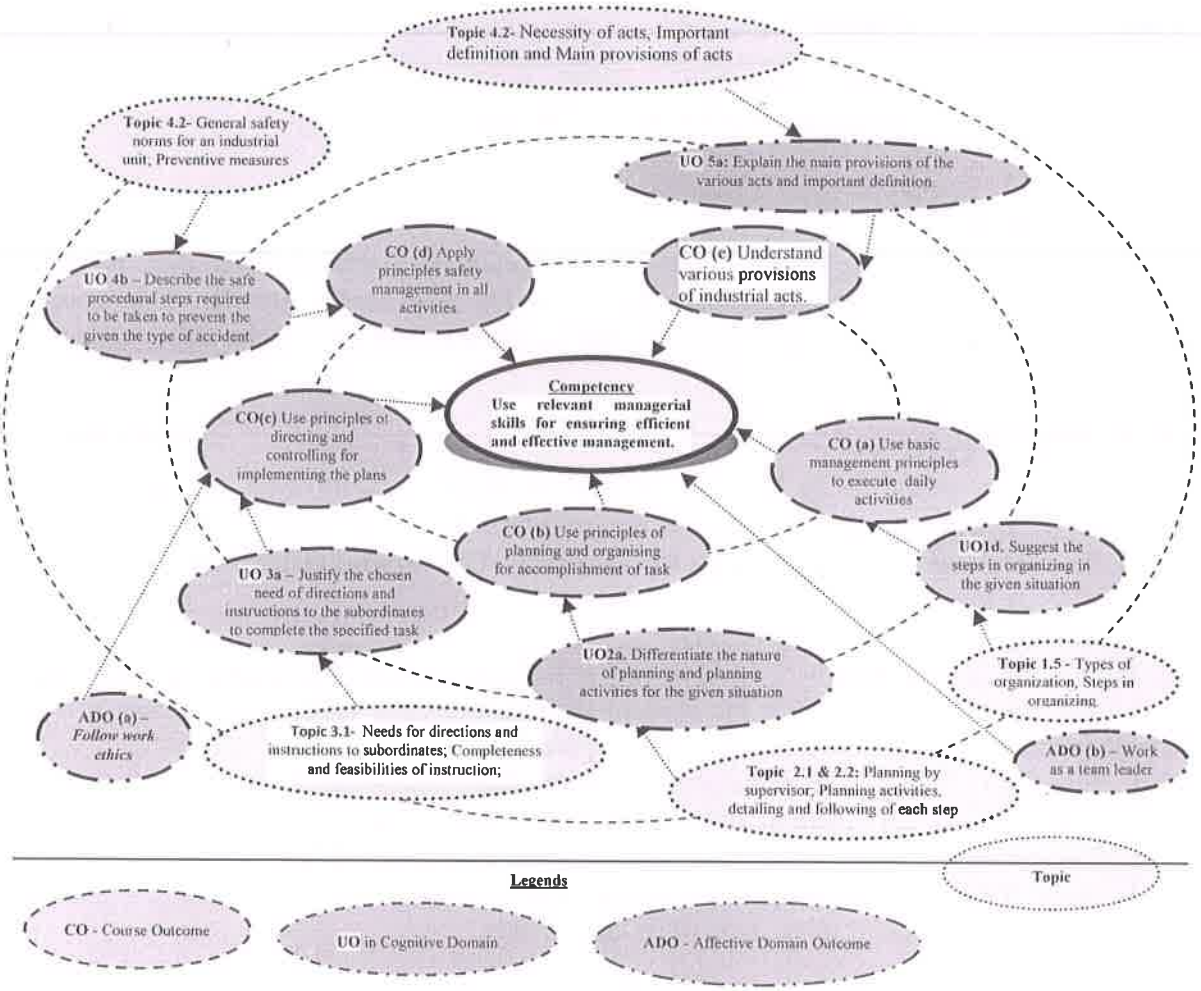

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

- Not applicable -

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

- Not applicable -

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Introduction to management concepts and managerial skills	1a. Differentiate the concept and principles of management for the given situation. 1b. Explain functions of management for given situation. 1c. Compare the features of the given types of planning 1d. Suggest the steps in organizing in the given situation. 1e. Suggest suitable type of organization for the given example. 1f. Identify the functional areas of management for the given situation 1g. Suggest suitable managerial skills for given situation with justification	1.1 Definitions of management, role and importance of management. 1.2 Management characteristics and principles, levels of management and their functions; management, administration and organization, relation between management and administration. 1.3 Functions of management: planning, organizing, leading/directing, staffing and controlling. 1.4 Types of planning and steps in planning 1.5 Types of organization, Steps in organizing 1.6 Functional areas of management. 1.7 Managerial skills.
Unit – II Planning and organizing at supervisory level	2a. Differentiate the nature of planning and planning activities for the given situation. 2b. Suggest the step wise procedure to complete the given activity in the shop floor. 2c. Prepare materials and manpower budget for the given production activity. 2d. Describe with block diagrams the organization of the physical resources required for the given situation. 2e. Describe the human needs to satisfy the job needs for the specified situation. 2f. List the tasks to be done by the concerned individuals for completing the given activity.	**Planning at supervisory level** 2.1 Planning by supervisor. 2.2 Planning activities, detailing and following of each step. 2.3 Prescribing standard forms for various activities. 2.4 Budgeting for materials and manpower. **Organizing at supervisory level** 2.5 Organizing the physical resources. 2.6 Matching human need with job needs. 2.7 Allotment of tasks to individuals and establishing relationship among persons working in a group
Unit– III Directing and Controlling at supervisory level	3a. Justify the chosen need of directions and instructions to the subordinates to complete the specified task. 3b. Select the feasible set of instructions to complete the given simple task, with justification 3c. Predict the possible mistakes for completing the given simple activity. 3d. Describe the managerial control	**Directing at supervisory level** 3.1 Needs for directions and instructions to subordinates; Completeness and feasibilities of instructions 3.2 Personal counselling advanced predictions of possible mistakes. 3.3 Elaborating decisions, laying disciplinary standards in overall working **Controlling at supervisory level**

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	actions and remedial measures required to be taken for completing the given task successfully.	3.4 Managerial control; Understanding team and link between various departments in respect of process and quality standards; Steps in control process 3.5 Controlling methods; Control over the performance in respect of quality, quantity of production, time and cost. Measuring performance, comparing with standards, correcting unfavorable deviations.
Unit – IV Safety Management	4a. State the general safety norms required to be taken in the given case. 4b. Suggest preventive measures of plant activities in the given situation. 4c. Describe the safe procedural steps required to be taken to prevent the given the type of accident. 4d. Prepare a work permit in to conduct the given maintenance activity. 4e. Explain the causes of the specified type of accident in the given situation. 4f. Prepare the specifications of the firefighting equipment required for the given type of fire.	4.1 Need for safety management measures 4.2 General safety norms for an industrial unit; Preventive measures. 4.3 Definition of accident, types of industrial accident; Causes of accidents; 4.4 Fire hazards; Fire drill. 4.5 Safety procedure 4.6 Work permits.
Unit – V Legislative Acts	5a. Explain the purpose of the act 5b. Explain the main provisions of the various acts and important definition.	5.1 Necessity of acts, Important definition and Main provisions of acts. 5.2 Industrial Acts: a. Indian Factory Act b. Industrial Dispute Act c. Workman Compensation Act d. Minimum Wages Act

***Note**: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to management	12	06	06	04	16

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	concepts and managerial skills					
II	Planning and organizing at supervisory level	08	04	06	04	14
III	Directing and controlling at supervisory level	08	04	06	04	14
IV	Safety Management	08	04	06	04	14
V	Legislative Acts	12	02	06	04	12
Total		**48**	**20**	**30**	**20**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note*: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a. Write assignments based on the theory taught in classrooms. Assignments consist of ten questions having long answers including charts, symbols, drawing, observations etc.
b. Prepare/Download information about various industrial acts.
c. Visit to any Manufacturing industry and prepare a report consisting of:
    i. Organization structure of the organization/ Dept.
    ii. Safety measures taken in organization.
    iii. Mechanism to handle the disputes.
    iv. Any specific observation you have noticed.
d. Give seminar on relevant topic.
e. Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open onlinc courscs (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e. Guide student(s) in undertaking micro-projects.
f. Demonstrate students thoroughly before they start doing the practice.

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g. Encourage students to refer different websites to have deeper understanding of the subject.
h. Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

a. Study of management principles applied to a small scale industry.
b. Study of management principles applied to a medium scale industry.
c. Study of management principles applied to a large scale industry.
d. Prepare case studies of Safety measures followed in different types of organization.
e. Study of measures to be taken for ensuring cyber security.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Management and entrepreneurship	Veerabhadrappa, Havinal	New age international publishers, New Delhi, 2014: ISBN: 978-81-224-2602-1
2	Principles of management	Chaudhry omvir Singh prakash	New Age international publishers, 2012, New Delhi ISBN: 978-81-224-3039-4
3	Industrial Engineering and management	Dr. O. P. Khanna	Dhanpath ray and sons, New Delhi
4	Industrial Engineering and management	Banga and Sharma	Khanna Publication, New Delhi

14. SUGGESTED SOFTWARE/LEARNING WEBSITES

a. https://www.versesolutions.com/
b. https://www.books.google.co.in/books?isbn=817758412X
c. https://www. www.educba.com › Courses › Business › Management

Program Name : **Computer Engineering Program Group**

Program Code : **CO/CM/IF/CW**

Semester : **Sixth**

Course Title : **Mobile Application Development**

Course Code : **22617**

1. RATIONALE

Android application development is one of the rising and growing trend in the industry of mobile. This course examines the principles of mobile application design and covers the necessary concepts which are required to understand mobile based applications and develop Android based Applications in particular. After completing this course students will design and build a variety of real-time Apps using Android.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Create simple Android applications.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a) Interprete features of Android operating system.
b) Configure Android environment and development tools.
c) Develop rich user Interfaces by using layouts and controls.
d) Use User Interface components for android application development.
e) Create Android application using database.
f) Publish Android applications.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
L	T	P			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	4	7	3	70	28	30*	00	100	40	25#	10	25	10	50	20	

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

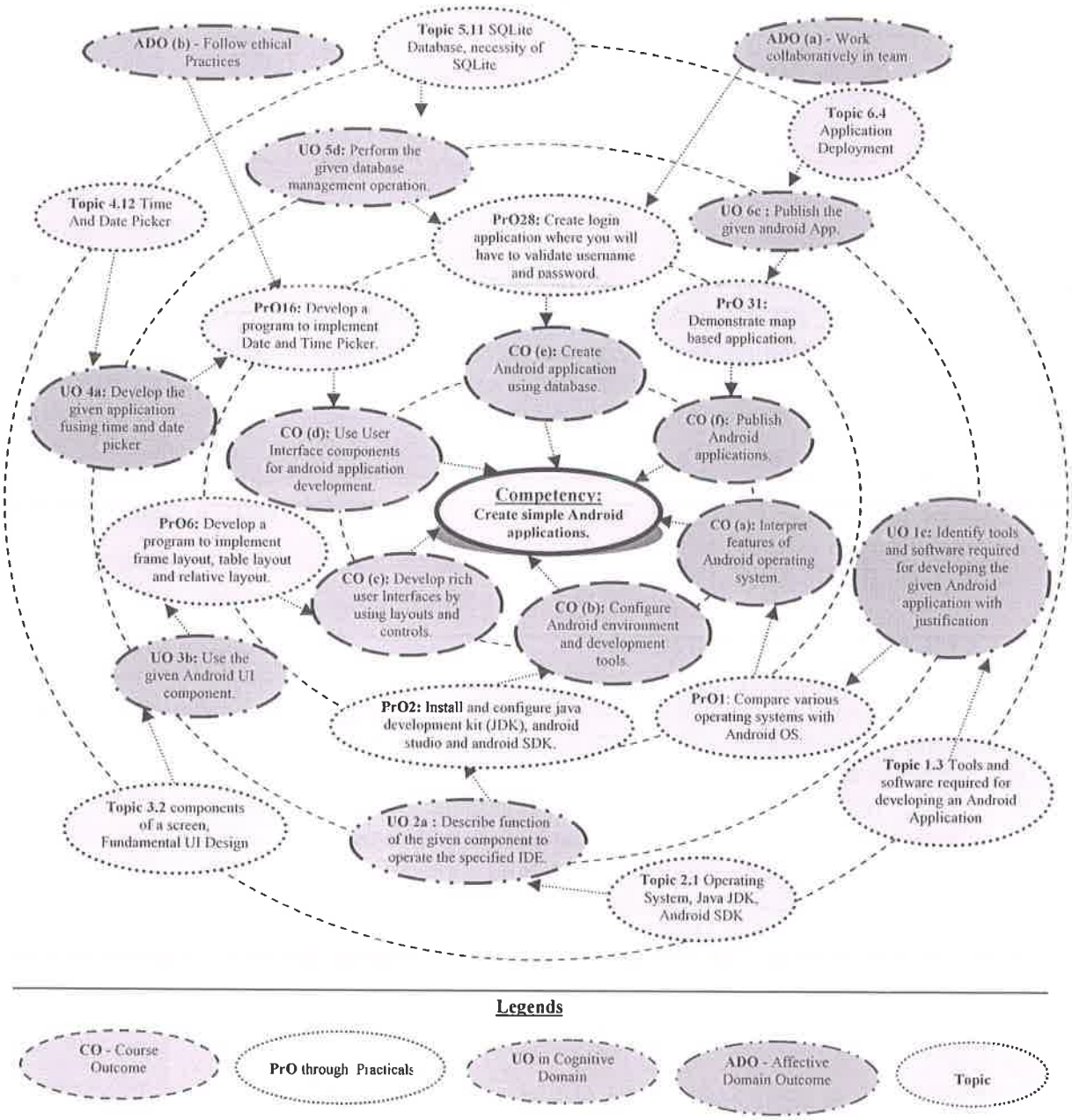

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the above stated competency.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Compare various operating systems with Android OS.	I	2
2	Install /configure java development kit (JDK), android studio and android SDK.	II	2*
3	Configure android development tools (ADT) plug-in and create android virtual device.	II	2*
4	Develop a program to display Hello World on screen.	III	2*
5	Develop a program to implement linear layout and absolute layout.	III	2*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
6	Develop a program to implement frame layout, table layout and relative layout.	III	2*
7	Develop a program to implement Text View and Edit Text.	IV	2*
8	Develop a program to implement Auto Complete Text View.	IV	2
9	Develop a program to implement Button, Image Button and Toggle Button.	IV	2*
10	Develop a program to implement login window using above UI controls.	IV	2*
11	Develop a program to implement Checkbox.	IV	2*
12	Develop a program to implement Radio Button and Radio Group.	IV	2*
13	Develop a program to implement Progress Bar.	IV	2*
14	Develop a program to implement List View, Grid View, Image View and Scroll View.	IV	2*
15	Develop a program to implement Custom Toast Alert.	IV	2*
16	Develop a program to implement Date and Time Picker.	IV	2*
17	Develop a program to create an activity.	V	2*
18	Develop a program to implement new activity using explicit intent and implicit intent.	V	2*
19	Develop a program to implement content provider.	V	2
20	Develop a program to implement service.	V	2
21	Develop a program to implement broadcast receiver.	V	2*
22	Develop a program to implement sensors.	V	2*
23	Develop a program to build Camera.	V	2*
24	Develop a program for providing Bluetooth connectivity.	V	2*
25	Develop a program for animation.	V	2
26	Perform Async task using SQLite.	V	2*
27	Create sample application with login module. (Check username and password) On successful login, Change TextView "Login Successful". And on login fail, alert user using Toast "Login fail".	V	2*
28	Create login application where you will have to validate username and password till the username and password is not validated, login button should remain disabled.	V	2*
29	Develop a program to: a) Send SMS b) Receive SMS	VI	2*+2*
30	Develop a program to send and receive e-mail.	VI	2*
31	Deploy map based application. Part I	VI	2*
32	Deploy map based application. Part II	VI	2*
	Total		**66**

Note

i. *A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. The practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.*

ii. *The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:*

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S. No.	Performance Indicators	Weightage in %
1	Correctness of User Interface design	30
2	Correctness of business logic applied	40
3	Debugging ability	10
4	Correctness of answers to sample questions	10
5	On time submission	10
Total		**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a) Work collaboratively in team
b) Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year.
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practicals, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer system (Any computer system which is available in laboratory with minimum 2GB RAM)	All
2	Any compatible open source tools (e.g. Android Studio/ Eclipse IDE, Any compatible web server, Any compatible database tool e.g. SQLite)	

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed to develop UOs in cognitive domain for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Android and its tools	1a. Explain the given basic terms related to Android system. 1b. Explain with sketches Android architecture for the given application. 1c. Identify tools and software required for developing the given Android application with justification.	1.1 Introduction to Android, open handset alliance, Android Ecosystem. 1.2 Need of Android, Features Of Android 1.3 Tools and software required for developing an Android Application 1.4 Android Architecture

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	1d. Explain significance of the given component in Android architecture.	
Unit– II Installation and configuration of Android	2a. Describe function of the given component to operate the specified IDE. 2b. Explain the given term related to virtual machine. 2c. Explain the given basic term related to Android development tools. 2d. Describe the features of given android emulator. 2e. Describe the steps to configure the given android development environment	2.1 Operating System, Java JDK, Android SDK 2.2 Android Development Tools(ADT) 2.3 Android Virtual Devices(AVDs) 2.4 Emulators 2.5 Dalvik Virtual Machine, Difference between JVM and DVM 2.6 Steps to install and configure Android Studio and SDK
Unit– III UI Components and Layouts	3a. Explain with relevant analogy the given Directory Structure. 3b. Describe the steps to use the given Android rich UI component. 3c. Describe the steps to use the given type of Layout. 3d. Develop the given basic Android application.	3.1 Control Flow, Directory Structure 3.2 Components of a screen, Fundamental UI Design 3.3 Linear Layout; Absolute Layout; Frame Layout; Table Layout; Relative Layout
Unit-IV Designing User Interface With View	4a. Develop rich user Interfaces for the given Android application. 4b. Develop Android application using the given view. 4c. Explain the significance of the given display Alert. 4d. Develop the given application using time and date picker.	4.1 Text View, Edit Text; Button, Image Button; Toggle Button; Radio Button And Radio Group; Checkbox; Progress Bar 4.2 List View; Grid View; Image View; Scroll View; Custom Toast Alert 4.3 Time And Date Picker
Unit –V Activity And Multimedia with databases	5a. Apply the given Intents and service in Application development. 5b. Use Fragment to generate the given multiple activities. 5c. Develop programs to play the given multimedia. 5d. Write the query to perform the given database management operation.	5.1 Intent, Intent_Filter 5.2 Activity Lifecycle; Broadcast Lifecycle 5.3 Content Provider; Fragments 5.4 Service: Features Of service, Android platform service, Defining new service, Service Lifecycle, Permission, example of service 5.5 Android System Architecture, Multimedia framework, Play Audio and Video, Text to speech, Sensors, Async tasks 5.6 Audio Capture, Camera 5.7 Bluetooth, Animation 5.8 SQLite Database, necessity of SQLite, Creation and connection

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		of the database, extracting value from cursors, Transactions.
Unit –VI Security and Application Deployment	6a. Explain the given location based service. 6b. Write the steps to customize the given permissions for users. 6c. Explain features of the given android security service. 6d. Write the steps to publish the given android App.	6.1 SMS Telephony 6.2 Location Based Services: Creating the project, Getting the maps API key, Displaying the map, Displaying the zoom control, Navigating to a specific location, Adding markers, Getting location, Geocoding and reverse Geocoding, Getting Location data, Monitoring Location. 6.3 Android Security Model, Declaring and Using Permissions, Using Custom Permission. 6.4 Application Deployment: Creating Small Application, Signing of application, Deploying app on Google Play Store, Become a Publisher, Developer Console

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Android and its tools	04	02	02	-	04
II	Installation and configuration of Android	06	02	02	02	06
III	UI Components and Layouts	08	02	02	04	08
IV	Designing User Interface With View	10	02	02	08	12
V	Activity and Multimedia with databases	18	02	06	12	20
VI	Security and Application Deployment	18	02	06	12	20
Total		**64**	**12**	**20**	**38**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note*: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various

outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare journal of practical.
b) Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Use different Audio Visual media for Concept understanding.
f) Guide student(s) in undertaking micro-projects.
g) Demonstrate students thoroughly before they start doing the practice.
h) Ensure use of latest version of tools.
i) Encourage students to refer various web sites to have detail understanding of JSP and related concepts.
j) Encourage students to refer different web-applications to have deeper understanding of web-applications.
k) Observe continuously the performance of students in laboratory.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a) Develop an android application on traffic surveying.
b) Develop an android application on online shopping.
c) Develop an android application for making a calculator.
d) Develop an android application for game.

Guidelines For Developing Micro Projects:

(Implement Following Relevant Guidelines For Micro Projects)

i. Must implement concepts of Advance java.
ii. Must publish the sample application on play store.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Android	Dixit, Prasanna Kumar	Vikas Publications, New Delhi 2014, ISBN: 9789325977884
2	Pro Android 5	Maclean David, Komatineni Satya, Allen Grant	Apress Publications, 2015, ISBN: 978-1-4302-4680-0
3	Android Programming for Beginners	Hortan, John	Packet Publication, 2015, ISBN: 978-1-78588-326-2

14. SOFTWARE/LEARNING WEBSITES

a) https://www.tutorialspoint.com/android
b) http://developer.android.com/guide/index.html.
c) http://developer.android.com/reference/packages.html
d) http://developer.android.com/guide/components/fundamentals.html
e) http://developer.android.com/guide/topics/ui/index.html
f) http://developer.android.com/guide/topics/ui/declaring-layout.html
g) https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf

Program Name : **Computer Engineering Program Group**

Program Code : **CO/CM/IF/CW**

Semester : **Sixth**

Course Title : **Emerging Trends in Computer and Information Technology**

Course Code : **22618**

4a. RATIONALE

Advancements and applications of Computer Engineering and Information Technology are ever changing. Emerging trends aims at creating awareness about major trends that will define technological disruption in the upcoming years in the field of Computer Engineering and Information Technology. These are some emerging areas expected to generate revenue, increasing demand as IT professionals and open avenues of entrepreneurship.

4b. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Acquire knowledge of emerging trends.**

4c. COURSE OUTCOMES (COs)

- Describe Artificial Intelligence, Machine learning and deep learning
- Interpret IoT concepts
- Compare Models of Digital Forensic Investigation.
- Describe Evidence Handling procedures.
- Describe Ethical Hacking process.
- Detect Network, Operating System and applications vulnerabilities

4d. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory						Practical							
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	--	--	3	90 Min	70*#	28	30*	00	100	40	--	---	--	--	--	--	

*(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests(**MCQ type**) to be taken during the semester for the assessment of the UOs required for the attainment of the COs.(*#)* :Online Examination

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *-Practical;* ***C*** *– Credit,* ***ESE*** *-End Semester Examination;* ***PA*** *- Progressive Assessment.*

4e. COURSE MAP (with sample COs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

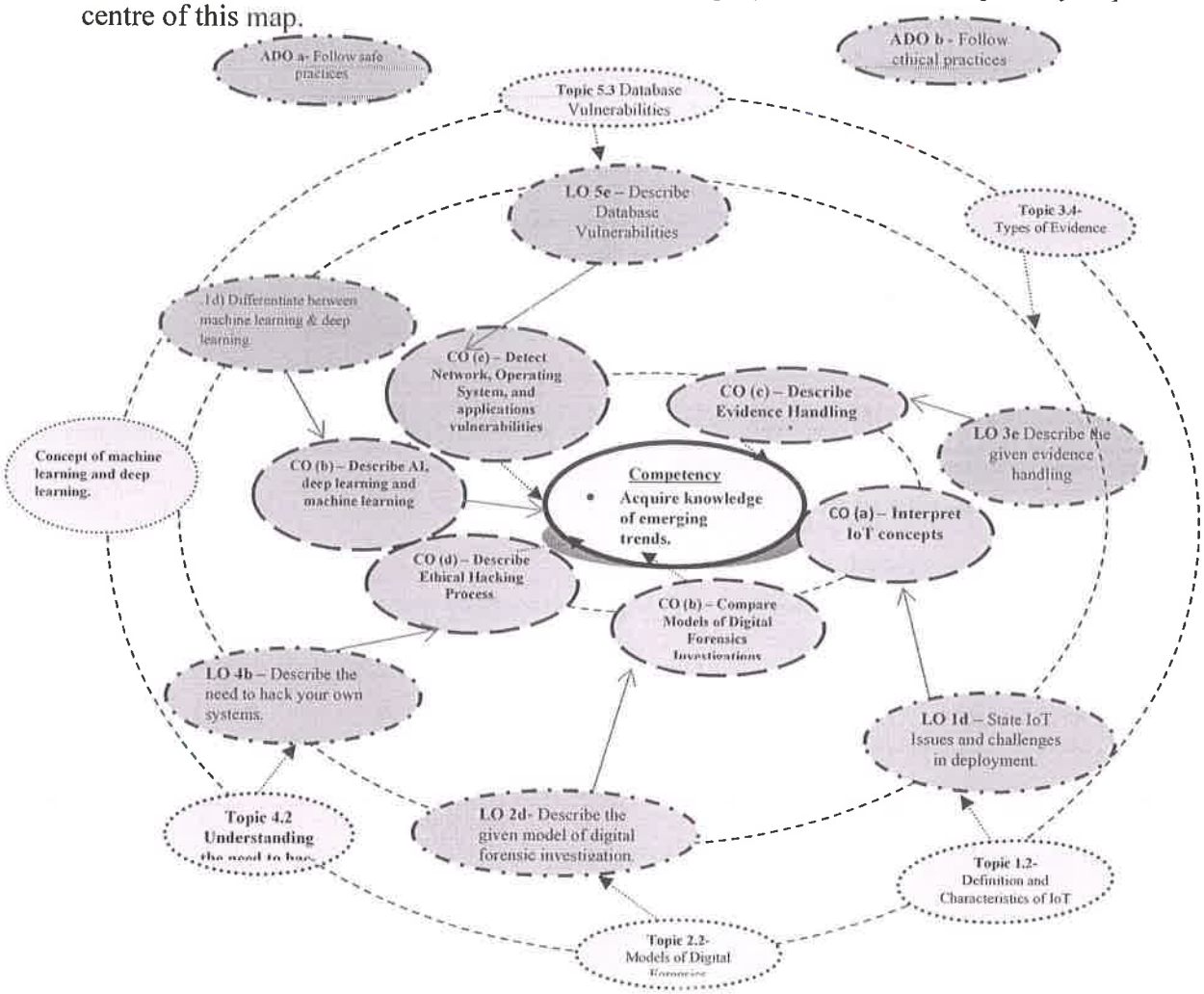

Figure 1 - Course Map

4f. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	Not Applicable		

4g. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO
	Not Applicable	

4h. UNDERPINNING THEORY COMPONENTS

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit I : Artificial Intelligence (06m, 4 hrs)	1a) Describe the concept of AI. 1b) State the components of AI. 1c) List applications of AI 1d) Differentiate between machine learning & deep learning.	**1.1 Introduction of AI** • Concept • Scope of AI • Components of AI • Types of AI • Application of AI **1.2 Concept of machine learning and deep learning.**
Unit II: Internet of Things (18m,12 hrs)	2a) State the domains and application areas of Embedded Systems 2b) Describe IoT systems in which information and knowledge are inferred from data. 2c) Describe designs of IoT. 2d) State IoT Issues and challenges in deployment.	**2.1 Embedded Systems:** • Embedded system concepts, purpose of Embedded Systems, Architecture of Embedded Systems, Embedded Processors-PIC, ARM, AVR, ASIC **2.2 IoT: Definition and characteristics of IoT** • Physical design of IoT, o Things of IoT o IoT Protocols • Logical design of IoT, o IoT functional blocks, o IoT Communication models, o IoT Communication APIs, • IoT Enabling Technologies • IoT levels and deployment

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		templates • IoT Issues and Challenges, Applications • IoT Devices and its features: Arduino, Uno, Raspberry Pi, Node Microcontroller Unit
Unit III: Basics of Digital Forensics (8m-5 hrs)	3a. Describe the history of digital forensics 3b. Define digital forensics. 3c. List the rules of digital forensic 3d. Describe the given model of digital forensic investigation. 3e. State the ethical and unethical issues in digital forensics	**3.1 Digital forensics** • Introduction to digital forensic • History of forensic • Rules of digital forensic • Definition of digital forensic • Digital forensics investigation and its goal **3.2 Models of Digital Forensic Investigation** • Digital Forensic Research Workshop Group (DFRWS) Investigative Model • Abstract Digital Forensics Model (ADFM) • Integrated Digital Investigation Process (IDIP) • End to End digital investigation process (EEDIP) • An extended model for cybercrime investigation • UML modeling of digital forensic process model (UMDFPM) **3.3 Ethical issues in digital forensic** • General ethical norms for investigators • Unethical norms for investigation
Unit IV: Digital Evidence (10M- 08 Hrs)	4a. Define digital evidence. 4b. List the rules of digital evidence. 4c. State characteristics of digital evidence. 4d. Describe the given type of evidences 4e. Describe the given evidence handling procedures	**4.1 Digital Evidences** • Definition of Digital Evidence • Best Evidence Rule • Original Evidence **4.2 Rules of Digital Evidence** **4.3 Characteristics of Digital Evidence** • Locard's Exchange Principle • Digital Stream of bits **4.4 Types of evidence** Illustrative, Electronics, Documented, Explainable, Substantial, Testimonial **4.5 Challenges in evidence handling**

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		• Authentication of evidence • Chain of custody • Evidence validation **4.6 Volatile evidence**
Unit V: Basics of Hacking (12M- 8Hrs)	5a) Define hackers. 5b) Describe the need to hack your own systems. 5c) Describe the dangers in systems. 5d) Describe the Ethical hacking Process 5e) Identify the Hacker's Mindset	**5.1 Ethical Hacking** • How Hackers Beget Ethical Hackers • Defining hacker, Malicious users **5.2 Understanding the need to hack your own systems** **5.3 Understanding the dangers your systems face** • Nontechnical attacks • Network-infrastructure attacks • Operating-system attacks • Application and other specialized attacks **5.4 Obeying the Ethical hacking Principles** • Working ethically • Respecting privacy • Not crashing your systems **5.5 The Ethical hacking Process** • Formulating your plan • Selecting tools • Executing the plan • Evaluating results • Moving on **5.6 Cracking the Hacker Mindset** • What You're Up Against? • Who breaks in to computer systems? • Why they do it? • Planning and Performing Attacks • Maintaining Anonymity
Unit VI: Types of Hacking (16 M- 11 Hrs)	6a. Describe Network Infrastructure Vulnerabilities (wired/wireless) 6b. List operating system Vulnerabilities 6c. Describe Messaging Systems Vulnerabilities 6d. Describe Web Vulnerabilities 6e. Describe Database Vulnerabilities	**6.1 Network Hacking** **Network Infrastructure:** • Network Infrastructure Vulnerabilities • Scanning-Ports • Ping sweep • Scanning SNMP • Grabbing Banners • Analysing Network Data and Network Analyzer • MAC-daddy attack

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		Wireless LANs: • Implications of Wireless Network Vulnerabilities, • Wireless Network Attacks **6.2 Operating System Hacking** • Introduction of Windows and Linux Vulnerabilities **6.3 Applications Hacking** **Messaging Systems** • Vulnerabilities, • E-Mail Attacks- E-Mail Bombs, • Banners, • Best practices for minimizing e-mail security risks **Web Applications:** • Web Vulnerabilities, • Directories Traversal and Countermeasures, **Database system** • Database Vulnerabilities • Best practices for minimizing database security risks

4f. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

4g.

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Artificial Intelligence (06m,4 hrs)	04	04	02	--	06
II	Internet of Things (18m,12 hrs)	12	10	04	04	18
III	Basics of Digital Forensics (8m-5 hrs)	05	06	02	00	08
IV	Digital Evidence (10M- 08 Hrs)	08	06	02	02	10
V	Basics of Hacking (12M- 08 Hrs)	08	06	04	02	12
VI	Types of Hacking (16 M- 11 Hrs)	11	06	08	02	16
Total		**48**	**38**	**22**	**10**	**70**

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

4h. SUGGESTED STUDENT ACTIVITIES

Other than the classroom learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also **collect/record physical evidences for their (student's) portfolio** which will be useful for their placement interviews:

a) Prepare report on suggestive case study of digital forensic, digital evidence and hacking as give below:
   i. The Aaron Caffrey case – United Kingdom, 2003
      http://digitalcommons.law.scu.edu/cgi/viewcontent.gi?article=1370&context=chtlj
   ii. The Julie Amero case – Connecticut, 2007
      http://dfir.com.br/wp-content/uploads/2014/02/ julieamerosummary.pdf
   iii. The Michael Fiola case – Massachusetts, 2008
      http://truthinjustice.org/fiola.htm.
b) Prepare report on any given case study of IoT

4i. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Use different Audio Visual media for Concept understanding.
f) Guide student(s) in undertaking micro-projects.
g) Demonstrate students thoroughly before they start doing the practice.
h) Observe continuously and monitor the performance of students.

4j. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In **special situations** where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it

before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a) IoT Based Humidity and Temperature Monitoring

i. Explain the need of IoT Based Humidity and Temperature Monitoring.
ii. What will be the hardware requirements for designing this system.
iii. What will be the software requirements
iv. Explain how circuit can be designed for this system along with its working
v. Explain how to design an IoT application and how to store and retrieve a data on it.

b) IoT based Weather Monitoring System

i. Explain the need of IoT Based Weather Monitoring System.
ii. What will be the hardware requirements for designing this system.
iii. What will be the software requirements
iv. Explain how circuit can be designed for this system along with its working
v. Explain how to design an IoT application and how to store and retrieve a data on it.

c) Study any case of fake profiling. Identify

i. The way digital forensics was used in detecting the fraud.
ii. Where was digital evidence located?
iii. Effects.

d) Study any case of forgery /falsification crime case solved using digital forensics:

i. Identify the model used for Digital Investigation.
ii. Was investigation done ethically or unethically.
iii. Where was digital evidence found for crime establishment?
iv. State the punishment meted.

e) Study Credit card fraud as an identity threat. Identify:

i. Use of digital media in carrying out fraud.
ii. Vulnerability Exploited.
iii. Effect of fraud.
iv. Protection/Precaution to be taken against such frauds.

f) Study any Trojan attack. Identify the Trojan attack:

i. State the way trojan got installed on particular Machine.
ii. State the effects of the Trojan.
iii. Elaborate/Mention/State protection/Blocking mechanism for this specific Trojan, example specification of any anti-threats platform which filters the Trojan.

4k. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Artificial Intelligence	R.B. Mishra	PHI
2.	Introduction to Embedded systems	Shibu K. V	Tata Mcgraw Hill ISBN 978-0-07-014589-4
3.	Internet Of Things-A Hands-on Approach	Arshadeep Bahga, Vijay Madisetti,	University Press ISBN 978-8-17371-954-7
4.	The Basics of Digital Forensic	John Sammons	Elsevier ISBN 978-1-59749-661-2
5.	Digital Forensic (2017 Edition)	Dr. Nilakashi Jain Dr. Dhananjat R. Kalbande	Wiley Publishing Inc. ISBN: 978-81-265-6574-0
6.	Hacking for Dummies (5th Edition)	Kevin Beaver CISSP	Wiley Publishing Inc. ISBN: 978-81-265-6554-2

4l. SOFTWARE/LEARNING WEBSITES

a) https://www.allitebooks.in/the-internet-of-things/
b) https://www.versatek.com/wp-content/uploads/2016/06/IoT-eBook-version5.pdf
c) https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf
d) http://www.spmkck.co.in/Notes/Learning%20Internet%20of%20Things.pdf
e) https://resources.infosecinstitute.com/digital-forensics-models/#gref.
f) https://www.researchgate.net/publication/300474145_Digital_Forensics/download
g) https://docs.microsoft.com/en-us/sysinternals/downloads/psloggedon
h) www.openwall.com/passwords/windows-pwdump
i) https://www.tutorialspoint.com/ethical_hacking/ethical_hacking_process.htm
j) https://slideplayer.com/slide/7480056/

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION MUMBAI

Program Name : **Diploma in Information Technology**

Program Code : **IF**

Semester : **Sixth**

Course Title : **Wireless and Mobile Network**

Course Code : **22622**

1. RATIONALE

Wireless and mobile networks play an increasingly important role in the world of communications. This course provides an introduction to various current and next generation wireless networking technologies, and undertakes a detailed exploration of fundamental architectural and design principles used at all layers of communication protocol stack. Students will also be able to analyze wireless protocols and their performance using tools and realistic simulations to maintain the wireless and mobile networks.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.

- **Maintain wireless and Mobile Networks.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a) Select cellular Mobile system standard.
b) Maintain wireless network Technologies.
c) Maintain wireless mobile application.
d) Interpret the components of WLL Applications.
e) Maintain Adhoc and wireless sensor network.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate attainment of COs and the remaining 20 marks for tests and assignments given by the teacher.

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *-Practical;* ***C*** *– Credit,****ESE*** *-End Semester Examination;* ***PA*** *- Progressive Assessment*

5. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the center of this map.

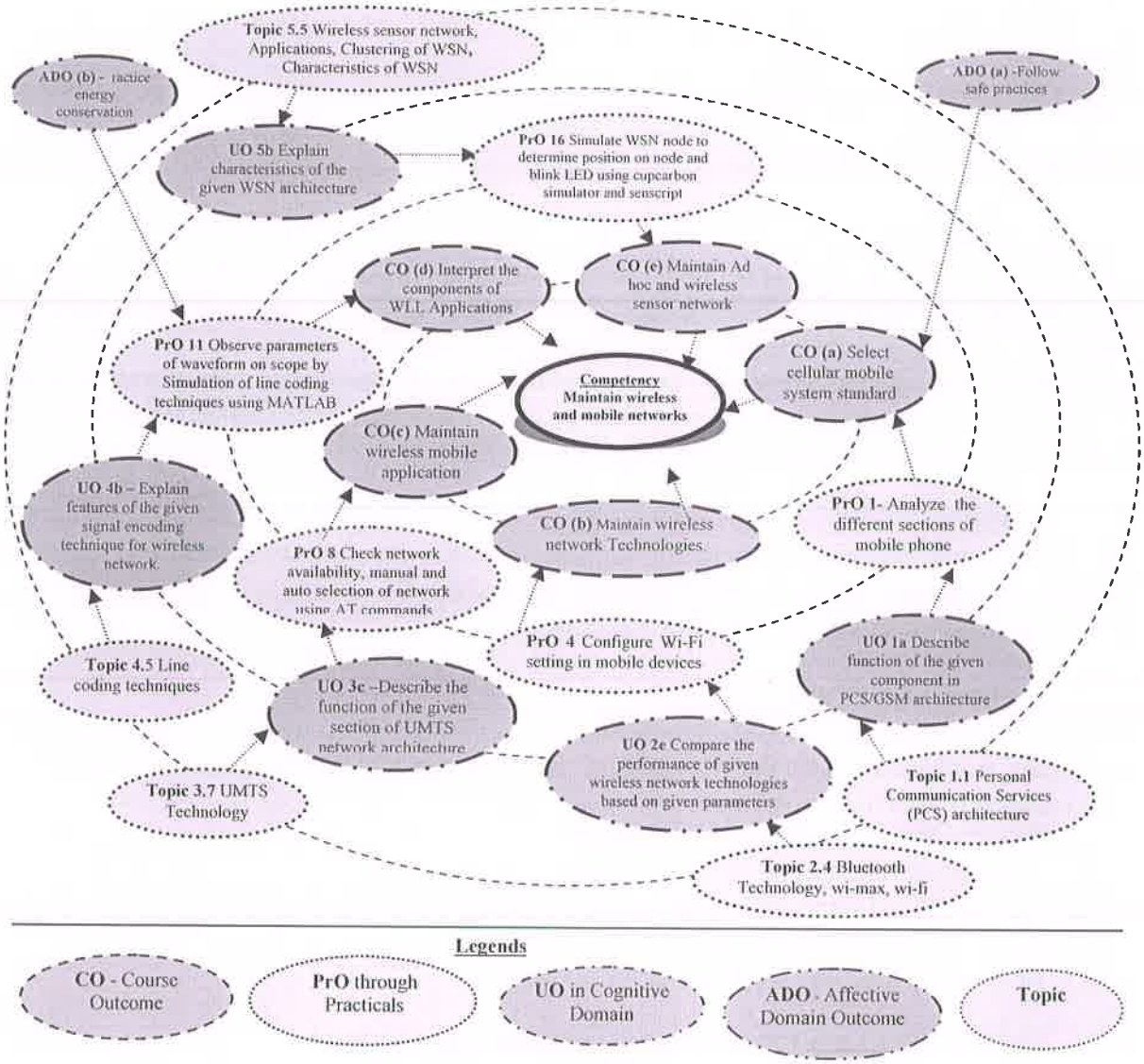

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the above stated competency.:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Test the different sections of mobile phone. (Such as ringer section, dialer section, receiver section and transmitter section)	I	02*
2	Perform the process of call connection and call release of cellular Mobile system.	I	02*
3	Transfer an image, audio and video file using Bluetooth protocol with varying distance between two devices and analyze the performance.	II	02*
4	Configure Wi-Fi setting in mobile devices using mobile tethering to connect two devices such as mobile phone to mobile phone, mobile phone to laptop.	II	02*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
5	Apply RFID technology for real life applications using RFID kit.	II	02
6	Establish seamless wireless connectivity using multiple access point.	II	02
7	Use AT commands to understand working of 3G network using 3G mobile phone Trainer kit.	III	02*
8	Check network availability, manual and auto selection of network using AT commands.	III	02*
9	Simulate Bluetooth voice transmission to observe effect of AWGN and interference of 802.11b on transmission using MATLAB and simulink.	III	02
10	Develop a mobile application for wireless technology using any wizards such as available on www.appypie.com or any other.	IV	02*
11	Simulate the line coding techniques using MATLAB and simulink.	IV	02
12	Simulate the Binary amplitude shift keying using MATLAB and simulink	IV	02*
13	Simulate the Binary phase shift keying using MATLAB and simulink.	IV	02*
14	Simulate the Delta modulation using MATLAB and simulink.	IV	02*
15	Simulate the Direct sequence spread spectrum using MATLAB and simulink.	IV	02*
16	Simulate WSN node to determine position on node and blink LED using cupcarbon simulator and senscript.	V	02*
	Total		**32**

Note

i. *A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. The practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.*

ii. *The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:*

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Follow Safety measures	10
4	Observations and Recording	10
5	Interpretation of result and Conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10
Total		**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a) Work collaboratively in team
b) Follow ethical Practices.

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The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTSREQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practicals, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications and Software	PrO. No.
1	Mobile phone trainer kit with Battery	1
2	Mobile phone trainer kit with Battery, SIM card of any GSM Service provider supporting 900/1800 frequency band, power supply	2
3	Blue tooth enabled two mobile phones	3
4	Mobile devices, Wi Fi access points	4
5	RFID kit	5
6	3,4 wi-fi enabled devices,Dlink wi fi access point	6
7	Mobile phone trainer kit with Battery	7
8	3G mobile phone Trainer kit,3G activated SIM card of any service provider supporting Tri-band UMTS 2100/1900/850 MHz, power supply,Hands free kit,CRO/Spectrum Analyzer,connecting wires,antenna with coaxial cable,Micro SD card.	8
9	PC with relevant software MATLAB	9, 11,12, 13, 14, 15
10	PC with internet connection	10
11	PC with relevant software Cupcarbon	16

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Major Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Basics of PCS and GSM	1a. Describe function of the given component in PCS/GSM architecture. 1b. Classify the given GSM logical channel. 1c. Describe the given step of call processing in GSM. 1d. Explain the significance of given type of area in cellular network.	1.1 Personal Communication Services (PCS) architecture 1.2 Global system for Mobile Communication (GSM) Architecture, GSM frequency spectrum , GSM radio aspects, GSM services, Supplementary services, GSM channel types, call processing in GSM 1.3 Mobility Management: Location updates procedure, Temporary

Unit	Major Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		Mobile Subscriber Identity, concept of roaming, Location area, routing area, tracking area. 1.4 Network signaling.
Unit– II GPRS and Mobile Data Communication	2a. Describe function of the given component of the GPRS architecture. 2b. Describe characteristics of the given IEEE protocol standard for wireless communication networks. 2c. Explain architecture of the given IEEE 802.11 protocol standard. 2d. Compare the performance of given wireless network technologies based on given criteria. 2e. State the procedure of scheduled maintenance of the given system	2.1 General Packet Radio Services (GPRS) architecture, GPRS Services, Quality of service 2.2 GPRS Network nodes, Mobility management and routing in GPRS, Logical channels in GPRS 2.3 WLANs (Wireless LANs) IEEE 802.11 standard, RFID 2.4 Bluetooth technology, Wi-Max, Wi-Fi 2.5 Mobile IP: operational principle, Home agent, foreign agent.
Unit– III Wireless Application Protocol and 3G Mobile Services	3a. Describe the given specification for compatibility requirements of IMT-2000 global standards. 3b. Explain features of the given next generation standard. 3c. Describe the function of the given section of UMTS network architecture. 3d. Compare features of the two given next generation mobile communication networks based on given criteria. 3e. State the procedure of scheduled maintenance of the given system	3.1 Mobile Internet standard, Wireless Application Protocol (WAP) Gateway and Protocols. 3.2 Wireless Markup Languages (WML) 3.3 International Mobile Telecommunications 2000 (IMT 2000) specification. 3.4 Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in third generation (3G) network. 3.5 UMTS Technology: Features, UMTS data rates, UMTS Spectrum, UMTS Architecture, applications and advantages. 3.6 Features of 4G and 4G LTE,VoLTE,4.5G,5G,4G Architecture, applications of 4G
Unit-IV WLL, signal encoding techniques and Spread spectrum modulati	4a. Describe the given application of Wireless local loop. 4b. Explain features of the given signal encoding technique for wireless network. 4c. Compare PCM, DPCM, DM modulation techniques on the given criteria. 4d. Describe characteristics of the	4.1 WLL architecture, Wireless local Loop (WLL) technologies 4.2 WLL types: FWT and WT with mobility, WLL Application 4.3 Concept of LEC networks 4.4 Line coding techniques 4.5 Amplitude shift keying, Binary phase shift keying; PCM, DPCM, DM; features; Types of spread spectrum;

Unit	Major Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
on	given Spread spectrum modulation technique. 4e. State the procedure of scheduled maintenance of the given system	DSSS, FHSS
Unit –V Mobile Ad-hoc Networks and Wireless Sensor Networks	5a. Explain the feature of given component in MANET architecture. 5b. Explain characteristics of the given WSN architecture. 5c. Describe the given design challenges in WSN 5d. Classify the given clustering algorithm. 5e. State the procedure of scheduled maintenance of the given system	5.1 MANET, MANET topologies, Features of MANET, Applications, types of MANET Architecture, Design challenges in MANET, 5.2 Mesh Networking; Wireless sensor network, Applications, Clustering of WSN, Characteristics of WSN; Sensor node: Block diagram, Different types of WSN Architecture, Energy efficiency in WSN 5.3 WSN, MANET and IOT; ISO equivalent protocol layer architecture for WSN, Classification of clustering algorithms, Components of WSN Architecture

Note: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of PCS and GSM	10	04	04	04	12
II	GPRS and Mobile Data Communication	12	-	04	08	12
III	Wireless Application Protocol and 3G Mobile Services	16	04	12	04	20
IV	WLL, signal cncoding techniques and Spread spectrum modulation	14	02	04	04	10
V	Mobile Ad-hoc Networks and Wireless Sensor Networks	12	04	04	08	16
Total		**64**	**14**	**28**	**28**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*

Note*: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Visit nearest MTNL/BSNL exchange and prepare detail report of entire setup of their cellular system.
b) Visit nearest CDMA based cellular switching center and prepare details of entire setup of their cellular system.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the LOs/COs through classroom presentations (see implementation guideline for details).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Guide student(s) in undertaking micro-projects.
f) Correlate subtopics with Electronics communication and Digital communication.
g) Use proper equivalent analogy to explain different concepts.
h) Use Flash/Animations to explain functions of mobile handset.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a) Prepare a report on TRAI regulations related to wireless and mobile Network.
b) Prepare a report on sectorisation, BTS Functions, Structure of BTS, Electronic Board Identification, Mechanical structure, Base station controller, BSS interface, BSS Planning of Base Station Subsystem.
c) Prepare a report on CDMA Base Transreceiver Station which includes BTS Functions, BTS Position in the system, BTS system Architecture, Mechanical features, Electrical

feature, Power Consumption, subsystem of BTS, Antenna and Feeder, Typical application, BTS Network Topology.

d) Prepare a report on Mobile Value added Services which includes Mobile Messaging Services, SMS, SMSC Deployment Architecture, EMS, WAPService, MMS Network Architecture, VMS, Voiceportal, Cell Broadcast Service, Push to Talk.

e) Prepare a report on Mobility management and associated algorithms in wireless and mobile Networks.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Wireless and mobile network Architectures	Lin Yi-Bang, Clamtac Imrich	John Wiley &sons, New Delhi,2001 ISBN 978-81-265-1560-8
2	Wireless communication-Principles and practice	Theodore S. Rappaport	Pearson publication New Delhi,2005 ISBN:978-81-317-3186-4
3	Wireless Communication	Singal T.L.	McGraw Hill Education Private Limited, New Delhi,2010, ISBN:978-0-07-068178-1
4	Mobile Computing Technology, Applications and service creation	Talukdar Asoke K, Javagal Roopa R	McGraw Hill Education Private Limited, New Delhi,2010, ISBN:978-0070144576

14. SOFTWARE/LEARNING WEBSITES

a) Mobile network standards:-http://gallucci.net/blog/gsm-cdma-and-lte-a-guide-to-mobile-network…/3/4

b) Bluetooth technology: -www.radio-Electronics.com/info/wireless/Bluetooth/Bluetooth_overview.php

c) The Evolution of mobile technologies:-https://www.qualcomm.com/…/the-evolution-of-mobile-technologies-1g-to-2g-to-3g-.

d) Wireless tutorials: https://www.octoscope.com/English/.../octoscope_WirelessTutorial_20090209.pdf

Program Name : **Computer Engineering Program Group**

Program Code : **CO/CM/IF/CW**

Semester : **Sixth**

Course Title : **Web Based Application development with PHP**

Course Code : **22619**

1. RATIONALE

PHP is a general purpose, server-side scripting language run a web server that's designed to make dynamic pages and applications. PHP as a web development option is secure, fast and reliable. In the growing field of Web technology it is essential for every Diploma pass outs to learn PHP Language to help them build interactive web applications. This course is designed to inculcate web based applications development skills in students using server side scripting with PHP.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Develop simple web-based application using PHP language.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a) Develop program using control statement.
b) Perform operations based on arrays and graphics.
c) Develop programs by applying various object oriented concepts.
d) Use form controls with validation to collect user's input.
e) Perform database operations in PHP.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.
***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

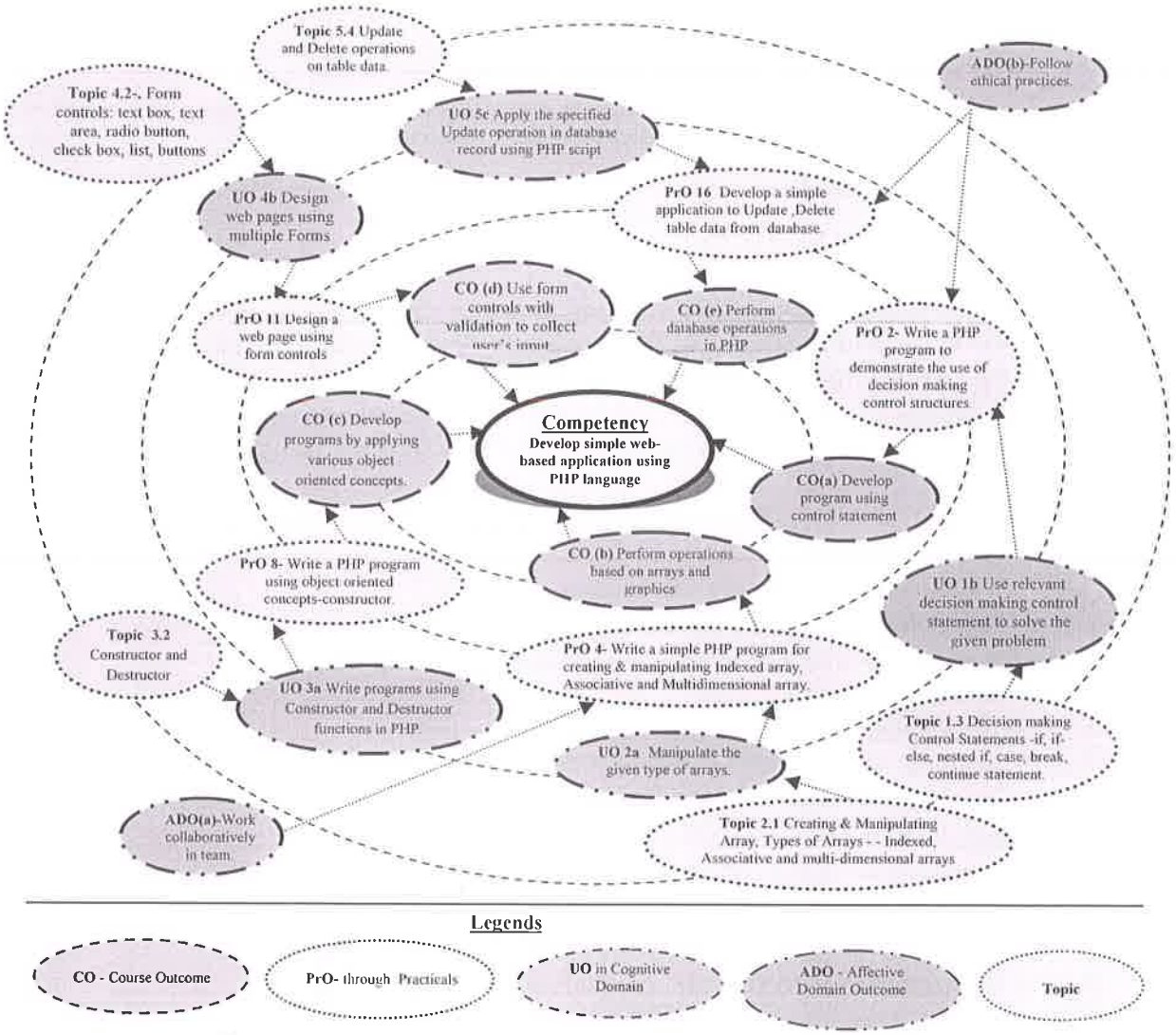

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	a. Install and configure PHP, web server, MYSQL b. Write a program to print "Welcome to PHP". c. Write a simple PHP program using expressions and operators.	I	02*
2	Write a PHP program to demonstrate the use of Decision making control structures using- a. If statement b. If-else statement c. Switch statement	I	02*
3	Write a PHP program to demonstrate the use of Looping structures using- a. While statement, b. Do-while statement c.For statement d. Foreach statement	I	02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
4	Write a PHP program for creating and manipulating- a. Indexed array b. Associative array c. Multidimensional array	II	02
5	a. Write a PHP program to– i. Calculate length of string. ii. Count the number of words in string -without using string functions. b. Write a simple PHP program to demonstrate use of various built-in string functions.	II	02*
6	Write a simple PHP program to demonstrate use of Simple function and Parameterized function.	II	02
7	Write a simple PHP program to create PDF document by using graphics concepts.	II	02
8	Write a PHP program to- a. Inherit members of super class in subclass. b. Create constructor to initialize object of class --by using object oriented concepts	III	02*
9	Write a simple PHP program on Introspection and Serialization.	III	02
10	Design a web page using following form controls: a. Text box, b. Radio button, c. Check box, d. Buttons	IV	02*
11	Design a web page using following form controls: a. List box, b. Combo box, c. Hidden field box	IV	02*
12	Develop web page with data validation.	IV	02*
13	Write simple PHP program to - a. Set cookies and read it. b. Demonstrate session Management.	IV	02*
14	Write a simple PHP program for sending and receiving plain text message (e-mail).	IV	02*
15	Develop a simple application to- a. Enter data into database b. Retrieve and present data from database.	V	02*
16	Develop a simple application to Update, Delete table data from database.	V	02*
	Total		**32**

Note:

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so that the student reaches the 'Applying Level' of Bloom's 'Cognitive Domain Taxonomy' as generally required by the industry.

ii. The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Write appropriate code to generate desired output in Web application	30

S. No.	Performance Indicators	Weightage in %
2	Debug, Test and Execute the programs	30
3	Presentation of Output	20
4	Able to Answer to oral questions	10
5	Submission of report in time	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a) Work collaboratively in team.
b) Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practicals, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. S. No.
1	Hardware : Computer system (Any computer system, preferably i3 - i5 with basic configuration)	All
2	Operating system : Windows / Linux	
3	Any database tool such as MySQL, MariaDB or any equivalent tool	15,16

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Expressions and control statements in PHP	1a Write simple PHP program to solve the given expression. 1b Use relevant decision making control statement to solve the given problem 1c Solve the given iterative problem using relevant loop statement.	1.1 History and Advantages of PHP, , Syntax of PHP. 1.2 Variables, Data types, Expressions and operators, constants 1.3 Decision making Control statements - if, if-else, nested if, switch, break and continue statement. 1.4 Loop control structures-while , do-while , for and foreach

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit– II Arrays, Functions and Graphics	2a Manipulate the given type of arrays to get the desired result. 2b Apply implode, explode functions on the given array. 2c Apply the given string functions on the character array. 2d Scale the given image using graphics concepts/ functions.	2.1 Creating and Manipulating Array, Types of Arrays- Indexed , Associative and Multi-dimensional arrays 2.2 Extracting data from arrays, implode, explode, and array flip. 2.3 Traversing Arrays 2.4 Function and its types –User defined function, Variable function and Anonymous function. 2.5 Operations on String and String functions:str_word_count(),strlen(),strrev(),strpos(),str_replace(), ucwords(),strtoupper(), strtolower(),strcmp(). 2.6 Basic Graphics Concepts, Creating Images, Images with text, Scaling Images, Creation of PDF document.
Unit-III Apply Object Oriented Concepts in PHP	3a Write constructor and destructor functions for the given problem in PHP. 3b Implement inheritance to extend the given base class. 3c Use overloading / overriding to solve the given problem. 3d Clone the given object.	3.1 Creating Classes and Objects 3.2 Constructor and Destructor 3.3 Inheritance, Overloading and Overriding, Cloning Object. 3.4 Introspection, Serialization
Unit –IV Creating and validating forms	4a Use the relevant form controls to get user's input. 4b Design web pages using multiple Forms for the given problem. 4c Apply the given validation rules on form. 4d Set/ modify/ delete cookies using cookies attributes. 4e Manage the given session using session variables.	4.1 Creating a webpage using GUI Components, Browser Role-GET and POST methods, Server Role 4.2 Form controls: text box, text area, radio button, check box, list, buttons 4.3 Working with multiple forms : - A web page having many forms - A form having multiple submit buttons. 4.4 Web page validation. 4.5 Cookies - Use of cookies, Attributes of cookies, create cookies, modify cookies value, and delete cookies. 4.6 Session - Use of session, Start session, get session variables, destroy session. 4.7 Sending E-mail.
Unit-V Database Operations	5a Create database for the given problem using PHP script. 5b Insert data in the given database using PHP script. 5c Apply the specified update operation in database record	5.1 Introduction to MySQL – Create a database. 5.2 Connecting to a MySQL database : MySQL database server from PHP 5.3 Database operations: Insert data, Retrieving the Query result 5.4 Update and delete operations on table

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	using PHP script. 5d Delete the given record from the database using PHP script.	data.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Expressions and control statements in PHP	06	02	02	08	12
II	Arrays, Functions and Graphics	10	02	04	10	16
III	Apply Object Oriented Concepts in PHP	12	02	04	10	16
IV	Creating and validating forms	12	02	04	06	12
V	Database operations	08	02	04	08	14
Total		**48**	**10**	**18**	**42**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note*: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare journal of practicals.
b) Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

e) Guide student(s) in undertaking micro-projects.
f) Demonstrate students thoroughly before they start doing the practice.
g) Encourage students to refer different websites to have deeper understanding of the subject.
h) Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a) Develop web application for- Sending plain text email, Sending HTML message, Sending e-mails with attachment
b) Develop web application for Library Management system. – Add book , Display list of book , Search book .
c) Develop web application for Student Feedback System.
d) Develop web application for Employee Pay Management System.

(Any other micro-projects suggested by subject faculty on similar line.)

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Programming PHP	Rasmus Lerdorf, Kevin.T and Peter M.	O'Reilly, USA, ISBN -978-1-449-39277-2, 2013
2	The Complete Reference PHP (Third Edition covers PHP)	Holzner, Steven	McGraw hill, New Delhi, ISBN 9780070223622, 2008.
3	PHP and MySQL	McGrath, Mike	McGraw Hill, New Delhi, ISBN-13: 978-1259029431
4	Advance Web Technology	Dr. Rajedra Kawle	Devraj Publication , ISBN- 978-93-86492-01-2

14. SOFTWARE/LEARNING WEBSITES

a) https://www.w3schools.com/php/default.asp
b) https://www.guru99.com/what-is-php-first-php-program.html
c) https://www.tutorialspoint.com/php/
d) https://tutorialehtml.com/en/php-tutorial-introduction/
e) www.tizag.com/phpT/
f) https://books.goalkicker.com/PHPBook/
g) https://codecourse.com/watch/php-basics

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION MUMBAI

Program Name : **Computer Engineering Program Group**

Program Code : **CO/CM/IF/CW**

Semester : **Sixth**

Course Title : **Network and Information Security**

Course Code : **22620**

1. RATIONALE

Computer network security is an important aspect in today's world. Now days due to various threats designing security in organization is an important consideration. It is essential to understand basic security principles, various threats to security and techniques to address these threats. The student will be able to recognize potential threats to confidentiality, integrity and availability and also able to implement various computer security policies. This course will introduce basic cryptographic techniques, fundamentals of computer/network security, Risks faced by computers and networks, security mechanisms, operating system security, secure System design principles, and network security principles. Also it will create awareness about IT ACT and different Cyber laws.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Maintain Network and Information security of an organization.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a) Identify risks related to Computer security and Information hazard in various situations.
b) Apply user identification and authentication methods.
c) Apply cryptographic algorithms and protocols to maintain Computer Security.
d) Apply measures to prevent attacks on network using firewall.
e) Maintain secured networks and describe Information Security Compliance standards.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory							Practical				
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
L	T	P			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20

***(*):** Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.*
***Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE -End Semester Examination; PA - Progressive Assessment*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the

course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

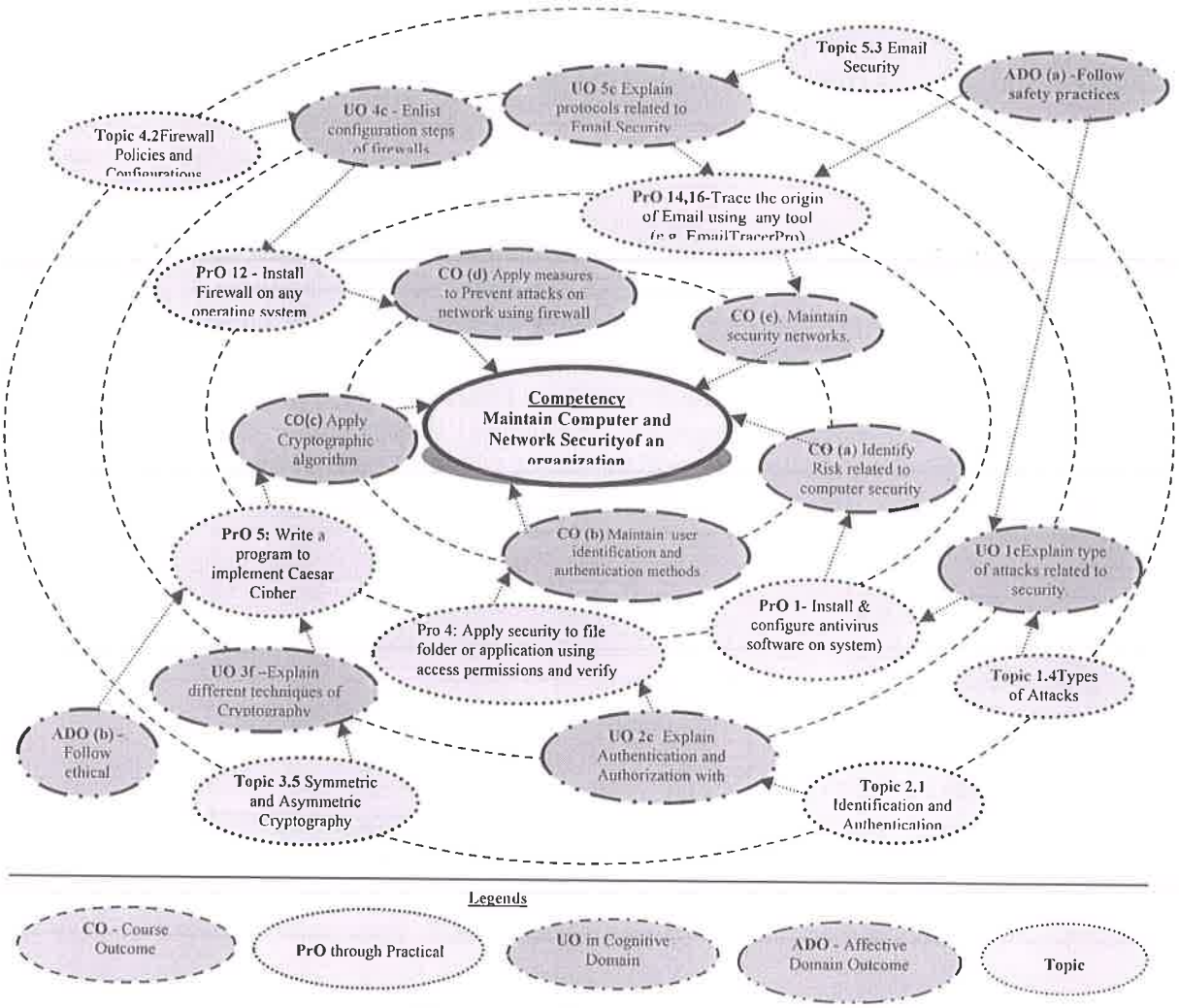

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	a. Install and configure Antivirus software on system (any). b. Set up operating system Updates.	I	2
2	Perform Backup and Restore of the system.	I	2
3	Set up passwords to operating system and applications.	II	2
4	Apply security to file folder or application using access permissions and verify.	II	2
5	Write a program to implement Caesar Cipher	III	2
6	Write a program to implement Vernam Cipher	III	2
7	Create and verify Hash Code for given message	III	2
8	Write a program to implement Rail fence technique	III	2
9	Write a program to implement Simple Columnar Transposition technique	III	2

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
10	Create and verify digital signature using tool (e.g. Cryptool)	III	2
11	Use Steganography to encode and decode the message using any tool.	III	2
12	a. Install firewall on any operating system. b. Configure firewall settings on any operating system.	IV	2
13	Create and verify Digital Certificate using tool (e.g. Cryptool)	V	2
14	Trace the origin of Email using any tool(e.g. emailTrackerPro)	V	2
15	Trace the path of web site using Tracert Utility	V	2
16	PGP Email Security a. Generate Public and Private Key Pair. b. Encrypt and Decrypt message using key pair.	V	2
		Total	**32**

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so that the student reaches the 'Applying Level' of Blooms's 'Cognitive Domain Taxonomy' as generally required by the industry.

ii. The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Correctness of the flow of procedures.	40
2	Debugging ability.	20
3	Quality of input and output displayed (messaging and formatting)	10
4	Answer to sample questions	20
5	Submission of report in time	10
Total		**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a) Work collaboratively in team
b) Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTSREQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practicals, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. S. No.
1	Computer system (Any computer system with basic configuration)	All
2	Antivirus Software(any)	
3	Any compiler	6,7,8,9
4	Encryption Decryption tool(preferably Open source based)	10,13
5	Steganography Tools. (preferably Open source based)	11
6	E-mail tracing Tools. (preferably Open source based)	14
7	Web tracing Tools. (preferably Open source based)	15

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Introduction to Computer and Information Security	1a. Explain the importance of the given component of computer security. 1b. Explain the characteristics of the given type of threat. 1c. Explain the given type of attacks related with security. 1d. Describe the features of given type of update of operating system. 1e. Classify Information. 1f. Explain Principles of Information Security.	1.1 Foundations of Computer Security: Definition and Need of computer security, Security Basics: Confidentiality, Integrity, Availability, Accountability, Non-Repudiation and Reliability. 1.2 Risk and Threat Analysis: Assets, Vulnerability, Threats, Risks, Counter measures. 1.3 Threat to Security: Viruses, Phases of Viruses, Types of Virus, Dealing with Viruses, Worms, Trojan Horse, Intruders, Insiders. 1.4 Type of Attacks: Active and Passive attacks, Denial of Service, DDOS, Backdoors and Trapdoors, Sniffing, Spoofing, Man in the Middle, Replay, TCP/IP Hacking, Encryption attacks. 1.5 Operating system security: Operating system updates : HotFix, Patch, Service Pack. 1.6 Information, Need and Importance of Information, information classification, criteria for information classification, Security, need of security, Basics principles of information security.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit– II User Authentication and Access Control	2a. Explain techniques of the given type of attack on passwords. 2b. Explain mechanism of the given type of Biometric. 2c. Apply the relevant Authentication method for the given situation with an example. 2d. Describe features of the given access control policy.	2.1 Identification and Authentication: User name and Password, Guessing password, Password attacks-Piggybacking, Shoulder surfing, Dumpster diving. 2.2 Biometrics: Finger Prints, Hand prints, Retina, patterns, Voice patterns, Signature and Writing patterns, Keystrokes. 2.3 Access controls: Definition, Authentication Mechanism, principle-Authentication, Authorization, Audit, Policies: DAC, MAC,RBAC.
Unit– III Cryptography	3a. Encrypt/Decrypt the given text using different substitution techniques. 3b. Convert plain text to cipher text and vice versa using the given transposition technique. 3c. Convert the given message using steganography. 3d. Explain the given technique of cryptography using example.	3.1 Introduction: Plain Text, Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. 3.2 Substitution Techniques: Caesar's cipher, Modified Caesar's Cipher, Transposition Techniques: Simple Columnar Transposition. 3.3 Steganography : Procedure 3.4 Symmetric and Asymmetric cryptography: Introduction to Symmetric encryption, DES (Data encryption Standard) algorithm, Asymmetric key cryptography: Digital Signature.
Unit-IV Firewall and Intrusion Detection System	4a. Compare types of firewall on the given parameter(s). 4b. Explain function of the given type of firewall configuration. 4c. Compare various IDS techniques on the given parameter(s). 4d. Describe features of the given IDS technique.	4.1 Firewall : Need of Firewall, types of firewall- Packet Filters, Stateful Packet Filters, Application Gateways, Circuit gateways. 4.2 Firewall Policies, Configuration, limitations, DMZ. 4.3 Intrusion Detection System : Vulnerability Assessment, Misuse detection, Anomaly Detection, Network-Based IDS, Host-Based IDS, Honeypots
Unit –V Network Security, Cyber Laws and Compliance Standards.	5a. Explain the given component of Kerberos authentication protocol. 5b. Explain the given IP Security protocol with modes. 5c. Explain working of the given protocol for Email security. 5d. Describe the given component of Public Key Infrastructure. 5e. Classify the given Cyber crime.	5.1 Kerberos : Working, AS, TGS, SS 5.2 IP Security- Overview, Protocols- AH, ESP, Modes- transport and Tunnel. 5.3 Email security- SMTP, PEM, PGP. 5.4 Public key infrastructure (PKI): Introduction, Certificates, Certificate authority, Registration Authority, X.509/PKIX certificate format. 5.5 Cyber Crime: Introduction, Hacking , Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography , Identity Theft and Fraud , Cyber terrorism, Cyber Defamation. 5.6 Cyber Laws: Introduction, need,

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	5f. Explain the specified Cyber law. 5g. Describe compliance standards for Information Security.	Categories: Crime against Individual, Government, Property. 5.7 Compliance standards: Implementing and Information Security Management System, ISO 27001, ISO 20000, BS 25999, PCI DSS, ITIL framework, COBIT framework.

***Note**:To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Computer and Information Security	12	06	06	02	14
II	User Authentication and Access Control	06	04	04	02	10
III	Cryptography	06	02	04	08	14
IV	Firewall and Intrusion Detection System	12	04	06	08	18
V	Network Security, Cyber Laws and Compliance Standards.	12	06	06	02	14
	Total	**48**	**22**	**26**	**22**	**70**

Legends: R=Remember, U=Understand, *A=Apply and above (Bloom's Revised taxonomy)*
***Note**: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare journal of practicals.
b) Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the

development of the COs through classroom presentations (see implementation guideline for details).

d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Guide student(s) in undertaking micro-projects.
f) Demonstrate students thoroughly before they start doing the practice.
g) Encourage students to refer different websites to have deeper understanding of the subject.
h) Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a) Case Studies in Secure Computing: Achievements and Trends.
b) Implement Client/Server communication using cryptography tools in your laboratory.
c) Create digital certificate for your departmental/ personal communication.
d) Implement communication system using steganography. Encrypt image and message using any cryptography technique.
e) Implement communication system using steganography using audio files. Encrypt audiofile and message using any cryptography technique.
f) Implement Three Level Password Authentication System.
g) Any other micro-projects suggested by subject faculty on similar line.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Computer Security	Dieter Gollmann	Wiley Publication, New Delhi, ISBN : 978-0-470-74115-3
2	Cryptography and Network Security	Atul Kahate	McGraw Hill Education, New Delhi ISBN: 978-1-25-902988-2
3	Cyber Laws And IT Protection	Harish Chander	PHI Publication,New Delhi, 2012 ISBN: 978-81-203-4570-6
4	Implementing Information Security based on ISO 27001 / ISO 27002 (Best Practice)	Alan Calder	Van Haren Publishing ISBN-13: 978-9087535414 ISBN-10: 9087535414

14. SOFTWARE/LEARNING WEBSITES

a) http://nptel.ac.in/courses/106105162/
b) https://www.tutorialspoint.com//computer_security/computer_security_quick_guide.htm
c) http://learnthat.com/introduction-to-network-security/
d) https://freevideolectures.com/course/3027/cryptography-and-network-security
e) https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/video-lectures/
f) http://stylesuxx.github.io/steganography/
g) https://smartninja-pgp.appspot.com/
h) http://www.cyberlawsindia.net/cyber-india.html
i) https://www.upcounsel.com/cyber-law
j) http://cyberlaws.net/cyber-law/

Program Name : **Computer Engineering Program Group**

Program Code : **CO/CM/IF/CW**

Semester : **Sixth**

Course Title : **Cloud Computing**

Course Code : **22624**

1. RATIONALE

Cloud computing has evolved as a very important computing model, which enables information, software, and other shared resources to be provisioned over the network as services in an on-demand manner. There are many aspects of cloud computing viz cloud types, storage in cloud, security in cloud, cloud monitoring and management. Having specific skills in these areas is necessary for diploma pass-outs to create and maintain cloud based services. After learning this course student will be able to implement virtualization, create cloud based storage, Implement security, and manage cloud services.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Maintain cloud based services.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a) Maintain Cloud Based Application.
b) Implement virtualization in Cloud Computing.
c) Maintain Storage System in Cloud.
d) Maintain Cloud Services.
e) Implement Security in Cloud Computing.
f) Implement cloud on different platforms.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Assessment.*

5. COURSE MAP COURSE MAP(with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the

course, in all domains of learning in terms of the industry/employer identified competency depicted at the center of this map.

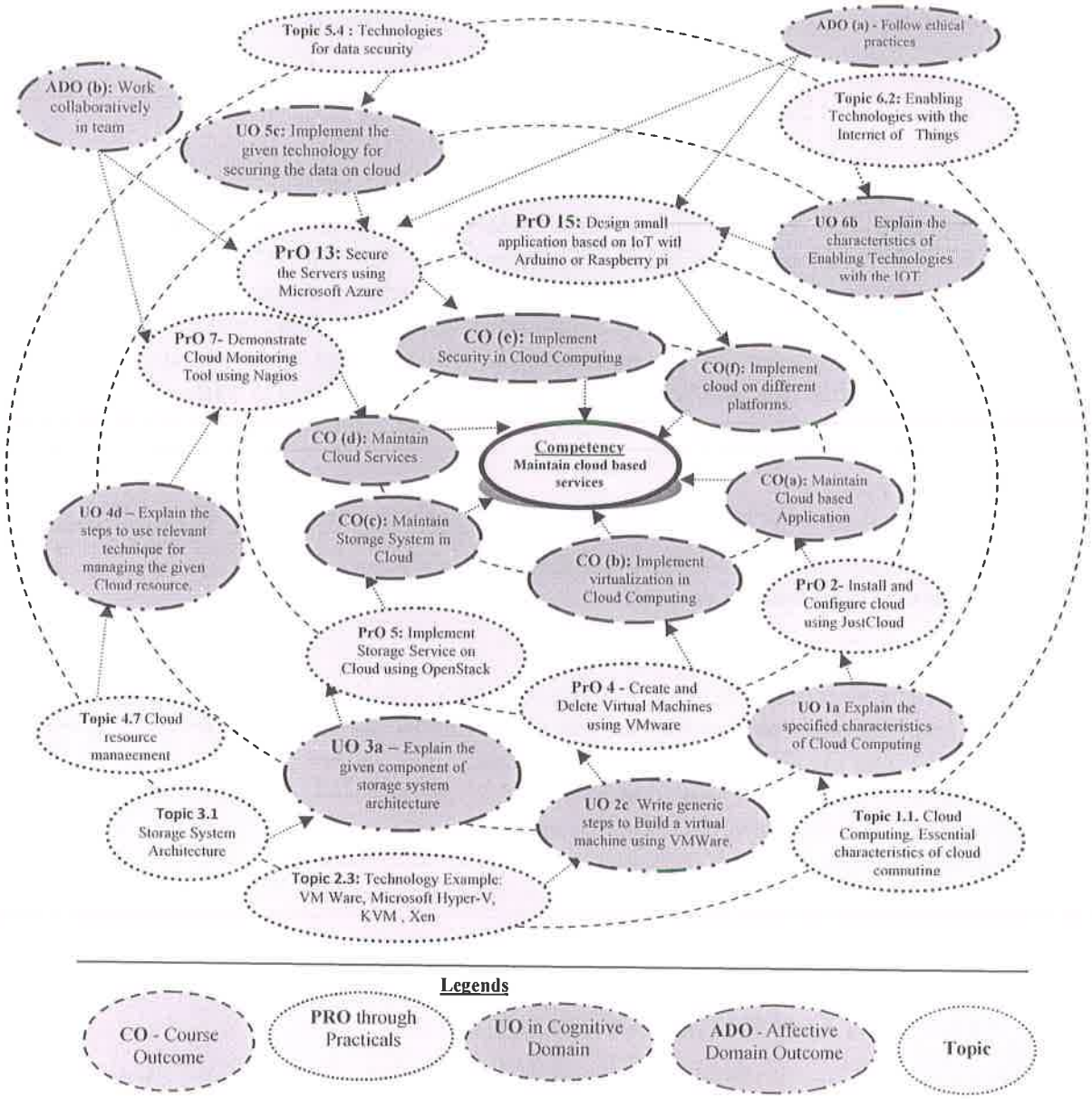

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Use Goggle Doc to make spreadsheet and notes	I	02*
2	Install/Configure cloud using JustCloud	I	02*
3	Use Cloud9 to demonstrate use of different language	I	02*
4	Create/Delete Virtual Machines using VMware (Private Cloud)	II	02*
5	Implement Storage Service on Cloud using OpenStack	III	02*
6	Use OpenStack for File Management	III	02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
7	Monitor cloud using Nagios Tool	IV	02*
8	Create and Host Simple Web Application on Microsoft Azure/Google cloud/Any cloud platform(Part-I)	IV	02*
9	Create and Host Simple Web Application on Microsoft Azure/Google cloud/Any cloud platform (Part-II)	IV	02*
10	Work in Codenvy to show Provisioning and Scaling of a website (Part-I)	IV	02
11	Work in Codenvy to show Provisioning and Scaling of a website (Part-II)	IV	02
12	Implement Identity Management and Access Management using OpenStack	V	02*
13	Configure Servers using Microsoft Azureto secure it. (Part-I)	V	02
14	Configure Servers using Microsoft Azureto secure it. (Part-II)	V	02
15	Design a small application based on IoT using Arduino or Raspberry pi (Part-I)	VI	02
16	Design a small application based on IoT using Arduino or Raspberry pi (Part-II)	VI	02
	Total		**32**

Note

i. *A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. The practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.*

ii. *The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:*

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental setup	30
2	Setting and Operation	20
3	Observation and Recording	20
4	Interpretation of result and conclusion	10
5	Answer to sample questions	10
6	Submission of report in time	10
Total		**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a) Work collaboratively in team
b) Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practicals, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO S. No.
1	**Computer system** - Hardware: Min 8GB RAM, 512 GB HDD, Gigabit Ethernet network equipment, Software Requirement: Apache Tomcat, Java, Python, Virtualization Software Academic version of any public cloud service(Google/AWS/Azure)	All

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed to develop UOs in cognitive domain for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Major Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Fundamentals of Cloud Computing	1a. Explain the specified characteristics of Cloud Computing. 1b. Compare the given Cloud Deployment Models on the given criteria. 1c. Explain the given service offered by identified Cloud Service Model. 1d. Explain the given component of cloud computing architecture 1e. Write steps to use Cloud Based Integrated Development Environment to develop the given application.	1.1 Cloud Computing, Essential characteristics of cloud computing 1.2 Cloud Deployment Model: Public cloud, Private cloud, Community cloud, Hybrid cloud 1.3 Cloud Service Models: IaaS, PaaS, SaaS 1.4 Cloud Economics and Benefits 1.5 Architecture of Cloud Computing 1.6 Cloud Computing Infrastructure 1.7 Cloud-Based Integrated Development Environment (IDE) to write, run, and debug code with a browser.
Unit– II Virtualization	2a. Explain the given feature of Virtualization. 2b. Explain the characteristics of the specified Virtualization type 2c. Write generic steps to build a virtual machine using VMWare on the given OS. 2d. Describe the given disadvantage of Virtualization.	2.1 Introduction, Virtualization Reference Model, Characteristics of virtualized environment 2.2 Virtualization Types 2.3 Technology Example: VMWare, Microsoft Hyper-V, KVM , Xen 2.4 Advantages: Virtual Machine(VM), VM Migration, VM Consolidation, VM Management 2.5 Disadvantages of Virtualization

Unit	Major Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit– III Storage in Clouds	3a. Explain the given component of storage system architecture. 3b. Write steps to design storage system for the given cloud set-up. 3c. Compare GFS and HDFS based on the given criteria.	3.1 Storage System Architecture, 3.2 Virtualize Data Centre (VDC) Architecture, VDC Environment, server, storage, networking, desktop and application virtualization techniques and benefits. 3.3 Block and file level storage virtualization, Virtual Provisioning, and automated storage tiering, Virtual storage area network(VSAN) and benefits, 3.4 Cloud file systems: Google File System GFS and Hadoop Distributed File System HDFS,
Unit-IV Cloud monitoring and management	4a. Describe the given component of federated cloud computing. 4b. Compare different types of SLA based on the given criteria. 4c. Describe the given cloud interface standard. 4d. Explain the steps to use relevant technique for managing the given Cloud resource.	4.1 Service Provider and users 4.2 An architecture of federated cloud computing 4.3 Service Level Agreement (SLA) management: Types of SLA, Life cycle of SLA. 4.4 Service catalog, management and functional interfaces of services , 4.5 Cloud portal and its functions 4.6 Cloud Service life cycle phases: Service planning, service creation, service operation and service termination 4.7 Cloud resource management • Ab-initio Resource Assignment • Periodic Resource Optimization
Unit –V Security in Cloud Computing	5a. Explain the given security related risk in Cloud Computing. 5b. Explain the specified feature of Key security terminology for data security. 5c. Write steps to implement the given Technology for Securing the Data on cloud. 5d. Write steps to manage the Identity and Access facility of given Cloud set-up. 5e. Explain the given feature of Security-As-A-Cloud Service.	5.1 Cloud Security Fundamentals 5.2 Cloud Risk, Cloud Risk division • Polity and Organizational Risks • Technical Risks • Legal risks 5.3 Technologies for Data security, Data security risk 5.4 Digital identity and access management, 5.5 Content level security 5.6 Security-As-A-Cloud Service
Unit –VI Trends and future in cloud	6a. Explain the characteristics of the given Enabling Technology with the IoT. 6b. Select relevant cloud platform	6.1 Cloud trends in supporting Ubiquitous Computing 6.2 Enabling Technologies with the Internet of Things (RFID, Sensor

Unit	Major Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
computing	for the identified application with justification. 6c. Describe the features of the given type of cloud-based smart device. 6d. Compare features of the given cloud platforms on the specified criteria.	Networks and ZigBee Technologies, GPS) 6.3 Innovative Applications with the Internet of Things (Ex: Smart Buildings and Smart Power Grid) 6.4 Future of Cloud-Based smart Devices, Home Based Cloud Computing, Energy Aware Cloud Computing. 6.5 Cloud Platforms: Amazon EC2 and S3, Microsoft Azure , Cloudstack, Intercloud, Google App Engine, Open Source cloud Eucalyptus, Open stack, Open Nebulla, etc.,

***Note**: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Fundamentals of Cloud Computing	04	02	02	02	06
II	Virtualization	08	02	02	04	08
III	Storage in Clouds	10	04	04	08	16
IV	Cloud monitoring and management	10	04	04	08	16
V	Security in Cloud Computing	08	02	04	04	10
VI	Trends and future in cloud computing	08	02	04	08	14
Total		**48**	**16**	**20**	**34**	**70**

***Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
***Note**: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare journal of practical.
b) Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Use different Audio Visual media for Concept understanding.
f) Guide student(s) in undertaking micro-projects.
g) Demonstrate students thoroughly before they start doing the practice.
h) Ensure use of latest version of tools.
i) Encourage students to refer various web sites to have detail understanding of JSP and related concepts.
j) Encourage students to refer different web-applications to have deeper understanding of web-applications.
k) Observe continuously the performance of students in laboratory.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a) Prepare the report on case study of Amazon Cloud Services.
b) Prepare the report on case study of Google App Engine.
c) Create infrastructure as service using OpenStack.
d) Develop Personal Cloud using ownCloud and Raspberry Pi

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Cloud Computing, Principals and Paradigms	Buyya Rajkumar, J.Broberg, A. Goscinski	A John Wilwy & Sons, Inc., Pubication, ISBN: 978-0-470-88799-8
2	Cloud Computing	Sharma Rishabh	Wiley Publication, ISBN: 978-81-265-5306-8
3	Mastering Cloud	Buyya Rajkumar.	McGraw Hill Publication, ISBN:

S. No.	Title of Book	Author	Publication
	Computing	Vecchiola Christian, Selvi S Thamarai	978-1-25-902995-0
4	Cloud Computing	Singh Shailendra	Oxford University Press, ISBN: 9780199477388

14. SOFTWARE/LEARNING WEBSITES

a) http://nptel.ac.in/courses/106105167/1
b) https://www.techopedia.com/definition/2/cloud-computing
c) https://onlinelibrary.wiley.com/doi/book/10.1002/9780470940105
d) http://www.chinacloud.cn/upload/2011-07/11073107539898.pdf

Program Name : **All Branches of Diploma in Engineering and Technology.**

Program Code : **CE/CR/CS/CH/CM/CO/IF/CW/DE/EJ/EN/EQ/ET/EX/IE/ MU/EE/EP/EU/IS/IC/AE/FG/ME/PG/PT/DC/TX/TC**

Semester : **Sixth**

Course Title : **Capstone Project – Execution & Report Writing**

Course Code : **22060**

1. RATIONALE

This course on 'Capstone Project–Execution and Report Writing' is the continuation of the previous semester course on 'Capstone Project–Planning'. So, in this semester, the students are to implement the detailed Capstone Project Plan, which they have prepared in the preceding semester. Therefore, to successfully complete this Capstone Project by the end of this semester, it is necessary to incorporate the suggestions of the guide/examiners of the preceding semester. Hence, it is of utmost importance for the student to again re-capitulate and comprehend the importance, concept and need of the 'Capstone Projects' which are well explained in the 'Capstone Project–Planning' course in the previous semester.

Often, the jobs in the industry, which the diploma holders will come across when they join it and will be in the form of small or large projects. Such projects are generally an integration of the various types of skills which cut across the three major domains of learning i.e. cognitive, psychomotor and affective domain which must have acquired during their journey from first semester to the last semester. Hence, it is essential that students are also given an opportunity to do large projects which require more time compared to the micro-projects in order to develop and integrate the highly essential industry oriented competencies and associated skills in the students. Therefore, in this semester the 'Capstone Project – Execution and Report Writing' will continue to integrate some more additional competencies along with those in the previous semester and hence build up greater confidence to face such situations in the world of work.

2. COMPETENCY

The course should be taught and implemented with the aim to develop the required course outcomes (COs) so that students will acquire following competency needed by the industry:

- **Implement the Capstone Project Plan to solve the identified problem/task faced by industry/user related to the concerned occupation by integrating the various types of skills acquired during the programme.**

3. COURSE OUTCOMES (COs)

Depending upon the nature of the projects undertaken, the following could be some of the major course outcomes that could be attained, although, in case of some projects few of the following course outcomes may not be applicable.

a) Implement the planned activity individually and/or as team.
b) Select, collect and use required information/knowledge to solve the identified problem.
c) Take appropriate decisions based on collected and analysed information.
d) Ensure quality in product.
e) Incorporate energy and environment conservation principles.
f) Consider the ethical issues related to the project (if there are any).
g) Assess the impact of the project on society (if there is any).
h) Communicate effectively and confidently as a member and leader of team.

i) Prepare project report after performing due plagiarism check using appropriate tools.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	4	4	--	--	--	--	--	--	--	50#	20	50~	20	100	40	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment

5. Course details

As the implementation of the Capstone project progresses and which has to be submitted at the end of project work, one of the outputs of this course is a detailed ***Project Report*** that is continuously prepared by the student. There will also be regular progressive assessment by the teacher as per the criteria no 7 on the basis of rubrics mentioned in **Appendix –C** and in the formats as shown in **Appendix-B** and also for the end-of-semester examination.

5.1 Guidelines for Capstone Project–Execution and Report Writing

a) The students would like to revise the 'Capstone Project – Plan' based on the feedback received in the fifth semester examination.

b) This revised 'Capstone Project – Plan' would be again approved by the project guide. As soon as the revised plan is approved by the teacher, the student will begin to work according to it and would also continue to maintain a dated ***'Project Diary'*** for the whole semester. This is a sort of a 'weekly diary' indicating all the activities conducted by the student every week in the semester to complete the project. This 'Project Diary' should be got signed by the teacher at regular intervals for progressive assessment. If this is maintained sincerely and truthfully by the student, it will be very helpful in compiling the ***Final Project Report*** at the end of the semester by him/her.

6. Project report

During the final Semester, the student will prepare a 'Project Report' in continuation with the activities conducted in fifth semester under Project Planning having following sub-titles:

Suggested contents of the Project report

- Title page (with name of team members and mentor teacher)
- Certificate (in the Format given in this document as annexure A)
- Acknowledgements (this may need revision at the end of the final semester)
- Abstract (in one paragraph not more than 150 words)
- Content Page

Chapters

1. Chapter–1 Introduction (background of the Industry or User based Problem/Task)
2. Chapter–2 Literature Survey (to finalise and define the Problem Statement)
3. Chapter–3 Scope of the project
4. Chapter–4 Methodology
5. Chapter-5 Details of designs, working and processes

6. Chapter-6 Results and Applications
7. Chapter-7 Conclusions And future scope
8. Appendix (if any)
9. References and Bibliography

Note:

i. The report should contain as many diagrams, figures and charts etc as relevant for the project.
ii. Originality of the report (written in own words) would be given more importance rather than quality of printing and use of glossy paper or multi-colour printing

7. ASSESSMENT OF PROJECT WORK

Project work has two components, first is Progressive Assessment (PA), while another is End Semester Examination (ESE).

7. 1. Progressive Assessment (PA) Guidelines and Criteria

Project guide is supposed to carry out this assessment. It is a continuous process, during which for developing desired qualities in the students, faculty should orally give **informal feedback** to students about their performance and interpersonal behaviour while guiding them on their project work every week. **F**ollowing criteria should be considered while assessing students informally or formally during different stages of the project work.

The following factors need consideration for both Capstone Project-Planning and Capstone Project-Execution and Report Writing.

a) Students should be assessed during the project work so that students can also get feedback for further improvement.
b) It should be kept in mind that project work is mainly experiential learning and it is not the research work, so emphasis should be on work based learning or learning from experience and development of attitudes and skills as mentioned in course outcomes. So focus of assessment should also be on learning from the process of completing project work rather than on novelty or innovation in the project work.
c) For progressive assessment at the end, students should be asked to give the power point presentation before group of teachers and junior students (so that junior students may also get awareness about the major project work they have to carry out in future)
d) The students would be awarded marks for their efforts (In some cases it may happen that due to some reasons such as unavailability of some material or component or some other resources, students may not be able to complete the project, but they have tried their best, in such cases students would be given appropriate marks if they have done enough efforts.)
e) The students would not be awarded marks if they have completed the project by getting done the work from market or some professionals (taking some help and guidance is different as compared to getting the work or maximum part of the work completed from others on payment basis).
f) Originality of the report (written in own words) would be given more importance.
g) The Project Guide will assure the quality of project done by his group.

Criteria of Marks for PA for Capstone Project -Execution and Report Writing.

S. No.	Criteria	Marks
1	**Project Proposal /Identification**	10
2	**Punctuality and overall contribution**	
3	**Project Diary**	
4	**Execution of Plan during sixth semester**	20
5	**Project Report including documentation**	15
6	**Presentation**	05
	Total	**50**

7.2 END SEMESTER EXAMINATION (ESE)

Evaluation shall be carried out according to following criteria. For each project, students from the concerned group should be asked to make presentation of their project , in front of the external and internal examiners which should be followed by question answer session to ascertain the contribution made by each student.

Criteria of Marks for ESE for Capstone Project -Execution and Report Writing

S. No.	Criteria	Marks
1	Project Proposal	05
2	Punctuality and overall contribution	
3	Project diary	
4	Execution of Plan during sixth semester	10
5	Project Report including documentation	10
6	Presentation	10
7	Question and Answer	15
	Total	**50**

8. SPECIAL TEACHING STRETAGIES (If any)

a) Teacher's should not spoon feed the students and let them try on their own at different stages of the project work and even first let them strive hard and only when efforts of students have failed, then teacher should guide them. Guidance should be in initially in the form of clues or hints rather than complete explanation, detailed explanation should be given only when students are not able to work based on clues/hints. The role of teacher should be limited to guide and facilitator

b) Teachers should help students in selecting a topic which is relevant and challenging (but within capacity) for students according to their abilities.

c) ***Teachers should come out of the mindset that there should be compulsorily some innovation and novelty in the project work. Because as discussed earlier, project is mainly opportunity for work based or experiential learning, the aim of which is to develop higher order cognitive skills and attitudes. Project at diploma level is not research or innovation.*** The main thing teachers have to ensure is that students choose a task or problem for their project work which is challenging but according to their capability i.e. a task which they can complete on their own without getting it done from market.

d) Teachers should ensure that students prepare the project plan in as much detail as possible, since this way only they would learn the importance of planning and how to do the detail planning. Teachers should allow students to proceed ahead only when they have detailed plan with them.

e) Teachers should motivate students to maintain project document project diary and project report. They should explain benefits of these activities to students and also train them in these activities, because most of them may be doing this first time.

f) Project Guide should ensure that students submit chapter of report one by one to him/her as per schedule and should check the content of the chapters. The Project guide should monitor that schedule is maintained and report writing is not left till last few weeks. It should not be a problem since first three chapters of the report should have been written in fifth semester itself.

g) Teachers should also encourage students to openly discuss their weaknesses and shortcomings .Teachers should develop confidence in students that admitting mistakes and weaknesses helps in improving them.

h) Teachers should continuously discuss with students about working of group and progress in the project and from this discussion should identify their personal qualities (both strengths and weaknesses) and suggest to them ways for improving those qualities.

i) Internal as well as external examiners should reward students for original work and efforts of students even if they are not fully successful or not able to complete the project in comparison to those students who have taken paid help from others to complete their project.

Appendix–A

CERTIFICATE

This is to certify that Mr./Ms.....

from .....Institute having Enrolment No: .....

has completed project of final year having title .....,.... during the academic year20__-20__. The project completed by individually/ in a group consisting of..... persons under the guidance of the Faculty Guide.

.....

.....

Name & Signature of Guide: .....

Telephone:.....

Appendix–B

PROGRESSIVE ASSESSMENT (PA) OF CAPSTONE PROJECT – EXECUTION AND REPORT WRITING

Evaluation Sheet for Internal Assessment

Name of Student: .....

Name of Programme..... **Semester: Sixth**

Course Title: Capstone Project : Execution and Report Writing **Code:22060.**

Title of the Capstone Project: .....

.....

A. **POs addressed by the Capstone Project** (Mention only those predominant POs)

a) .....
b) .....
c) .....
d) .....

B. **COs addressed by the Capstone Project** (Mention only those predominant POs)

a) .....
b) .....
c) .....
d) .....

C. **OTHER LEARNING OUTCOMES ACHIEVED THROUGH THIS PROJECT**

1. **Unit Outcomes (Cognitive Domain)**
   a) .....
   b) .....
   c) .....
   d) .....

2. **Practical Outcomes (in Psychomotor Domain)**
   a) .....
   b) .....
   c) .....
   d) .....

3. **Affective Domain Outcomes**
   a) .....
   b) .....
   c) .....
   d) .....

PROGRESSIVE ASSESSMENT (PA) Sheet		
S. No.	**Criteria**	**Marks**
1	Project Proposal /Identification	10
2	Punctuality and overall contribution	
3	Project Diary	
4	Execution of Plan during sixth semester	20
5	Project Report including documentation	15
6	Presentation	05
Total		**50**

Appendix–B

Suggested Rubric for Capstone Project – Execution and Report Writing

S. No.	Characteristic to be assessed	Poor	Average	Good	Excellent
1	**Problem/Task Identification (Project Title)**	Relate to very few POs Scope of Problem not clear at all	i. Related to some POs ii. Scope of Problem/Task vague	i. Take care of at-least Three POs ii. Scope of Problem/task not very specific	• Take care of more than three POs ii. Scope of problem/task very clear
2	**Literature Survey /Industrial Survey**	Not more than ten sources (primary and secondary), very old reference	At-least 10 relevant sources, at least 5 latest	At –least 15 relevant sources, most latest	About 20 relevant sources, most latest
3	**Project proposal**	Methods are not appropriate, All steps not mentioned, Design of prototype not started (if applicable).	Appropriate plan but not in much detail. Plan B for critical activities not mentioned. Time line is not developed. Design of Prototype is not complete. (if applicable)	Appropriate and detailed plan with Plan B for critical activities mentioned, but clarity is not there in methods, time line is given but not appropriate. Design of prototype is not detailed (if applicable)	Appropriate and detailed plan with Plan B for critical activities mentioned, clarity in methods with time line, Detailed design of prototype (if applicable)
4	**Project Diary**	Entries for most weeks are missing. There is no proper sequence and details are not correct.	Entries for some weeks are missing, details are not appropriate, not signed regularly by the guide.	Entries were made every week but are not in detail. Signed and approved by guide every week	Entries were made every week in detail, signed and approved by guide every week
5	**Final Report Preparation**	Very short, poor quality sketches, Details about methods, material, precaution and conclusions	Detailed, correct and clear description of methods, materials, precautions and	Conclusions. Sufficient Graphic Description.	Very detailed, correct, clear description of methods, materials, precautions and conclusions. Enough tables,

S. No.	Characteristic to be assessed	Poor	Average	Good	Excellent
		omitted, some details are wrong			charts and sketches
6	**Presentation**	Major information is not included, information is not well organized .	Includes major information but not well organized and not presented well	Includes major information and well organized but not presented well	Well organized, includes major information ,well presented
7	**Defense**	Could not reply to considerable number of question.	Replied to considerable number of questions but not very properly	Replied properly to considerable number of question.	Replied to most of the questions properly

Appendix C
Suggestive Project Diary format

Week no:
Activities planned:
Activities Executed:
Reason for delay if any
Corrective measures adopted
Remark and Signature of the Guide