GOVERNMENT ARTS COLLEGE (AUTONOMOUS)

SALEM-7

Reaccredited with B Grade by NAAC
(Affiliated to Periyar University)

Bachelor Computer Applications

Regulations and Syllabus

Ratification on 06.03.2023

(Inclusion of Naan Mudhalvan Course in Ist ,IVTh ,Sem VI TH SEMESTER)
Language Proficiency for Employability

Digital Skills for Employability &

Emerging Technology for the Work Place – I

(Effective from the Academic Year 2022-2023)

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

REACCREDITED WITH B BY NAAC

UNDER GRADUATE PROGRAMME
REGULATIONS AND SYLLABUS
(Effective from the Academic Year: 2022-23 onwards)

1. CONDITIONS FOR ADMISSION

A candidate who has passed Higher Secondary Examination, (Academic Stream) conducted by Department of School Education, Tamil Nadu or an examination accepted as equivalent to 10+2 courses including CBSE, that are recognized by Periyar University, are eligible for admission to Under Graduate(UG) Programmes.

The candidates requesting admission shall have passed the qualifying examination with the mandatory subjects as prescribed in the latest guidelines issued by the Government of Tamil Nadu through the Directorate of Collegiate Education, Chennai - 6, may be followed.

2. ATTENDANCE REQUIREMENT

The attendance shall be calculated on the basis of 90 days / 540 instructional hours per semester. Attendance for **theory and practical classes are calculated separately**. For practical examinations the attendance for practical shall be calculated on the basis of 180 days / 1080 instructional hours per year combining the odd and even semesters.

Attendance Percentage 75 & Above

Candidates are mandatorily required to have 75% or above in attendance to apply and appear for their semester theory examinations without condonation of attendance.

Attendance Percentage 65 to 74

A candidate whose attendance is within 65% to 74%, has to pay condonation fees separately for theory and practical examinations as Rs 800 + 800 = Rs 1600. Condonation fees are separate for theory and practical examinations and are NOT to be combined as a single fee of Rs. 800.

The candidate will be allowed to appear for both theory and practical examinations under the condition that the condonation fees have been paid for both theory and practical examinations. A candidate who is absent for the theory/practical examinations after paying the condonation fees has to repay the condonation fees for appearing in the next or subsequent semester/year.

Attendance Percentage Below 64

Candidates with attendance percentage for theory courses **below 65%** in a semester are **NOT allowed** to appear for the theory semester examinations and mandatorily have to redo or repeat the particular semester in which they lack the necessary attendance in the subsequent odd/even semester to continue the study**.**

Candidates whose attendance percentage for the practical below 65% are NOT allowed to appear for the practical examinations and mandatorily have to redo or repeat the particular practical(s) in which they lack the necessary attendance. Redo or repeat candidates have to apply through proper channel to the Principal and COE for permission to redo their lapsed semester. A candidate who is absent for the practical examinations after paying the condonation fees has to repay the condonation fees for appearing in the next even or subsequent semester.

3. EXAMINATION

The Theory Examinations shall be of three hours duration conducted at the end of each semester. **The maximum mark for each theory course is 100**. The candidate failing to get the minimum marks required for passing in any course shall be permitted to appear for each failed subject(s) in the subsequent semesters. The Practical Examinations shall be conducted at the end of each semester with the duration of three hours.

4. PASSING MINIMUM

The breakup of marks shall be:

Theory	Continuous Internal Assessment(CIA)				Semester Examination(SE)
	Attendance	Assignment	Test	Total	
	5	10	10	25 (No Passing minimum)	75(Passing minimum-30 in SE)
Practical	Continuous Internal Assessment(CIA)				Semester Practical Examination(SE)
	Attendance	Observation	Test	Total	
	10	15	15	40 (No Passing Minimum)	60(Passing minimum-24)

5. CONTINUOUS INTERNAL ASSESSMENT (CIA)

Attendance Component

Attendance Marks for theory courses is given as follows:

Attendance percentage	Marks
90 to 100	5
80 to 89	4
70 to 79	3
60 to 69	2
50 to 59	1

Attendance Marks for Practical courses is given as follows:

Attendance percentage	Marks
95 to 100	10
90 to 94	9
85 to 89	8
80 to 84	7
75 to 79	6
74 to 70	5
65 to 69	4
60 to 64	3
60 to 64	2
55 to 59	1

Assignment Component

The three assignments (Maximum 5 marks for each) have to be submitted for each theory course. The marks of best two assignments shall be added and awarded for the assignment component in CIA.

Test Component

Maximum marks for theory courses in test component are 10. The average marks of CIA test 1(Out of 5) and CIA test2(Out of 5) shall be added with Model test mark(Out of 5) and awarded to test component for each theory course.

Maximum marks for practical courses in test component are 15. The average marks of CIA test 1(Out of 5) and CIA test2(Out of 5) shall be added with Model test mark(Out of 10) and awarded to test component for each practical course.

Observation and Record

The observation note book maintained properly shall be awarded 15 marks maximum. The marks for record note shall be 10 and included in semester practical examination. Submission of practical record notebooks with proper bona fide certificate duly signed by the Staff in charge prior to the Main practical examination is mandatory for the award for record notebook marks. Candidates who do not submit their record notebooks on time will be awarded zero (0) marks.

Revaluation

Revaluation of Theory courses, Re-totaling of marks, supplementary and instant examination, and transparency of Theory courses are **allowed** as per Government Arts College (Autonomous), Salem-7 Examination Guidelines. Candidates need to apply to the Controller the Examinations, through the Principal with proper endorsement and recommendation by
the Head of the department concerned.

Revaluation of Practical courses, Re-totaling of marks, supplementary and instant examination, and transparency of Practical courses are **NOT allowed** as per Government Arts College (Autonomous), Salem-7 Examination Guidelines. **The candidate has to apply and re-appear for the practical examination at subsequent semesters.**

6. CLASSIFICATION OF SUCCESSFUL CANDIDATE

The performance of the student is indicated by the Grades, the corresponding Grade Point (GP), Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). A student is deemed to have completed a course successfully and earned the appropriate credit, only if the **candidate has earned a grade of C and above**. **RA denotes the candidate should Re-Appear for the examination.**

GP = (Marks obtained in a course x Credit) / 10
GPA =Total Grade points earned in a semester/Total Credits registered in a semester
CGPA= Sum of Grade Points earned / Sum of Credits registered

Classification of Cumulative Grade Point Average (CGPA)

Grade	Cumulative Grade Points Average (CGPA)	Grade Description	Class Obtained	Range of Marks
O	9.0-10	**Outstanding**	**I CLASS-DISTINCTION**	90-100
E	8.0-8.9	**Excellent**		80-89
D	7.5-7.9	**Distinction**		75-79
A+	7.0-7.4	**Very Good**	**I CLASS**	70-74
A	6.0-6.9	**Good**		60-69
B	5.0-5.9	**Satisfactory**	**II CLASS**	50-59
C	4.0-4.9	**Average**		40-49
RA	0.0-3.9	**Re-Appear**	-	0-39
ABSENT	0.0	**ABSENT**	-	ABSENT

7. QUESTION PATTERN

The question pattern for theory courses shall be as follows:

Duration of examination: 3 Hours **Maximum Marks: 75**

Part A: 15x 1 = 15 Marks

15 Objective Type Questions
(Answer all the questions)

(Three questions from each unit)

Part B: 2 x 5 = 10 Marks

5 Questions (Answer any Two questions)
(One question from each unit)

Part C: 5 x 10 =50 Marks
5 Questions (Answer all the questions)
(One question will be set from each unit with internal choice)

The question pattern for practical courses shall be as follows:

Duration of examination: 3 Hours **Maximum Marks: 60**

No. of questions = 2 (without internal choice)

No. of experiments 2 x 25 = 50 Marks

Record = 10 Marks

Total Marks = 60 Marks

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8. RANKING

Candidates who have passed all the examinations prescribed for the course **in the first appearance only are eligible for ranking**. A candidate who is **absent** for one or more courses in a semester examination and who later appears for the same course or courses in the subsequent semester examination **is NOT eligible for ranking** even though he/she has completed the course within three academic years / six semesters from his/her year of admission.

9. COMMENCEMENT OF THIS REGULATION

This regulation shall take effect from the academic year **2022-2023**. The students admitted to the first year of the UG programme from **2022-2023** and thereafter shall follow these regulations.

10. TRANSITORY PROVISION

The duration for completion of a UG programme in any subject is six semesters. The maximum period for completion is twelve Semesters.

Thereafter they will be permitted to appear for examination only under the syllabus and regulations then in force. It is mandatory for the candidate to inform the Controller of Examinations and Principal and get written permission from them to appear for their arrear courses after the transitory provision has lapsed in their case.

11. ACADEMIC COUNCIL RATIFICATION AND APPROVAL

These guidelines and regulations will be effective from the academic year 2021-2022. Any changes to these guidelines and regulation will be subject to the ratification and written approval

of the Academic Council. Any subsequent changes may be done by the BOS after written permission / communication from the Academic Council. The changes are to be put up with justification for ratification and written approval of the Academic Council.

I VISION OF THE DEPARTMENT

To promote innovation centric education with cutting edge technologies to cope up with current state of art and industrial standard, to develop human resources with sound technical knowledge in Computer Applications and to produce high level intellectuals, and entrepreneurial leaders to the society with professional attitude, human values and social ethics.

II MISSION OF THE DEPARTMENT

- To provide an innovation centric curriculum and syllabus with latest cutting technologies that motivates student's self-learning, entrepreneurial skills, leadership quality, career development and placement oriented training.
- To develop infrastructure and to enhance state of art equipment to provide an intellectually inspiring environment for teaching-learning, knowledge sharing, creativity and excellence in technical education and research
- To identify student's innovation, talent, and extraordinary skill, to train them continuously to expose their fullest potential by launching various students clubs and to encourage/appreciate them to outreach the world.
- To inculcate ethical practices, professionalism, social committed attitude, human values and environmental values among students.
- To facilitate academia – industrial collaboration by enhancing alumni association and parent teachers association and to promote student's employability.

III PROGRAMME SPECIFIC OUTCOMES

PSO1: Develop proficiency in problem solving and logical thinking skill.

PSO2: To impart the knowledge of programming languages, web designing, networking and Software development cycle.

PSO3: Enrich the communicative ability to present orally throughout all the stages of Software development process.

PSO4: Learn latest development and technologies in IT and Communications system.

PSO5: Implementation of professional engineering solutions for the betterment of society keeping the environmental context in mind, be aware of professional ethics and be able to communicate effectively.

IV PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: To impart advance knowledge about various sub-domains related to the field of computer applications.

PEO2: To provide the strong character to uphold the spiritual and cultural values of our country to make students acceptable to both industries and higher education.

PEO3: Graduates will be capable of attaining higher position in their professional carrier, capable to do quality research by strengthening their mathematical, scientific and basic engineering fundamentals.

PEO4: Graduate will be capable of adopting the changing technologies, tools, and industrial environment.

PEO5: Graduates will promote collaborative learning and spirit of team work through multidisciplinary projects and diverse professional activities.

V PROGRAMME OUTCOMES

PO1	Capable to apply the knowledge of mathematics, algorithmic principles and computing fundamentals in the modeling and design of computer based systems of varying complexity
PO2	Ability to critically analyze, categorizes, formulate and solve the problems that emerges in the field of computer science.
PO3	Able to provide software solutions for complex scientific and business related problems or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.
PO4	Understand the impact of software solutions in environmental and societal context and strive for sustainable development.
PO5	Use contemporary techniques, skills and tools necessary for integrated solutions.
PO6	Function effectively with social, cultural and ethical responsibility as an individual or as a team member with positive attitude.
PO7	Function effectively as member or leader on multidisciplinary teams to accomplish a common objective.
PO8	An ability to communicate effectively with diverse types of audience and also able to prepare and present technical documents to different

	groups.
PO9	Graduates will recognize the need for self-motivation to engage in lifelong learning to be in par with changing technology.
PO10	Enhance the research culture and uphold the scientific integrity and objectivity.

Curriculum for BCA Degree Programme
(For the Candidates admitted from the Academic year 2022-2023
Course Structure under CBCS

S. No	Part	Course code	Course Name	Hours	Credits	Marks		Max
						IA	SE	
SEMESTER – I								
1	I	22FTL01	Language – I:Tamil	5	3	25	75	100
2	II	22FEL01	Communicative English – I	5	3	25	75	100
3	III	22UCA01	Core Course I:Foundations of Computer Applications	5	4	25	75	100
4	III	22UCAP1	Core Practical – I: Office Automation Lab	3	3	40	60	100
5	III	22AMT01	Allied – I Paper – I: Mathematics – I	5	4	25	75	100
6	III	22AMTP1	Allied-I Practical-I: Mathematics(Extended to II Semester)	3	-	-	-	-
7	IV	22AECC1	AECC –I: Value Based Education	2	2	25	75	100
8	IV	22UPE01	Professional English-I	2	2	50	-	50
TOTAL				**30**	**21**			**650**
SEMESTER – II								
1	I	22FTL02	Language –II : Tamil	5	3	25	75	100
2	II	22FEL02	Communicative English-II	5	3	25	75	100
3	III	22UCA02	Core Course II : Programming in C	5	4	25	75	100
4	III	22UCAP2	Core Practical II : C Programming Lab	3	3	40	60	100
5	III	22AMTP1	Allied – Practical I: Mathematics – (Extended from II Semester)	3	3	40	60	100
6	III	22AMT02	Allied – I Paper –II: Mathematics – II	5	4	25	75	100
7	IV	22AECC2	AECC-II: Environmental Studies	2	2	25	75	100
8	IV	22UPE02	Language Proficiency for Employability	2	2	50	-	50
TOTAL				**30**	**24**	**--**	**--**	**750**
CUM-TOTAL					**45**			**1400**

SEMESTER – III								
1	I	22FTL03	Language – III:Tamil	5	3	25	75	100
2	**III**	22UCA03	Core Course III : Data and File Structures	5	4	25	75	100
3	**III**	22UCA04	Core Course IV : Computer Architecture	5	4	25	75	100
4	**III**	22UCAP3	Core Practical III: Data Structures using C	3	3	40	60	100
5	**III**	22AST01	Allied – II- Course I: Mathematical Statistics – I	5	4	25	75	100
6	**III**	22ASTP1	Allied – II Practical(Extended to IV Semester)	3	-	-	-	-
7	**IV**	22UCAS1	Skill Enhancement Course I: Practical – Image Editing Tools Lab	2	2	40	60	100
8	**IV**	22CAUN1	Non-Major Elective Course I:Principles of Internet	2	2	25	75	100
9	**V**	**22EXAT1**	**Extension(Community Service)* : National Cadet Corps**	**2(Self Study)**	**2**		**100**	**100**
		22EXAT2	**Extension(Community Service)* : National Social Service**					
		22EXAT3	**Extension(Community Awareness)* : Indian Heritage and Culture**					
		22EXAT4	**Extension(Community Awareness)* : Public Health and Personal Hygiene**					
TOTAL				**30**	**24**			**800**
CUM-TOTAL					**69**			**2200**
SEMESTER – IV								
1	I	22FTL04	Language –IV : Tamil	5	3	25	75	100
2	**III**	22UCA05	Core Course V : VB.NET Programming	5	4	25	75	100
3	**III**	22UCA06	Core Course VI : Relational Database Management Systems	5	5	25	75	100
4	**III**	22AST02	Allied – II-Course-II: Mathematica Statistics – II	5	4	25	75	100
5	**III**	22ASTP1	Allied – II Practical(Extended From III Semester)	3	3	40	60	100
6	**III**	22UCAP4	Core Practical IV: Visual Basic.Net & RDBMS Lab	3	3	40	60	100
7	**IV**	22NMNDS	Digital Skills for Employability	2	2	25	75	100
8	**IV**	22UCAN2	Non-Major Elective Course - II :Internet of Things(IoT)	2	2	25	75	100
9	**IV**	**22AEEC1**	**Ability Enhancement Elective Course I : Gandhian Thoughts**	**2(Self Study)**	**2**		**100**	**100**
		22AEEC2	**Ability Enhancement Elective Course I : Human Rights**					

		22AEEC3	**Ability Enhancement Elective Course I : Business Startup Fundamentals**					
		22AEEC4	**Ability Enhancement Elective Course I : Professional Ethics & Cyber Netiquette**					
TOTAL				**30**	**28**			**900**
CUM-TOTAL					**96**			**3100**
SEMESTER – V								
1	**III**	22UCA07	Core Course VII : Operating Systems	5	5	25	75	100
2	**III**	22UCA08	Core Course VIII : Computer Networks	5	5	25	75	100
3	**III**	22UCA09	Core Course IX: Core Java Programming	5	5	25	75	100
4	**III**	22UCAM1	Major Based Elective I : Client/Serv Technology	5	4	25	75	100
		22UCAM2	Major Based Elective II : Software Engineering					
5	**III**	22UCAM3	Major Based Elective III : Unix and Shell Programming	5	4	25	75	100
		22UCAM4	Major Based Elective IV :Data Minir and warehousing					
6	**III**	22UUCAP5	Core Practical V: Core Java Programming Lab	3	3	40	60	100
7	**IV**	22UCAS3	Skill Enhancement Course III : Web Programming Lab-I (HTML & JavaScript)	2	2	40	60	100
TOTAL				**30**	**28**			**700**
CUM-TOTAL					**124**			**3800**
SEMESTER – VI								
1	**III**	22UCA10	Core Course XVI: Open Source Software	5	5	25	75	100
2	**III**	22UCA11	Core Course XVII: Python Programming	5	5	25	75	100
3	**III**	22UCAM5	Major Based Elective V : Software Testing	6	4	25	75	100
		22UCAM6	Major Based Elective VI : Internet of Things(IoT)					
4	**III**	22UCAM7	Major Based Elective VII: BIG DATA ANALYTICS	6	4	25	75	100
		22UCAM8	Major Based Elective VIII: Mobile Computing					
5	**III**	22UCAPR	Project Work: Software Development Lab	3	4	40	60	100
6	**III**	22NMNET	Emerging Technology for the Workplace-I	2	2	25	75	100
7	**III**	22UCAP6	Practical – VI:Programming in	3	3	40	60	100

			Python					
TOTAL				**30**	**27**			**700**
CUM-TOTAL					**152**			**4500**

SEMESTER I

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA01	Core Course I:Foundations of Computer Applications	**5**	**-**	**-**	**4**

OBJECTIVE

On successful completion of this subject the students should have Knowledge on

- To understand the basic concepts of computer organization
- To familiarize with different number systems and digital arithmetic & logic gates.
- To impart the knowledge of I/O devices, secondary storage devices
- To understand the basic concepts of software, flowchart and programming language
- To understand the concepts of operating system, internet and multimedia.

SYLLABUS

UNIT-I **12 Hours**

Introduction - Characteristics of computers - Evolution of Computers - Classification of Computers - The Computer Generations - Basic Computer organization.

UNIT-II **12 Hours**

Number System: Non-Positional number system - Positional number system: Binary, Octal, Hexadecimal, Conversions. **Computer Codes:** BCD code-EBCDIC-ASCII. **Computer Arithmetic:** Binary-Binary arithmetic: Addition – Subtraction – Multiplication - Division. **Logic Gates:** AND, OR, NOT, NAND, NOT - Logic Circuits - Half Adder - Full Adder.

UNIT-III **12 Hours**

Input-Output devices: Input devices: Keyboard - point and draw devices - data scanning devices – digitizer - electronic card reader - voice recognition devices - vision I/P system. **Output Devices:** Monitors – Printers-Screen Image Projector - Voice Response System - primary storage - Secondary Storage devices – **Sequential and direct access devices:** Magnetic tape, Magnetic disk, Optical disk, Mass Storage devices.

UNIT-IV **12 Hours**

Computer Software: What is Software? - Relationship between Hardware and Software - Types of software - Planning the computer Program: What is an Algorithm? - **Flowcharts:** What is a Flowchart? – Uses - Symbols - Levels of flowcharts - Flowcharting Rules - Advantages and Disadvantages of flowcharts -. **Computer Languages:** Machine Language - Assembly Language - High level language – Compiler – Linker - Interpreter.

UNIT-V **12 Hours**

Operating Systems: What is an Operating System? - Functions of OS - Some Popular OS - **Application Software packages:** Word Processing package – Spreadsheet package - Graphic Package. **Internet:** Definition – Services - Uses of internet. **Multimedia:** What is Multimedia? - Multimedia Components - Multimedia Applications.

TEXT BOOKS

1. Pradeep K.SinhaPriti Sinha, "Computer Fundamentals", BPB Publications, Third Edition, 2003.

REFERENCE BOOKS

1. Alexis Leon, Mathew's Leon, "Fundamentals of Computer Science and Communication Engineering",Vikas Publishing House,New Delhi,1998.
2. MalavinoLeach , "Digital Principles & Applications", TMH,Edition.1991.
3. J.P.Hayes, "Computer Organization and Architecture", TMH, Second Edition , 1988.

WEB RESOURCES

1.https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_classification.htm

2.https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_number_system.htm

3.https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_types_of_os.htm

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remember the basic concepts of computers, logic gates, and number system	Remember

CO2	Understand basic structure of classification of computers and characteristics of computers	Understand
CO3	Learn the basic structure of number system methods like binary, octal and hexadecimal and understand the arithmetic and logical operations are performed by computers:	Apply
CO4	Apply the number conversion system	Apply
CO5	Apply the computer language fundamentals(Flow chart and algorithm)	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	S	M	M	L
CO2	S	M	S	M	M	S	M	M	M	L
CO3	S	S	S	M	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

S- Strong; M-Medium; L-Low

SEMESTER I

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAP1	Core Practical – I: Office Automation Lab	-	-	3	3

OBJECTIVE

To enable the students to understand the components of office automation.

- Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools.
- To familiarize the students in preparation of documents and presentations with office automation tools
- Understand and discuss about the use of Office Package in daily life.

MS-WORD

LIST OF LAB EXERCISES

1. **Bio data Preparation:**
   - Prepare a Bio-data with name, age, gender, date of birth, address with pincode, email id, mobile number, adhaar number.
   - Add a photograph
   - Add qualification details as a table
   - Add skill set with numbering and highlight the important one.
2. **Tables and Manipulation:**
   - Create an Application form for college admission
   - Create a table for entering student data
   - Insert and Delete Data, Columns and Rows
   - Create a mark sheet with text and table combination. Add photograph to the mark sheet.
   - Convert some table content to text and text to table in the mark sheet after mark sheet preparation.
3. **Mail Merge:**
   - Prepare an invitation to organize a technical symposium in your department.

- Invite your friends from other colleges to participate in the event.
- Prepare at least five letters. Import data from excel sheet.

MS-EXCEL

4. Data sorting-Ascending and Descending (both numbers and alphabets)

   Employee Pay Bill preparation.

5. Collect ticket reservation data from the user and print the Reserved Ticket.
6. Drawing Graphs for student performance class-wise for a department.

MS-POWERPOINT

7. Create 5 Slide presentation and do the following with different animation effects:
   - Inserting Pictures
   - Copying picture and text from previous slide
   - Slide with two column content
   - Slide with pictures and text
8. Create an animation with transition effects and other features.

MS-ACCESS

9. Create a table and sort the records as follows :
   - Ascending order of a field
   - Descending order of a field
   - Sort using more than one fields
   - Set necessary keys to avoid repeated information in Access.
10. Create the following for the database with more than one tables:
    - Two Reports and Two Queries

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Recognize and use the Office Package software	Remember

CO2	Understand the menus in Word, Excel and components of Power point	Understand
CO3	Identify and apply the menus in MS-Word	Apply
CO4	To prepare documentation, and accounting operations	Apply
CO5	To prepare presentation skills	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	S	M	M	L
CO2	S	M	S	M	M	S	M	M	M	L
CO3	S	S	M	M	S	M	S	M	M	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	M	M	M	M	S	M	S	S

S- Strong; M-Medium; L-Low

SEMESTER II

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA02	Core Course II : Programming in C	**5**	**-**	**-**	**4**

OBJECTIVE

The main objectives of this course are to:

- To impart knowledge about Computer fundamentals
- To understand the concepts and techniques in C Programming
- To equip and indulge themselves in problem solving using C

SYLLABUS

UNIT: I **12 Hours**

Overview of C: History of C – Basic structure of C programs – Executing a 'C' program - **Developing a C program:** Program design – Program coding – Common programming errors - Constants - Variables and Data types – **Operators and Expressions** :Arithmetic Operators, Unary Operators, Relational and Logical Operators, The Conditional Operator, Library Functions, Bitwise Operators, The Increment and Decrement Operators, The Size of Operator, Precedence of operators.

UNIT: II **12 Hours**

Decision making and Branching: Introduction – Simple if statement - if-else statement - nesting if - nesting of if-else statement, else-if ladder, Switch statement?: operator - go to statement. **Decision making and looping:** Introduction – While statement – Do statement – For statement – jumps in loops.

UNIT: III **12 Hours**

Arrays: Introduction – One dimensional Arrays – Two dimensional Arrays – Multi-dimensional Arrays – Dynamic Arrays. **Character Arrays and Strings:** Introduction – Declaring and initializing string variables – String handling functions- storage Classes and Visibility, Automatic or local variables, Global variables, Static variables, External variables.

UNIT: IV **12 Hours**

Functions, managing input and output operations: User-defined functions: Introduction – Elements of user-defined functions. Reading a character – Writing a character - Structures and Unions- Pointers -**The Pre-processor:** File Inclusion, Macro Definition and Substitution, Macros with Arguments, Nesting of Macros, Conditional Compilation

UNIT: V **12 Hours**

File management in C: Defining and opening a file – closing a file – I/O operations on files – Random access to files – Command line arguments. **The preprocessor:** Introduction – Macro substitution – File inclusion – compiler control directive.

TEXT BOOKS

1. E. Balagurusamy, **"Programming in ANSI C"**, McGraw Hill Education, New Delhi, 8th edition 2017.

REFERENCE BOOKS

1. R.Rajarama, P.Chitra, "Problem Solving using C", Scitech Publications, Chennai 2001.
2. Yeshvant P Kanitkar, **"Let us C",**BPB Publications, 10th edition, 2011.
3. S. Thamaraiselvi and R. Murugesh, **"C for All"**, Anuradha publications, Chennai 2011.
4. PVN. Varalakshmi, "**Projects using C"**, Scitech publications (India) pvt.Ltd., Chennai 2001.

WEB RESOURCES

1. Introduction to Programming in C – NPTEL
2. Problem solving through Programming in C – SWAYAM

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Enumerate the basic concepts of C programming	Remember

CO2	Learn about the Computer programming and the Problem solving	Understand
CO3	Describe the reason why different decision making and loop constructs area variable for iteration in C	Apply
CO4	Describe the reason why different decision making and loop constructs are available for iteration in C	Apply
CO5	Demonstrate the concept of User defined functions , Recursions , Scope and Lifetime of Variables, Structures and Unions	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	M	S	L
CO2	S	M	S	M	M	L	M	L	M	L
CO3	S	S	M	M	M	M	M	M	M	M
CO4	S	S	M	M	S	M	M	M	M	M
CO5	S	S	M	M	M	M	M	M	S	M

S- Strong; M-Medium; L-Low

SEMESTER II

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAP2	Core Practical II : C Programming Lab	-	-	3	3

OBJECTIVE

The main objectives of this course are to:

- To practice the Basic concepts, Branching and Looping Statements and Strings in C programming
- To implement and gain knowledge in Arrays, functions, Structures, Pointers and File handling

LIST OF LAB EXERCISES

1. Write a C program to find the sum, average, standard deviation for a given set of numbers.
2. Write a C program to generate n prime numbers.
3. Write a C program to generate Fibonacci series.
4. Write a C program to print magic square of order n where n > 3 and n is odd.
5. Write a C program to sort the given set of numbers in ascending order.
6. Write a C program to check whether the given string is a palindrome or not using pointers.
7. Write a C program to count the number of Vowels in the given sentence.
8. Write a C program to find the factorial of a given number using recursive function.
9. Write a C program to print the students Mark sheet assuming roll no, name, and marks in 5 subjects in a structure. Create an array of structures and print the mark sheet in the university pattern.
10. Write a function using pointers to add two matrices and to return the resultant matrix to the Calling function.
11. Write a C program which receives two filenames as arguments and check whether the file contents are same or not. If same delete the second file
12. Write a program which takes a file as command line argument and copy it to another file. At the end of the second file write the total i) no of chars ii) no. of words and iii) no. of lines.

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remember the logic used in counting the vowels in a sentence	Remember
CO2	Understand the logic for a given problem and to generate Primenumbers & Fibonacci Series **(Program-1,2,3)**	Understand
CO3	Apply the concepts to print the Magic square, Sorting the data. **(Program-4,5,6)**	Apply
CO4	Apply the concepts to print Strings, Recursivefunctions and Pointers **(Program-6,8,10)**	Apply
CO5	Apply and Analyze the concepts of Structures and File management **(Program-9,11,12)**	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	L	M	S	S	S	L
CO2	S	S	S	M	L	M	S	S	S	M
CO3	S	S	S	L	L	M	S	S	S	L
CO4	S	S	S	M	L	M	S	S	S	M
CO5	-	-	-	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

SEMESTER III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA03	Core Course III : Data and File Structures	5	-	-	4

OBJECTIVE

The main objectives of this course are to:

- To introduce the fundamental concept of data structures
- To emphasize the importance of data structures in developing and implementing efficientalgorithms.
- Understand the need for Data Structures when building application
- Ability to calculate and measure efficiency of code
- Improve programming logic skills.

SYLLABUS

UNIT - I **12 Hours**

Data Structures: Definition – Concept of Data Structure - Overview of Data structure – Arrays Definition – One Dimensional Array – Two Demission Array – Row major & Column major order – Pointer Arrays – **Linked Lists** : Definition – Single Linked List – Operation on a Single Linked List. **Double linked list:** operation on a Doubly links list – Sparse Matrix.

UNIT-II **12 Hours**

Stack: Definition-Representation of Stack – Operations of Stacks – Application of Stack - Evaluation of Arithmetic Expressions – INFIX to POSTFIX conversion –Tower of Hanoi Problem. **Queue**: Definition – Representation of Queue – Various Queue structures – Circular Queue – DE Queue – Priority Queue – Application of Queue –Round Robin Algorithm.

UNIT - III **12 Hours**

Trees: Basic Terminologies – Definition and Concepts – Binary Tree Representation – Operations on Binary Trees – Binary Tree Traversal – Types of Binary Tree - Conversion of Forest tree to Binary tree.

UNIT - IV **12 Hours**

Graphs : Definition & terminology representation of graphs – Graph Traversals- Depth First Search – Breadth First Search – Applications of Graph Structures – Shortest Path Problems : Dijkstra's Algorithm.

UNIT - V **12 Hours**

Sorting Techniques: Insertion – Selection-Bubble-Quick - Heap – Merge. **Searching Technique**: Linear Search – Binary Search - Comparison of Linear & Binary Search.

TEXT BOOKS

1. D. Samanta, "Classic Data Structures", PHI Learning, Second Edition, New Delhi, 2011.

REFERENCE BOOKS

1. Aprita Gopal, "Magnifying Data Structures", First Edition , PHI Learning, New Delhi 2010.
2. Horowitz, S. Sahni, and S. Rajasekaran, Computer Algorithms, Galgotia Pub. Pvt. Ltd., 1998.

WEB RESOURCES

1. https://nptel.ac.in/courses/106/102/106102064/
2. https://onlinecourses.swayam2.ac.in/cec19_cs04/preview

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the basic concepts of data structures	Remember
CO2	Construct and analyze of stack and queue operations with illustrations	Understand/Analyze
CO3	Enhance the knowledge of Linked List and dynamic storage management.	Understand /Apply

CO4	Demonstrate the concept of trees and its applications	Understand /Apply
CO5	Design and implement various sorting and searching algorithmsfor applications and understand the concept of file organizations	Apply/ Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	M	M	M
CO2	S	S	S	M	M	M	M	M	M	M
CO3	S	S	S	M	S	M	M	M	S	S
CO4	S	S	S	M	S	S	S	S	M	M
CO5	S	S	S	M	M	S	S	M	M	S

S- Strong; M-Medium; L-Low

SEMESTER III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA04	Core Course IV : Computer Architecture	5	-	-	4

OBJECTIVE

- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To understand different types of addressing modes and memory organization.
- To learn different algorithm used in the design of ALU.
- To learn different I/O organization mechanisms and modes of data transfer from I/O subsystem to CPU.
- Learn the different types of serial communication techniques.

SYLLABUS

UNIT - I **12 Hours**

Data Representation: Data Types – Complements - Fixed point and Floating point representation - other Binary Codes - Register transfer languages - Register Transfer - Bus and Memory transfer.

UNIT - II **12 Hours**

Arithmetic Unit: Introduction - Addition and subtraction of signed numbers – Multiplication Algorithms – Division Algorithms - Floating point numbers and operations - Decimal Arithmetic Unit - Decimal Arithmetic operations.

UNIT III **12 Hours**

Basic Processing Unit: Fundamental concepts – Instruction Format – Addressing Modes – Data transfer Manipulation – Program Control – CISC-RISC.

UNIT IV **12 Hours**

Memory System: Basic concepts – Semiconductor RAMs - ROMs – Speed - size and cost – Cache Memories - Performance consideration – Virtual memory - Memory Management Requirements – Secondary storage.

UNIT V **12 Hours**

I/O Organization: I/O Interface - Asynchronous Data Transfer - Priority Interrupts – Direct Memory Access - IOP - Serial communication.

TEXT BOOKS

1. M. Morris Mano, "Computer System Architecture", M. Morris Mano, Edition 3, Pearson Publications, 2011.

REFERENCE BOOKS

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer. Organization", McGraw-Hill, 2002.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.
3. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.
4. John P.Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

WEB RESOURCES

1.https://www.tutorialspoint.com/Computer-System-Architecture

2. https://nptel.ac.in/courses/106/105/106105163/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Identify, understand different number systems and codes.	Remember

CO2	Understand the architecture and functionality of central processing unit.	Understand
CO3	Learn the basic structure of number system methods like binary, octal and hexadecimal and understand the arithmetic and logical operations are performed by computers.	Apply
CO4	Demonstrate in a better way the I/O and memory organization.	Apply
CO5	Design and analyze algorithms for fixed-point and floating-point binary arithmetic.	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	M	M
CO2	S	S	S	M	M	M	M	M	M	M
CO3	S	S	S	M	S	M	M	M	S	S
CO4	S	S	S	M	S	S	S	S	M	M
CO5	S	S	S	M	M	S	S	M	M	S

S- Strong; M-Medium; L-Low

SEMESTER III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAP3	Core Practical III: Data Structures using C	-	-	3	3

OBJECTIVE

The main objectives of this course are to:

- To understand basics knowledge of data structure operations, algorithms and their application.
- To design and implement algorithms and data structure operations using C program.
- To learn various techniques for representation of the data in non linear fashion
- To learn advance concept of searching.
- To understand basics of file organization and graphs.

LIST OF LAB EXERCISES

1. To demonstrate the concept of one dimensional array finding the sum of array elements.

2. Write a C Program to find the maximum and minimum element in an array.

3. Design, develop and execute a program in C to implement doubly linked list where each node consist of integers. The program should support following functions.

a. Create a doubly linked list b. Insert a new node c. Delete a node if it is found, otherwise display appropriate message d. Display the nodes of doubly linked list

4. Write a C Program to perform Stack operations using Array.

5. Write a C Program to perform Queue operations using Arrays.

6. Write a C program for implementation of circular queue using array

7. Design, develop and execute a program in C to evaluate a valid postfix expression using stack.

9.Write a C program to implementation of binary search tree using linked list.

10.Write a C Program to implement dijkstra's algorithm

10. Write a C Program to perform linear search and binary searching using array.

11. Write a C Program arrange the list of numbers in ascending order using a)Merge Sort b)Quick Sort

12.Write a C Program to arrange the given list using Insertion sort using function.

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand basics knowledge of data structure operations like finding sum ,max min array data structures	Remember
CO2	Illustrate and model of Linked Lists	Understand
CO3	Identify the concepts of Stack and Queue using Arrays	Apply
CO4	Discover the usage of Trees and Graphs	Apply
CO5	Explain the usage of sorting, searching	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	M	M	M	L
CO2	S	S	S	S	S	S	S	M	M	M
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	M	M	S

*S-Strong; M-Medium; L-Low

SEMESTER III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAS1	Skill Enhancement Course I: Practical – Image Editing Tools Lab	-	-	2	2

OBJECTIVE

- To teach the students about image editing operations.
- To make the students to learn Photoshop software
- To provide training to students on image editing operations
- To train the students to perform text effect operations.
- To help the students to get the practical skill on the area of design.

LIST OF LAB EXERCISES

1. Create a Text with Text effects.
2. Create a Passport Size Photo.
3. Create a Birthday Greeting Card and use Marquee tool for moving the text.
4. Import a image and apply Blending, Blurring options.
5. Create a Seminar Invitation.
6. Create a Seminar Certificate.
7. Create a text with Fire Effect.
8. Import an Image and Display the image using Glass Display.
9. Import a Plant Image and impose Water drop effect.
10. Create a Text, Image and use i. Reflection Effect ii. Rainbow.

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Identify the area of photo design	Remember
CO2	Understand image cropping Operations	Understand
CO3	Acquire the knowledge on photo editing Perform Procedures as per Laboratory Standards in the area of image cropping Operations	Apply
CO4	Design a Passport photo	Create
CO5	Perform Procedures as per Laboratory Standards in the area of design	Apply/Design

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	M	M	M	L
CO2	S	S	S	S	S	S	S	M	M	M
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	M	M	S

*S-Strong; M-Medium; L-Low

SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA05	Core Course V : VB.NET Programming	5		-	4

OBJECTIVE

- To understand .Net Framework fundamentals and basic concepts
- To learn to use Basic Windows Controls Using VB.Net
- To know how to establish database connectivity using ADO.Net
- To explore the latest technique such as Web Services

SYLLABUS

Unit – I: **12 Hours**

Visual Basic.Net and .NET Framework: Introduction to .net framework – Features, Common Language Runtime(CLR), Framework Class Library(FCL). Visual Studio.Net – IDE, Languages Supported Components. Visual Programming, VB.Net Features, IDE – Menu System, Toolbars, Code Designer, Solution Explorer, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window.

Unit – II: **12 Hours**

Elements of VB.Net: Properties, Events and Methods of Form, Label, Text Box, List Box, Combo Box, Radio Button, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, HScrollBar, VScrollBar, Group Box, Tooltip, Timer.

Unit – III: **12 Hours**

Programming in VB.Net: Data Types, Keywords, Declaring Variables and Constants, Operators. Conditional Statements: If-Then, If-then-else, Nested if, Select Case. Looping Statement: Do-loop, For-loop, While-loop. Arrays-Static and Dynamic.

Unit – IV: **12 Hours**

Functions, Built-In Dialog Boxes, Menus and Toolbar: Menus and toolbars-Menu Strip, Tool Strip, Status Strip. Built-In Dialog Boxes-Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, Input Box, Msg Box, Interfacing with End user, Creating Parent and Child. Functions and Procedures-Built-In Functions-Mathematical and String Functions, User Defined Functions and Procedures.

Unit-V: **12 Hours**

Database Connectivity: Introduction- Advantages of ADO.NET- Managed Data Providers- Developing a simple ADO.NET Based Application- Creation of a Data Table- Retrieving Data from Tables- table Updating and Disconnecting Data Access through Dataset Object.

TEXT BOOKS

1) Steven Holzner, "Visual Basic.Net Black Book", Dream TechPress, 2013

2) The Complete Reference Visual Basic.Net jefferR.ShapiroTaat McGraw Hills

REFERENCE BOOKS

1. Murach's Beginning VB.Net by Anne Bohem

2. "Thearon Willis, Jonathan Crossland, Richars Blair, Beginning VB .NET 2003, Wiley Dreamtech publishers – 2004 edition.

3.C. Muthu,"VISUAL BASIC .NET" McGraw-Hill Educations.

WEB RESOURCES

1.https://www.tutorialspoint.com/vb.net/index.htm

2. https://www.javatpoint.com/vb-net

3. https://docs.microsoft.com/en-us/dotnet/visual-basic/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB

CO1	Understand the basics of .NET framework and the object oriented programming.	Remember
CO2	Understand the procedures, Database connectivity	Understand
CO3	Understand and remember the components in VB.NET IDE, ADO.NET and also the window forms	Understand
CO4	To develop a project in .Net for a real-time and live application	Apply
CO5	Perform Procedures as per Laboratory Standards in the area of design	Apply/Design

MAPPING WITH PROGRAM OUTCOMES

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	M	M	M	L
CO2	S	S	S	S	S	S	S	M	M	M
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	M	M	S

*S-Strong; M-Medium; L-Low

SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA06	Core Course VI : Relational Database Management Systems	5	-	-	5

OBJECTIVE

- To understand the fundamentals of data models.
- Explain the database system using ER diagram.
- Study the SQL and relational database design.
- To make the students to understand relational database design.
- To know the features and syntax of PL/SQL.
- To understand the concepts of Database Triggers in PL/SQL.

SYLLABUS

UNIT-I: **12 Hours**

Introduction: Database system Applications – Purpose of Database systems – View of Data – Data Models – Database Languages – Database Users and Administrators – Transaction Management – Database Architecture. **Relational Model:** Structure of Relations Databases – Keys – Relational Operations.

UNIT-II: **12 Hours**

E-R Model: The E-R Model – Constraints – Removing Redundant Attributes– E-R Diagram – Weak Entity Set. **SQL:** Overview of SQL – SQL Data Definition **–** Basic Structure – Set Operations – Null Values – Aggregate Functions – Views.

UNIT- III: **12 Hours**

Relational Database Design: Normalization **–** First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Fourth Normal Form.

UNIT- IV: **12 Hours**

PL/SQL: Introduction to PL/SQL– PL/SQL. **Essentials:** Block Structure – Data types – Operators – Attributes – PL/SQL Expressions – PL/SQL Built-in Functions.

UNIT V: **12 Hours**

Cursors and Triggers: PL/SQL Control Structure – Implementing SQL Operations in PL/SQL – Cursors in PL/SQL – Working with Database Triggers in PL/SQL.

TEXT BOOKS

1. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, "Database System Concepts ", McGraw- Hill Education, Edition, 6TH Edition-2011.(Unit – I, II, III)
2. "Oracle PL/SQL Programming in Simple steps", Kongent Solutions Inc, dreamtech press Pvt. Ltd, 2008.(Unit – IV, V)

REFERENCE BOOKS

1. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, PHI, 2005.
2. Alexis Leon, Mathews Leon, "Essentials of Database Managements Systems", Vijay Nicole imprints PVT LTD, 2006.

WEB RESOURCES

1. https://nptel.ac.in/courses/106/105/106105175
2. https://ntpel.ac.in/courses/106/106/106106095
3. https://www.javapoint/com/dbms-sql-command
4. https://www.geeksforgeeks.org/plsql-introduction/
5. https://www.tutorialspoint.com/dbms/dbms_concurrency_control.htm

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the basic concepts of the database and data models	Remember
CO2	Understand the basic features of PL/SQL triggers.	Understand
CO3	Design a database using ER diagrams and map ER into Relations.	Apply

CO4	Develop a simple database applications using normalization.	Apply
CO5	Attain a good practical skill of managing and retrieving of data usingData Manipulation Language (DML)	Apply/Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	M	M	L
CO2	S	S	S	M	S	M	M	M	M	L
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	S	S	M	S	S	M	L
CO5	S	S	S	S	S	M	S	S	M	L

S- Strong; M-Medium; L-Low

SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAP4	Core Practical IV: Visual Basic.Net & RDBMS Lab	-		3	3

OBJECTIVE

- Study the SQL and relational database design.
- To make the students to understand relational database design.
- To know the features and syntax of PL/SQL.
- To understand the concepts of Database Triggers in PL/SQL.
- To understand .Net Framework fundamentals and basic concepts
- To learn to use Basic Windows Controls Using VB.Net
- To know how to establish database connectivity using ADO.Net

LIST OF LAB EXERCISES

Visual Basic.Net Lab:

1. To create a Simple Image Slider program using vb.net.

2. Create a program for a various font application.

3. Develop a program for simple calculator Using Buttons.

4. Create the Employee Registration Form using the Text Box, Combo box, Radio Button in vb.net.

5. Develop a program for create and reading, writing text file using vb.net.

6. Design an application to create a login form and validate it using msgbox & timer control.

7. Design to Link one Form to another Form using vb.net.

8. Design color palette applications using scroll bars.

9. Design a simple Menu Strip using vb.net.

10. Develop an application to create student mark entry system with Database connectivity.

Oracle Lab

1. Simple Queries using DML Commands
2. Built-in Functions
3. Set operations
4. Nested Queries and Join Queries
5. Create a database Trigger Operation
6. PL/SQL program to find the total and average of 6 subjects and display the grade sheet

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the concepts of Visual Basic.Net	Remember
CO2	Learn the advantages of Controls in VB.Net	Understand
CO3	Design and develop the event- driven applications using Visual Basic.Net framework.	Apply
CO4	Apply the knowledge of database methods.	Apply/Analyze
CO5	Learn basics of PL/SQL and develop programs using Cursors, Exceptions,Procedures and Functions	Create

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	M	L	S	M	M	L
CO2	S	S	S	L	M	M	S	M	S	L
CO3	S	S	S	M	S	M	S	S	S	M
CO4	S	S	S	M	S	M	S	S	M	M
CO5	S	S	S	S	S	S	S	S	S	M

S- Strong; M-Medium; L-Low

SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22NMNDS	Digital Skills for Employability	-		2	2

Microsoft Philanthropies

Digital Training on Microsoft Office 365 Productivity Suite Offerings

InfiSpark

03. Microsoft Excel

Total Phases:	**2**	**Total Course Duration**	**24 Hours**	**Phase 01**	**12 hours 25 mins**	**Phase 02**	**12 hours**	**Delivery Model**	Self Learnin

Session No.	Module Name	Name	Subitems	Total Duration (Hours)	Course Time (mins)	Learning Days	Phase	Outcome	Assessment	MS Reference Materials
3.1	Microsoft Excel	Introduction to Excel	a. Starting up b. Recent documents and pinning documents c. Templates	5 hrs 20 mins	20 mins	Day 9	Phase 1	MS Excel is the most used tool for data entry and storing large numeric data in a tabular format.	Assessment 1	a. https://docs.microsoft.com/en-us/learn/certifications/mos-excel-2019/ b. https://docs.mi
3.2		Layout - Tabs, ribbons, and groups in Microsoft Excel	a. Rows b. Columns c. Cells and Ranges		20 mins		Phase 1	The Page Layout tab provides commands for the user which helps them in preparing the workbook.		

		Worksheets in Microsoft Excel	a. View and zooming b. Inputting Data c. Formatting Data d. Wrapping Text e. Insert Row/ Merge & Center cells f. Currency formatting g. Print view h. Sorting i. Format Painter j. Wrap Text k. Text orientation		90 mins	Day 10 - Day 13	Phase 1	Individuals can insert, store, update, and analyze data in worksheets.		crosoft.com/en-us/learn/certifications/exams/mo-200
3.4		Basic formulas in Microsoft Excel	a. Copy formula b. Formula Based Formatting c. Average, Sum, Subtraction, Multiplication, Division, Percentage		40 mins	Day 14	Phase 1	Individuals can calculate data and numbers with the library of formulas available.		
3.5		Freeze Pane	Freezing Rows		5 mins	Day 15	Phase 1	The function of Freeze pane is to lock rows and cloumns.	**Assessment 2**	
3.7		"Tell Me" in Microsoft Excel	How to use "Tell Me" to make your work a bit easier?		5 mins		Phase 1	Individuals can enter words and phrases of the function; they want to carry out next in the document with the help of Tell Me		
3.8		Inserting charts in Microsoft Excel	a. Charts from the data set in one dimension (x or y) or two-dimension (xy) b. Comparative analysis		40 mins	Day 16-Day 17	Phase 1	Charts in Microsoft Excel helps the user in presenting the data analysis with visualizations.	**Assessment 3**	
3.9		AutoFilling cells in Excel	a. Drag Fill b. Fill Command c. Recognizing a Pattern		10 mins	Day 18	Phase 1	Auto Fill feature helps the users to fill cells with data that follows a pattern or based on the data in the other cells.		
3.10		Add your own autofill	Add cell borders colors Fill Fonts Formatting		20 mins		Phase 1	Users can create customized AutoFill lists.		

3.12		Sorting data in Excel	Using filters in Microsoft Excel		10 mins	Day 19-Day 20	Phase 1	Users can sort information in the worksheet and rearrange the data to find values quickly.	**Assessment 4**	
3.13		Simple copy/paste	a. Transpose paste in Excel b. Copy and paste formulas in Excel c. Paste a link d. Special paste in Microsoft Excel		30 mins		Phase 1	Copy/Paste function helps the user to copy or move cell contents from one cell to another.		
		Saving/ Printing Excel	a. Print a big excel sheet using page break preview b. Print a selection part only c. Saving Excel in different formats d. Protecting Excel		30 mins	Day 21	Phase 1	Individuals will learn about how to save and print Excel, along with protecting the document.		
3.14		How to use Flash Fill in Excel	Different ways to use Flash Fill	**6 hrs 30 mins**	20 mins	Day 33	Phase 2	Flash Fill helps in automatically filling up data in the cells, once it recognizes the pattern.	**Assessment 5**	
3.15		Hyperlinks in Excel (link to websites)	a. Create Hyperlink b.Fix Hyperlink Error		20 mins		Phase 2	The hyperlink creates shortcuts for the user that takes them to a website.		
3.16		Create a directory or table of contents with internal links	Creating Table of Contents		10 mins	Day 34	Phase 2	A table of contents might help to maintain the overview of the worksheets		
3.17		Formatting Lists as Tables	a. Formatting lists as table b. Converting a list to a table		10 mins		Phase 2	A Table of Figures (also known as a List of Figures or a List of Tables) created in MS Excel		
3.18		Filtering Records from Lists or Tables	Removing Duplicates from Lists or Tables		15 mins		Phase 2	Conditional Formatting helps in exploring and analyzing data, detecting critical issues, identifying patterns, and		

								trends.	
3.19		Single & Multi-Level Sorting	a. Single Level Sorting b. Multi-level Sorting		15 mins	Day 35	Phase 2	In some cases, when the individual needs to sort two columns or more than two columns, they can use sorting function	**Assessment 6**
3.20		Inserting Automatic Subtotals in Lists	Insert Automatic Subtotals		20 mins		Phase 2	Individuals can insert automatic subtotals in already sorted lists.	
3.22		Inserting Data Charts Using Recommended Charts	a. Inserting Data Charts using recommended charts b. Formatting and Editing Chart Elements c. Creating and Applying Custom Chart Elements d. Adding and Removing Data from Charts e. Inserting Sparklines f. Printing Charts		20 mins + 20 mins + 10 mins	Day 36	Phase 2	Charts in Microsoft Excel helps the user in presenting the data analysis with visualizations.	
3.23		Pivot Table	a. Inserting b. Filtering c. Using Report Layouts d. Refreshing & Changing Source Data e. Pivo Charts		20 mins + 20 mins 20 mins	Day 37-Day 38	Phase 2	Pivot Table is a tool to calculate, summarize, and analyzes data and helps the user in comparing patterns and trends in data.	**Assessment 7**
3.24		Data Validation	a. Applying Built-In Conditional Formatting b. Creating Custom Conditional Formats c. Linking Data		20 mins + 20 mins + 10 mins	Day 39	Phase 2	Excel Data Validation is a feature that restricts (validates) individual input to a worksheet. Technically, you create a validation rule that controls what kind of	

								data can be entered into a certain cell.		
3.25		Dynamic Array	a. Dynamic Array functions b.Dynamic Array formulas		20 mins	Day 40	Phase 2	Individual can add comments to cells.		
3.26		Excel Macros	a, Creating Excel Macros b. Macros in single workbook c. Absolute References d.Relative References		30 mins	Day 41	Phase 2	The individual can prevent other users from viewing hidden worksheets, adding, moving, deleting, or hiding worksheets, by protecting the Microsoft Excel workbook with a password.		
3.27		VLOOKUP & Reference Functions	a. VLOOKUP True b.VLOOKUP Error c. Match Data in Excel d. Excel Match Function e. Excel lookup Function f. Excel Index Function g. Excel offset Formula		20 mins + 10 mins	Day 42	Phase 2	The VLOOKUP (Vertical Lookup) function looks for a value in the leftmost column of a table and then returns a value in the same row from another column individual specify.	**Assessment 8**	
3.28		Conditional Formatting	Applying Conditional Formatting in Formulas		20 mins + 10 mins	Day 43	Phase 2	The best part of conditional formatting is individuals can use formulas in it.		

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA07	Core Course VII : Operating Systems	5	-	-	4

OBJECTIVE

- To understand the basic concepts and functions of operating system.
- To understand the principles of OS and Deadlocks.
- To understand the various operating system components like process management, I/O management.
- To learn the various memory and Information management schemes.

UNIT – I **12 Hours**

Introduction – Operating System – History – process concepts: process states – process state transitions – Process Control Block – operations – Interrupt processing – **Asynchronous concurrent processes:**Dekkers Algorithm-Peterson's Algorithm-Semaphores.

UNIT – II **12 Hours**

Deadlock and Indefinite postponement: - Introduction – Examples – Necessary conditions – Major areas of deadlock research – Deadlock prevention – avoidance – detection - recovery.

UNIT – III **12 Hours**

Real storage:-Storage organization – Management - Hierarchy – Storage management strategies – contiguous vs. noncontiguous storage allocation – Fixed variable partition - Multiprogramming – virtual storage organization. **Virtual storage management:** Virtual storage management strategies – page replacement strategies.

UNIT – IV **12 Hours**

Job and processor scheduling:- Introduction – Scheduling objectives – preemptive vs. non-preemptive scheduling – priorities – Deadline scheduling – FIFO – RR – Quantum size – SJF – SRT – HRN – Multilevel Feedback Queues – fair share.

UNIT – V **12 Hours**

File and database systems: Introduction – File system – File system functions – File organization– File descriptor – Database systems – Database models. **Case study:** MS – DOS and Windows, Unix.

TEXT BOOKS

1. H. M. Deital, "Operating Systems", Pearson Edition, Third Edition,2009.

REFERENCE BOOKS

1. William Stallings, "Operating Systems – Internals & Design Principles", Prentice – Hall of India P.Ltd, New Delhi. 5th Edition,,2006.
2. Silberschatz and Galvin, "Operating System Concepts", 6th Edition, John Wiley & Sons, Inc., 2004.

WEB RESOURCES

1.https://nptel.ac.in/courses/106/105/106105214/

2. https://www.tutorialspoint.com/operating_system/index.htm

3. https://www.cse.iitb.ac.in/~mythili/os/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Explain the types of operating system and ability to create threads and perform interposes communication.	Remember
CO2	Remember the basic concepts of operating system	Remember
CO3	Understand the concepts of process and Gain the knowledge of concurrent process	Understand and Apply
CO4	Understand the concepts like interrupts, deadlock , memory management and filemanagement	Understand

CO5	Analyze the need for scheduling algorithms and implement different algorithmsused for representation, scheduling, and allocation in DOS,Windows and UNIX operatingsystem.	Remember and Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	M	L
CO2	S	S	S	S	S	M	M	M	S	L
CO3	S	M	M	M	S	M	S	S	S	L
CO4	S	S	S	M	S	S	S	M	M	M
CO5	S	S	S	M	S	S	S	M	M	M

*S-Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA08	Core Course VIII : Computer Networks	5	-	-	4

OBJECTIVE

- To understand the terminology and concepts of the OSI reference model and the TCP-IP reference model.
- To understand wired and wireless networking concepts.
- To be familiar with Routing and Congestion control Algorithms.
- To understand the data link & Application layer protocols.
- To have a Knowledge on Computer Network security.

SYLLABUS

UNIT-I **12 Hours**

Network Hardware: LAN – WAN – MAN – Wireless Networks. **Network Software:** Protocol Hierarchies **–** Design Issues for the Layers – Connection-oriented and connectionless services – Service Primitives – **Reference Models:** OSI Reference Model –TCP/IP reference Model

UNIT-II **12 Hours**

PHYSICAL LAYER - Guided Transmission Media : Twisted Pair – Coaxial Cable – Fiber Optics. **Wireless Transmission**: Electromagnetic Spectrum – Radio Transmission –Microwave Transmission – Infrared and Millimeter Waves – Light Waves. **Communication Satellites:** Geostationary, Medium-Earth Orbit, Low Earth-orbit Satellites

UNIT-III **12 Hours**

DATA-LINK LAYER: Design Issues - Error Detection and correction – Elementary Data-link Protocols: Stop and wait Protocol - Sliding Window Protocols - **MEDIUM-ACCESS CONTROL SUB LAYER:** Multiple Access Protocols:-ALOHA – Carrier Sense Multiple Access Protocols – Wireless LANs : 802.11 Protocol stack – Services- Bluetooth: Bluetooth Architecture

UNIT-IV **12 Hours**

NETWORK LAYER: Routing algorithms: The Optimality Principle – Shortest Path Routing – Distance Vector Routing – Congestion Control Algorithms: General Principles of Congestion Control – Congestion Prevention Policies – Congestion Control in Virtual-Circuit Subnets. **TRANSPORT LAYER:** Elements of Transport Protocols :Addressing – Internet Transport Protocols: TCP segment header – Introduction to UDP

UNIT-V **12 Hours**

APPLICATION LAYER: DNS name space – E-mail.: Architecture and services- User Agent **NETWORK SECURITY**: Cryptography - Introduction- Substitution ciphers-Transposition Ciphers – Symmetric Key Algorithms: DES(The Data Encryption Standard) – Public Key Algorithms: RSA – Digital Signatures: Symmetric Key Signatures – Public Key Signatures- Crypto Currency.

TEXT BOOKS

1. Andrew S. Tanenbaum, "Computer Networks", 4th edition, PHI, 2003 *(UNIT-I:1.2-1.4 UNIT- II:2.2-2.4 UNIT-III:4.2-4.6 UNIT-IV:5.2,5.3,6.2,6.5 UNIT-V:7.1,7.2,8.1-8.4)*

REFERENCE BOOKS

1. Achyut Godbole, "Data Communication and Networks" TMH, 2007.

2. Uyless Black,"Computer Networks Protocols, Standards and Interfaces", 2nd edition, PHI,1993.

WEB RESOURCES

1.https://www.tutorialspoint.com/computer_networks/index.asp

2. https://nptel.ac.in/courses/106/105/106105080/

3. https://www.cse.iitb.ac.in/~cs348m/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remember the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks.	Remember
CO2	Understand Internet structure and can see how standard problems are solved and the use of cryptography and network security.	Understand
CO3	Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.	Apply
CO4	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies	Analyze
CO5	Knowledge about different computer networks, reference models and the functionsof each layer in the models	Remember and Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	L	M	S	M	S	M	M
CO2	S	S	L	S	M	S	M	M	S	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	M	S	M	M	M	S	M	S	M

*S-Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA09	Core Course IX: Core Java Programming	5	-	-	5

OBJECTIVE

- Understood the concepts of Object-Oriented Programming.
- Differentiate C++ and Java.
- Could Learn about to use classes and objects.
- Able Know about usage of Interfaces and Packages in programming
- Could understand the concept concurrent programming using Multi threading
- Able to to do internet programming using Applets and GUI.
- Understood the file handling operations and database connectivity using JDBC.

SYLLABUS

UNIT I **12 Hours**

Java Evolution: History – Features – How Java differs from C and C++ – Java and Internet – Java and www –Java Environment Overview of Java: Introduction- simple Java program – Program Structure – Java Tokens – Java Statements- Implementing a Java Program –Java Virtual Machine. Constants, Variables and Data Types: Constants, Variables, Data Types, Declarartion, Giving values to the vaiables, Scope of the Variables. Operators and Expressions.

UNIT II **12 Hours**

Decision Making and Branching: if- if...else - nested if -switch,-? : Operator. Decision Making and Looping: While- do - for Statements – Jumps in Loops - Labeled Loops. Classes, Objects and Methods: Defining a class – Adding variables, methods – Creating objects –Accessing Class Members– Constructors – Methods overloading – static members –Nesting of Methods – Inheritance – Overriding methods – final Variables and methods –Final classes – finalizer methods – Abstract methods and classes – visibility control. Arrays, Strings and Vectors: Arrays –

One Dimensional Arrays – Creating an array – Two Dimensional Arrays – Strings – Vectors – Wrapper Classes.

UNIT III **12 Hours**

Interfaces: Multiple Inheritance: Defining interfaces – Extending interfaces –implementing interfaces – Accessing interface variable. Packages: Java API Packages –Using system packages – Naming conventions – Creating Packages – Accessing a Package –Using a Package – Adding a Class to a Package – hiding classes. Multithreaded Programming: Creating Threads – Extending the Thread Class– Stopping and Blocking a Thread – Life Cycle of a Thread – Using Thread methods – Thread Exceptions – Thread Priority – Synchronization – Implementing the 'Runnable' Interface. Managing Errors and Exceptions: Types of errors – Exceptions – Syntax of Exception handling code – Multiple Catch Statements – Using finally statement – Throwing our own Exceptions – Using Exceptions for Debugging.

UNIT IV **12 Hours**

Designing a Web Page Graphics Programming: Introduction-Graphics Class-Lines and Rectangles-Circles and Ellipse-Arcs. AWT Packages:Introduction-Events-Listeners-Event handling methods-Labels-Button Controls-CheckBox Controls-Radio Button Controls-Choice control-List Control-Scrollbars-Flow ,Border, Grid,Card Layout-Panels.

UNIT V **12 Hours**

I/O Streams:Introduction- Text and Binary Format of data-I/P and O/P stream Classes- Reader and Writter Classes- DataInput Stream and DataOutput Stream Classes.JavaDatabase Connectivity:Introduction-Purpose of JDBC API- Architecture of JDBC-JDBC Components-Steps to connect to the database-Establishing a Connection-Creation of Data Tables-Entering into the Tables-Table Updating.

TEXT BOOKS

1. E. Balagurusamy, "Programming with JAVA – A Primer", Fifth Edition,

TATA McGraw-Hill Education Private Limited, New Delhi, 2015.

2. C. Muthu," Programming with JAVA", Second Edition, Vijay Nicole Imprints Private

Limited,Chennai, 2019.

REFERENCE BOOKS

1. Herbert Schildt ,"Java:The Complete Reference", Ninth Edition, TATA Mc Graw Hill Publishing Company Limited, New Delhi, 2014.

2. H.M. Deitel, P.J.Deitel, "Java – How to Program", Tenth Edition, Pearson Education Pvt. Ltd, Delhi, 2015.

WEB RESOURCES

1.www.spoken-tutorial.org

2. www.nptel.ac.in

3. https://www.w3schools.in/java-tutorial/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	The competence and the development of small to medium sized application programs that demonstrate professionally acceptable coding	Remember & Understand
CO2	Demonstrate the concept of object oriented programming through Java	Understand &Analyze
CO3	Apply the concept of Inheritance, Modularity, Concurrency, Exceptions handling and data persistence to develop java program	Apply
CO4	Develop java programs for applets and graphics programming	Apply
CO5	Understand the fundamental concepts of AWT controls, layouts ,events and JDBC	Remember & Understand

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	L	S	M	M	M
CO2	S	S	S	M	S	L	S	M	M	M
CO3	S	S	S	M	S	M	S	S	M	M
CO4	S	S	S	M	S	M	M	S	M	M
CO5	S	S	S	M	S	M	S	S	M	M

*S-Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UUCAP5	Core Practical V: Java Programming Lab	-		3	3

OBJECTIVE

The main objectives of this course are to:

- The main objective of JAVA Programming Lab is to provide the students a strong foundationon programming concepts and its applications through hands-on training.
- To practice the Basic concepts, Branching and Looping Statements and Strings in java programming
- To implement and gain knowledge in Arrays, functions, Structures, Pointers and File handling

LIST OF LAB EXERCISES

1. Write a java program to display employee details using Classes and Objects
2. Write a java program to count number of vowels and consonants from the given strings.
3. Write a java program to demonstrate extending & implementing Interfaces
4. Write java program to print Table of Five, Seven and Thirteen using Multithreading
5. Write java programs to demonstrate Exception handling using try, catch, throw, throws and finally statements.
6. Write a java program to create user defined packages.
7. Write java program to works simple calculator use to Grid Layout.
8. Write a Java program for handling Mouse events and Key events.
9. Write a Java program that displays the number of characters, lines and words in a text file.
10. Write a Java program that connects to a database using JDBC and does add, delete, operations.

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the basic concepts of Java Programming with emphasis on ethics andprinciples of professional coding	Remember & Understand

CO2	Demonstrate the creation of objects, classes and methods and theconcepts of constructor, methods overloading, Arrays, branchingand looping	Understand
CO3	Create data files and Design a page using AWT controls and Mouse Events in Javaprogramming Implement the concepts of code reusability and debugging	Understand and analyze
CO4	Develop applications using Strings, Interfaces and Packages and applets	Apply
CO5	Construct Java programs using Multithreaded Programming ,Exception Handling and JDBC	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	S	M	M	L
CO2	S	S	S	L	S	M	S	M	M	L
CO3	S	S	S	M	S	M	S	M	M	L
CO4	S	S	S	M	S	M	S	S	M	S
CO5	S	S	S	M	S	S	S	S	M	S

*S-Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAS3	Skill Enhancement Course III : Web Programming Lab-I (HTML & JavaScript)	-	-	2	2

OBJECTIVE

The main objectives of this course are to:

- To gain knowledge about how to develop web applications
- To create web applications using HTML
- To create web applications using HTML with Style sheets
- To design interactive web sites with all the features given in Web programming

LIST OF LAB EXERCISES

1. Design a home page which will display your information i.e. Bio data.

2. Create Hyperlinks in home page i.e educational details, Hobbies, Achievement,

3. Design a timetable and display it in tabular format.

4. Design a Registration form in HTML.

5. Write a java script function to print an integer with commas as thousands separators.

6. Write a java script for loop that will iterate from 0 to 15 for each iteration, it will check if the current number is odd or even, and display a message to the screen.

7. Write a JavaScript program to design Simple calculator

8. Write a JavaScript program to check from two given integers, whether one is positive and another one is negative.

9. Write a java script program to test the first character of a string is uppercase or not.

10 Write a pattern that matches e-mail addresses.

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the problems and create applications in basics of web programming	Understand, Analyze and create
CO2	Understand and develop Web pages with formatting styles.	Understand & Apply
CO3	Apply the features in JavaScript to present the details given	Apply
CO4	Analyze the problem, apply the concept for developing applications	Analyze and Evaluate
CO5	Create web sites of real time applications	Create

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	L	M	M	M
CO2	L	S	M	M	S	M	S	S	M	M
CO3	S	M	S	S	M	S	S	M	S	S
CO4	M	S	S	S	M	S	M	S	S	L
CO5	S	M	L	S	S	M	S	S	M	S

*S-Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA10	Core Course X: Open Source Software	5	-	-	4

OBJECTIVE

- create awareness about Free and Open Source Software technologies
- To acquire proficiency in open source technologies such as PHP and MySQL.
- To realize the power of open source technologies.

SYLLABUS

UNIT- I **12 Hours**

Introduction to Internet : Client Server model - Domain name-World Wide Web. **Introduction to HTML**: History - HTML Tags - HTML Documents - Header section-Body section-Headings-Link Documents using Anchor Tag- Formatting Characters –Font Tag-Images and Pictures-Listing-Tables in HTML.

UNIT – II **12 Hours**

Frames and Forms: Frameset Definition-Frame Definition-Nested Framesets-HTML forms-Elements of a Form. **Java Script:** Data Types-Variables-Operators-Conditional Statements-Array Objects-Date Objects-String Objects.

UNIT – III **12 Hours**

Objects and Events: Document Object Model-The Document Object-Image Object-Forms and Elements-Browser object-Submit event and Data Validation-ParseInt() Function-ParseFloat() function-Recursive Functions.

UNIT – IV **12 Hours**

PHP: Introduction to PHP-Static websites vs. Dynamic websites-Dynamic content from Databases-Client-side scripting vs. Server-side scripting-PHP Scripting Fundamentals-Print statement-Code Blocks-Primitive Data Types-Constants and Variables-Arrays-Functions.

UNIT –V **12 Hours**

MySQL: Introduction to MySQL Database –SQL-Basic Elements of SQL-Data Types-Variables and Literals. **Working with Database and Tables:** Creating Databases-Types of SQL Statements (DDL,DML,DQL). **Querying Tables in the Databases:** Retrieving Rows from Table-Overview of Clauses-Overview of Operators. **Working with Databases and forms:** PHP's Database APIs-Simple SQL Queries via PHP.

TEXT BOOKS

1. C.Xavier, "Web Technology & Design", First Edition, New Age International Publishers,2007.
2. Steve Seuhring, Tim Converse, Joyce Park, "PHP6 and MySQL 6 Bible", Wiley India Pvt. Ltd, New Delhi,2009.

REFERENCE BOOKS

1. Chris Bates ,"Web Programming, Building Internet Applications", 2nd edition, Wiley Dreamtech, 2006.
2. N.P.Gopalan,J.Akilandeswari,"Web Technology – A Developer's Perspective,2nd Edition, PHI, 2014.

WEB RESOURCES

https://www.cs.uct.ac.za/mit_notes/web_programming.html

http://www.webstepbook.com/supplements/slides/ch01-internet.pdf

https://www.tutorialspoint.com/mysql/mysql_tutorial.pdf

https://downloads.mysql.com/docs/apis-php-en.pdf

https://www.tutorialspoint.com/mysql/mysql_pdf_version.htm

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB

CO1	Understand the basics of .Html frames and forms	Remember
CO2	Understand basics of JavaScript and objects	Understand
CO3	Understand and remember the java script DOM, form validations.	Understand
CO4	Understand the PHP objects, cookies, connecting remote files, and databaseconnections	Apply
CO5	Knowledge on PHP ,MYSQL, and databaseconnections	Understand and Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	M	M	S	S	M	M	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	M	M	S	S	M	S	M

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCA11	Core Course XI: Python Programming	**5**	**-**	**-**	**4**

OBJECTIVE

The main objectives of this course are to:

- To introduce the fundamentals of Python Programming.
- To teach about the concept of Functions in Python.
- To impart the knowledge of Lists, Tuples, Files and Directories.
- To learn about dictionaries in python.
- To explore the object-oriented programming, Graphical programming aspects of python with help of built in modules.

SYLLABUS

Unit- I **12 Hours**

BASICS OF PYTHON PROGRAMMING: Introduction to Python – Values and Types – Python Keywords –Identifier/Variables – Assigning Value to the Variable - input (),print(), eval() function – Comments **OPERATORS AND EXPRESSIONS**: Arithmetic Operators – Relational Operators – Boolean Operators – Bit Wise Operators - Operator Precedence and Associativity

Unit- II **12 Hours**

DECISION MAKING STATEMENTS: The if Statement – if-else statements – Nested if – Multiway if-elif-else statements – Conditional expressions **LOOP CONTROL STATEMENTS**: The While loop – The for Loop – the range() function – Nested Loop - break and continue Statement

Unit- III **12 Hours**

FUNCTIONS: Syntax and Basics of a function – Use of a Function – Parameters and Arguments in a Function – Local and Global Scope of a Function – The return Statement – Recursive Functions – Lambda Function **STRINGS:** Basic Inbuilt Python Functions for String – str class –

indexing[] operator – Traversing the String – Immutable Strings – String Operators – string Operations- String Methods search the substring, testing its character and to convert a String from one form to another

Unit-IV **12 Hours**

LISTS: Creating List – Accessing Elements of a List – List Slicing – Built-in functions for Lists – List Operators – List Aliasing and List Cloning-List Methods – **TUPLES AND DICTIONARIES** : Creating Tuples – Inbuilt functions for Tuples – Indexing and Slicing – Operations on Tuples- Zip and Inverse Zip(*) Function – Basics of Dictionary – Creating Dictionary – Adding and replacing Values – Formatting Dictionaries – The Methods of Dictionary Class – Traversing Dictionaries

Unit-V **12 Hours**

FILE HANDLING: Opening, Reading, Writing and Closing a File – The seek() function – Reading Binary files- **EXCEPTION HANDLING,MODULES AND PACKAGES**: Errors and Exception – Python Exception and its Hierarchy – Handling Exception – raising Exception – writing and Importing Modules – Creating Modules – Invoke specific functions of variables from Modules - Packages in Python

TEXT BOOKS

1 Ashok NamdevKamthane, Amit Ashok Kamthane, "Problem Solving and Python Programming", McGraw Hill Education (P) Ltd.,Second Edition, 2018

REFERENCE BOOKS

1 Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.

2 Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

3 Wesley J Chun, —Core Python Applications Programming‖, Prentice Hall, 2012.

WEB RESOURCES

1.https://www.tutorialspoint.com/python/index.htm

2. https://nptel.ac.in/courses/106/106/106106182/

3. https://www.w3schools.com/python/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remembering the concept of operators, data types, looking statements in Python programming.	Remember
CO2	Understanding the concepts of Input / Output operations in file.	Understand
CO3	Applying the concept of functions and exception handling	Apply
CO4	Analyzing the structures of list, tuples and maintaining dictionaries	Analyze
CO5	Demonstrate significant experience with python program development environment	Analyze and Create

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	M	L	M	S	S
CO2	S	S	S	L	S	M	L	M	S	S
CO3	S	S	S	L	S	M	L	M	S	S
CO4	S	S	S	L	S	M	L	M	S	S
CO5	S	S	S	L	S	M	L	M	S	S

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAPR	Project Work: Software Development Lab	**5**		**-**	**4**

OBJECTIVE

The main objectives of this course are to:

- To understand and select the task based on their core skills.
- To get the knowledge about analytical skill for solving the selected task.
- To get confidence for implementing the task and solving the real time problems.
- Express technical and behavioral ideas and thought in oral settings.
- Prepare and conduct oral presentations

AIM OF THE PROJECT WORK

- The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.
- Each student should carry out individually one project work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.
- The project work should be compulsorily done in the college only under the supervision of the department staff concerned.

Viva Voce

1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners, after duly verifying the **Annexure Report** available in the College, fora total of 100 marks at the last day of the practical session.
2. Out of 100 marks, 60 marks for project report and 40 marks for Viva Voce.

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB

CO1	Formulate a real world problem and develop its requirements develop a designsolution for a set of requirements.	Remember
CO2	Test and validate the conformance of the developed prototype against the originalrequirements of the problem.	Evaluate
CO3	Work as a responsible member and possibly a leader of a team in developingsoftware solutions.	Apply
CO4	Express technical ideas, strategies and methodologies in written form. Self-learnnew tools, algorithms and techniques that contribute to the software solution of the project.	Remember & Analyze
CO5	Generate alternative solutions, compare them and select the optimum one.	Create

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	S	S
CO5	S	S	S	M	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Project Report Format

PROJECT WORK

TITLE OF THE DISSERTATION

Bonafide Work Done

bySTUDENT NAME

REG. NO.

Dissertation submitted in partial fulfillment of the requirements for the award of

<Name of the Degree>

of Government Arts College(Autonomous), Salem-7**.**

College Logo

Signature of the Guide Signature of the HOD

Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

Month – Year

CONTENTS

Proposed System
Features
3. System Design and Development
File Design
Input Design
Output Design
Database Design
System Development
Description of Modules (Detailed explanation about the project work)
4. Testing and Implementation
5. Conclusio
n
Bibliograph
y
Appendices
A. Data Flow Diagram
B. Table Structure
C. Sample Coding
D. Sample Input
E. Sample Output

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAP6	Practical – VI:Programming in Python	-		3	3

OBJECTIVE

The main objectives of this course are to:

- To introduce the fundamentals of Python Programming.
- To teach about the concept of Functions in Python.
- To impart the knowledge of Lists, Tuples, Files and Directories.
- To learn about dictionaries in python.
- To explore the object-oriented programming, Graphical programming aspects of python with help of built in modules.

LIST OF LAB EXERCISES

1. Write a Python Program to demonstrate different number data types in Python.

2. Write a Python Program to demonstrate the usage of built-in mathematical functions.

3. a. Write a Python Program to Swap two variable without using a third variable

b. Write a Python Program to Compute Simple Interest and Compound Interest for a given Principal, Rate of Interest and Duration in Years.

4. a. Write a Python Program to find the largest of 'N' Numbers.

b.Write a Python Program to find factorial of a number using Recursion

5. a. Write a Python Program to Convert Stings in Lowercase to Uppercase, Vice versa and Swapping the Case.

b.Write a Python Program to Count separately the Vowels of a given String.

6. a. Write a Python Program to Compute the Sum of Odd and even Numbers for a given Range in a List

b.Write a Python Program to reverse the members of the List.

7. a. Write a Python Program to Add Two given Matrices.

b.Write a Python Program to Compute transpose of a given matrix.

8. a. Write a Python Program to using Tuples to input Student details. The Program should accept a given student's Roll Number and display his specific record.

b.Write a Python Program to using Tuples to input Student details and Compute his Percentage and Class based on his Average marks for five Subjects.

9. Write a python program using dictionary to generate a small dictionary of synonyms. The Program should then accept a word and generate Synonym for the same.

10. a.Write a python program to read from a file and print the same.

b. Write a Python Program to count the Number of Lines in a File

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remembering the concept of operators, data types, looking statements in Python programming.	Remember
CO2	Understanding the concepts of Input / Output operations in file.	Understand
CO3	Applying the concept of functions and exception handling	Apply

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MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	M	L	M	S	S
CO2	S	S	S	L	S	M	L	M	S	S
CO3	S	S	S	L	S	M	L	M	S	S
CO4	S	S	S	L	S	M	L	M	S	S
CO5	S	S	S	L	S	M	L	M	S	S

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22NMNET	Emerging Technology for the Workplace-I	-		2	2

NAAN MUDHALVAN – PROPOSAL

Project-based experiential learning program forArts & Science Colleges by IBM Career Education

Table of Contents

1. Overview

Naan Mudhalvan is a flagship initiative of the Tamilnadu government, implemented throughthe Tamil Nadu Skill Development Corporation (TNSDC), to provide students with various skill training based on current industry demand for talent. The initiative assists students in

learning in-demand skills that will prepare them for employment in the industry.

As part of Naan Mudhalvan initiative, IBM is proposing a project-based experiential learningprogram for the 6th semester students of BSc and BCA groups from Govt., Govt. aided and private colleges across the state of Tamil Nadu as part of the Naan Mudhalvan initiative.

2. Objectives

- To empower the students with technical skills to require solving a real-world challenge
- To train the students on the approach to building solutions by applying critical thinkingand problem-solving capabilities in a collaborative environment.
- To mentor the students in building proof-of-concept solutions by applying designthinking concepts.
- To introduce the standard project development methodologies followed in the industryto the students
- To develop the professional skills like teamwork, leadership qualities, communicationin the students
- To enhance the employability of students in order to get them internships and jobopportunities

3. Program Details

This program is a mandatory, 3 months immersive project-based learning program deliveredas a course in the curriculum. 6th Semester students from Bachelor of Science (B.Sc.) and Bachelor of Computer Applications (BCA) from Government, Government Aided and Private colleges are the beneficiaries of the program.

Project Based Learning is introduced to the students to give them hands-on experience on open-source digital technologies while they learn an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem in collaborative learning environment while being guided by mentors from Industry and College

Highlights of the Program:

- Total 60 Hrs. of project-based learning engagement
- 30 Hrs. of virtual live instructor-led, hands-on training on leading technologies suchas
    - Artificial Intelligence,
    - Software Testing
    - Data Analytics & Visualization
    - Front-End Web Development
- 30 Hrs. to develop the solutions for the real-world use cases in various businessdomains like healthcare, finance, retail, fashion, agriculture,

transportation, manufacturing, etc.

- 20 use cases identified to build innovative solutions by implementing leadingtechnologies.
- Team based development activity build their professional skills
- Use case specific mentoring support to handhold the students during thedevelopment process.
- Training the students on design thinking, agile methodologies, and projectdevelopment process.
- 12 hrs. of knowledge sessions for the faculty on design thinking, agile methodologies,and project development process.
- Hands-on with open-source technologies and digital tools
- Master classes for the students and faculty on best industry practices
- Evaluation of project submissions by evaluators
- Dashboard Access to the various stakeholders to track the progress
- Certificate of completion along with assessment report for students

Outcomes of the Program

On completion of the course, the students will be able to

- Understand the leading technologies and apply them for solving real-world problems
- Understand the concepts of design thinking and agile methodologies
- Develop professional skills like teamwork, time management, communication andproject management skills
- Understand various digital tools & best practices followed in the industry
- Develop the products from scratch i.e. idea to working prototype
- Industry course completion certificate from IBM

4. Program Milestones

Following are the major milestones of the project. Refer to annexure-1 for the detailedproject plan.

- Set-up the platform to onboard various stakeholders
- Organize the program orientation session for principals & faculty
- Onboard the principals, college SPOCs, faculty mentors and faculty evaluators
- Organize the program orientation session for students
- Onboard the students on to the platform
- Use case orientation sessions for the students
- Team formation & project enrollment
- Team approval & faculty mentor, evaluator assignment
- Conduct Agile & Design Thinking sessions for students which can be attended byfaculties too
- Training batch selection & team assignment
- Technical training sessions for students
- Knowledge sessions for faculty

- Design thinking & Agile training sessions for students
- Project development by student teams
- Project mentoring sessions
- Project submission by the student teams
- Project approval by the mentors
- Project evaluation by the evaluators & score submission
- Leader board generation
- Issuing certificate of completion
- Program success meeting & closure.

5. Stake Holders

Key stakeholders and their responsibilities are listed below.

Organization	**Role & Responsibility**
Tamil Nadu Skill Development Corporation	Role: Owner of the Program Responsibilities: • Approval for the program structure and execution methodology • Project Budgeting & Financing • Facilitating interaction with universities • Onboarding of the colleges (principal & faculty) • Collecting the information of beneficiaries (students) and validation • Integration of Naan Mudhalvan platform with program platform • Coordination with stakeholders like ministry of education, higher education council etc. • Branding & Promotion of the program across various channels
IBM	Role: Platform & Execution Partner Responsibilities: • Set-up the platform to drive the student learning journey • Prepare the training curriculum • Create the 20 usecases on the platform along with collaborative work environment • Conduct Agile & Design Thinking sessions for students • Coordination with college level stakeholders • Online live instructor-led training • Project mentoring via various channels • Email campaigns & notifications on the program • Review and Approval of project submissions • Evaluation of approved projects & scoring • Certification of completion • Weekly reports on the program

University	Role: University Partner Responsibilities: • Communication with affiliated colleges • Circulars / notifications to colleges on program • Assigns a university SPOC for the program • Coordinates with college SPOCs for the timely completion the program
College	Role: College Partner Responsibilities: • Assign a College SPOC for the program • Assign faculty mentors & evaluators for the program • Implement the program as part of academic calendar • Ensure the availability of resources - Labs, Internet, Projectors etc. • Ensure the attendance of students in technical training sessions
	• Support students in project development • Attend the knowledge sessions • Evaluation of submitted projects

6. Scope of Work

Scope of work includes the following activities

A. Platform & Project-based learning content

a. Dedicated infrastructure for the platform
b. Integration of Naan Mudhalvan portal with platform
c. Dedicated micro-site for each college
d. Setting-up roles & permissions for the users/stakeholders
e. Creation of four learning tracks for students - refer Annexure-2 for trainingcurriculum
    i. Artificial Intelligence
    ii. Software Testing
    iii. Data Analytics & Visualization
    iv. Front-End Web Development
f. Creation of project workspace for 20 use cases - Refer Annexure-3 forsample list of use cases
g. Creation of 20 project specific mentoring channels
h. Creation of training calendar for faculty & students on the platform
i. Setting up the email templates & email campaign engine on the platform
j. Setting up the dashboards for various stakeholders
k. Customization of the reports as per project requirements
l. Customization of evaluations metrics and scorecard

m. Creation of technical assessments on the platform
n. Customization of certificate of completion
o. Setting-up support channels

B. Operational Support (Platform level & On the ground)

a. Organizing the program orientation sessions for the Principals & faculty
b. Organizing the program orientation sessions for the students
c. Organizing the platform orientation sessions for the faculty & students
d. Registration of college SPOC, mentor and evaluators
e. Coordination with principals for the approval for SPOC, Mentor andEvaluators
f. Student invitation emails & onboarding
g. Coordination with college SPOCs to add alternate emails for the students withwrong emails ID's
h. Coordination with college SPOCs for team approval, modifications etc.
i. Coordination with college SPOCs for the assignment of mentor andevaluators
j. Orientation session for the faculty on the training calendar & training batchselection
k. Coordination with college SPOCs for the training batch selection & teamassignment
l. Coordination with faculty mentors for the timely submission of projectdeliverables.
m. Onboarding of industry mentors and evaluators
n. Assigning teams to industry mentors & evaluators
o. Orientation sessions for the industry mentors and evaluators
p. Monitoring the 20 project channels to ensure the communication betweenstudents and industry mentors
q. Coordination with trainers to deliver the training as per schedule
r. Coordination with industry mentors for the approval activities
s. Coordination with industry evaluators for the evaluation of submitted projects
t. Weekly report generation & circulation to various stakeholders
u. Support through various channels - Telephonic, Chat, Emails
v. Physical visits to the campuses for extended support if necessary.
w. Coordination with University SPOC for the timely notifications to the colleges
x. Coordination with TNSDC technical & support team

C. Technical Training, Mentoring and Evaluation

a. Training curriculum creation for 4 technology tracks
b. Conduct Agile & Design Thinking sessions for students
c. Identifying 20 use cases and relevant content creation on the platform
d. Training calendar creation for the program

e. 30 Hrs. of technology training for 4 technologies in 12 batches, so total 48 parallel batches, total 1440 hrs. Of technical training - refer Annexure-4 fordetailed training batches & timings
f. 14 Hrs. of knowledge sessions for the faculty on design thinking, agile methodologies, digital tools and project templates. Refer Annexure-5 for thelist of knowledge sessions.
g. Answering the queries on 20 project channels between 9am - 9pm by thementors - Maximum response time 24 Hrs.
h. Organizing alternate day AMA (Ask me Anything Sessions) for the students &faculty during the project development
i. Organizing the platform orientation sessions in Tamil medium
j. Uploading the recordings of sessions to dashboards of students & faculty
k. Review and approval of the project deliverables by the industry mentors
l. Evaluation of the projects submitted by the students & scoring

7. Project Timeline

The weekly timeline of the project is listed below with tentative dates. Refer annexure-1 fordetailed milestones, activities, and timelines.

Month	**Week**	**Milestone**	**Stakeholders**
Jan' 23	Week(-2) - Week (0)	Platform set-up and micro-sites for colleges	TechTeam
Jan' 23	Week-1	Launch, Principal & faculty orientation session	Principals and Faculty
Jan' 23	Week-2	Onboarding of college SPOCs, mentors and evaluators	Faculty
Month	**Week**	**Milestone**	**Stakeholders**
Jan' 23	Week-2	Invitation to students & onboarding	Students
Jan' 23	Week-3	Student orientation sessions & Replay	Students
Jan' 23	Week-4	Team formation & Project enrollment	Students
Feb' 23	Week-5	Team Approval by the College SPOC	College SPOC
Feb' 23	Week-6	Training Batch Selection by College SPOC & Assignment of teams to the batches	College SPOC

Feb' 23	Week-7	Commencement of Technology Training Sessions	Students
Feb' 23	Week-7	Commencement of Faculty Knowledge Sessions	Faculty
Mar' 23	Week-12	End of Technology training sessions	Students
Mar' 23	Week-12	End of Faculty Knowledge Sessions	Faculty
Mar' 23	Week-13	Commencement of Project Development	Students
Mar' 23	Week-13	Commencement of AMA Sessions	Students & Faculty
April' 23	Week-16	End of Project Development	Students
April'23	Week-16	End of AMA Sessions	Students & Faculty
Apr'23	Week-17	Commencement of Project Evaluations	Faculty & Industry Evaluators
Apr'23	Week-20	End of Project Evaluations	Faculty & Industry Evaluators
May'23	Week-21	Evaluation report submission	Management
May'23	Week-22	Certificate Generation for Students & Faculty	Students & Faculty
June '23	Week-23	Overall Report Submission & Project Closure	Management

8. Project Execution Methodology

Project execution methodology has been designed considering the infrastructural challengesin the colleges and the academic calendar.

Key points in consideration:

a. Program will be delivered as a mandatory course for all the students

b. University / college allocates 8 hrs. In a week / three sessions of each 2.5 hrs in aweek to deliver the technology training and mentoring sessions.

c. Total 4 weeks will be provided for the technology training and 4 Weeks + 3 Dedicateddays for project development

d. Training will be delivered online by an instructor via zoom meetings.

e. Mentoring will be provided to student team via online AMA sessions and projectcommunication channels by industry mentors

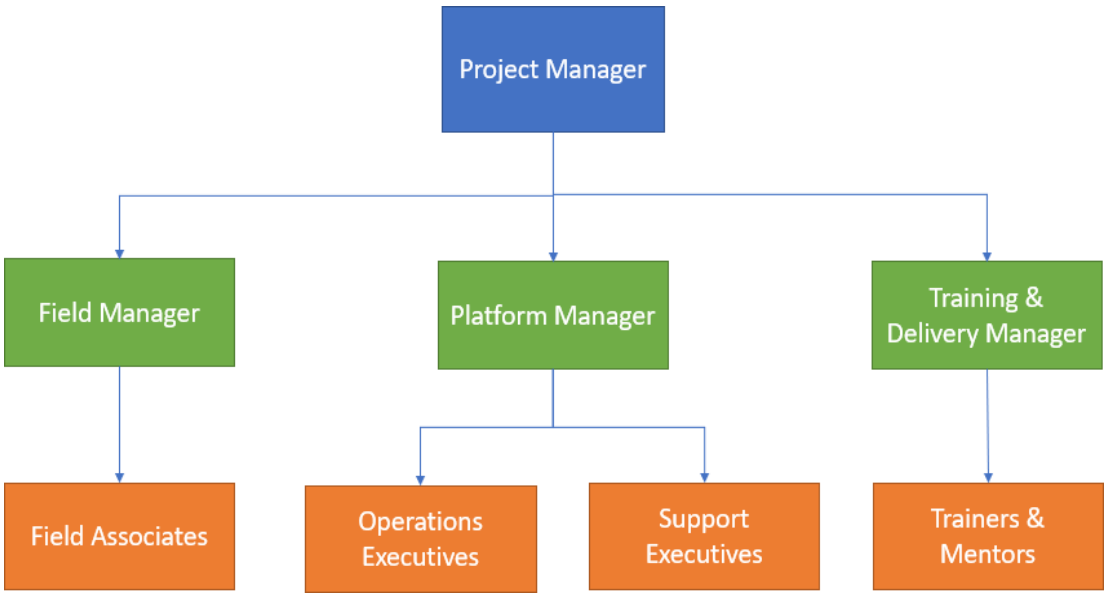
f. Colleges will be allocating the batches as per the training batches listed in theannexure-4

g. College assigns a single point of contact (SPOC) & faculty mentors to drive thisprogram on the ground

h. College shall assign one mentor for every 8 teams i.e. 32 students per each mentor

i. Colleges shall have a computer lab of atleast 30 computers with minimum requiredconfiguration and good internet connectivity to provide training to 120 students.

9. Project Team & Org Chart:



The number of team members for each role will be decided in the later stage of proposal.

10. Service Assumption

Assumptions related to in-scope services and/or components include:

- This program is for a minimum of 25000 students
- For every 30 students there is available a faculty who would act as mentor
- There is available a faculty evaluator for every 30 students who would do individualfaculty evaluation
- Program has been offered as mandatory course as part of the curriculum and weekly 5 – 6hrs. will be provided in the academic calendar

- All the learners are equipped with computer/laptop with necessary configuration(Minimum Intel Core i3 or equivalent, 4GB RAM, Windows 10 / Linux
- All the learners are equipped with internet connection with necessary bandwidth (Minimum 10 MBPS download speed)
- All the learners are having minimum coding skills e.g. Python or Java
- All the learners are having minimum knowledge on any database

Payment and Terms

Min. No of Students	Service Description	Unit Price (INR)
25,000	IBM Career Education Project based learning program as defined in this document	990

A total of sum of INR 2,47,50,000/-

- The prices shall be exclusive of all applicable taxes, duties and levies and shall be charged as peractuals.
- Payment would be 100% in advance before the commencement of the program.
- The quotation is valid for 30 days from date of submission.
- Even if the student registration is less than 75,000, the minimum charge would be INR \ taxes. At anystage if there are additional students, both the parties will mutually agree on the commercials & corresponding details will be agreed by signing a PCR.

Annexure-1

Project Schedule - L1

Month	Week	Milestone	Stakeholders
Jan' 23	Week(-2) - Week (0)	Platform set-up and micro-sites for colleges	TechTeam
Jan' 23	Week-1	Launch, Principal & faculty orientation session	Principals and Faculty
Jan' 23	Week-2	Onboarding of collegeSPOCs, mentors and evaluators	Faculty
Jan' 23	Week-2	Invitation to students & onboarding	Students
Jan' 23	Week-3	Student orientation sessions & Replay	Students
Jan' 23	Week-4	Team formation & Project enrollment	Students
Feb' 23	Week-5	Team Approval by the College SPOC	College SPOC

Feb' 23	**Week-6**	**Training Batch Selection by College SPOC & Assignment of teams to the batches**	**College SPOC**
Feb' 23	**Week-7**	**Commencement of Technology Training Sessions**	**Students**
Feb' 23	**Week-7**	**Commencement of Faculty Knowledge Sessions**	**Faculty**
Mar' 23	**Week-12**	**End of Technology training sessions**	**Students**
Mar' 23	**Week-12**	**End of Faculty Knowledge Sessions**	**Faculty**
Mar' 23	**Week-13**	**Commencement of Project Development**	**Students**
Mar' 23	**Week-13**	**Commencement of AMA Sessions**	**Students & Faculty**
April' 23	**Week-16**	**End of Project Development**	**Students**
April'23	**Week-16**	**End of AMA Sessions**	**Students & Faculty**
Apr'23	**Week-17**	**Commencement of Project Evaluations**	**Faculty & Industry Evaluators**
Apr'23	**Week-20**	**End of Project Evaluations**	**Faculty & Industry Evaluators**
May'23	**Week-21**	**Evaluation report submission**	**Management**
May'23	**Week-22**	**Certificate Generation for Students & Faculty**	**Students**
June '23	**Week-23**	**Overall Report Submission & Project Closure**	**Management**

Note: Project Schedule L2/L3 will be submitted in later stage of the proposal.

Annexure-2 Curriculum for Technical Trainings

Technology Track	Topics covered	Training Hours

Artificial Intelligence	• Introduction to Artificial Intelligence • Python for Artificial Intelligence • Data Wrangling Techniques • Introduction to Neural Networks • Tensorflow & Keras • Convolutional Neural Networks • Natural Language Processing • Build and Deploy AI Applications	30 Hrs.
Software Testing	• Basic concepts of software testing • Software development life cycle • Test process & Test levels • Test scenario writing • Test case writing • Test Execution and Bug Reporting • Testing Reports: Test Progress & Test Summary Report • Basics of Agile & Agile Testing • Using JIRA for Agile Testing • Mobile Testing basics • API Testing Fundamentals, Postman • SQL for Software Testers • Introduction to GitHub	30 Hrs.
Data Analytics & Visualizations	• Introduction to Data Analytics • Python for Data Analysis • Extract data from database, txt files, webscrapping • Data Visualization using Matplotlib, seaborn • Data Visualization using Plotly • Data Visualization using Pygal, Bokeh etc. • Build Visualization Dashboards & Stories	30 Hrs.
Front-End Development	• Introduction to Front-End Web Development • Concepts of UX Design • HTML5 - Basics to Advanced • CSS - Basics to Advanced • JavaScript - Basics to Advanced • JQuery • Modern Java Script (ES6) for React • React Js • Building Responsive webpages with React Js	30 Hrs.

Annexure-3

Sample Use Cases for Project Development

Technology Track	**Use cases**

Artificial Intelligence	• Fake News Detection Using NLP • AI-based localization and classification of skin diseases
Software Testing	• Testing a E-commerce portal • Testing a to-do application • Testing a chat application • Testing a ticket booking website
Data Analytics & Visualizations	• Exploratory Data Analysis of Rainfall in Chennai • Corporate Employee Attrition Analytics & Visualization
Front-End Development	• Developing webpages for To-Do Application • Developing webpages for recruitment portal

Note: Complete details of the 20 usecases will be provided in the later stage of proposal.

Annexure-4:List of Knowledge Sessions for Faculty

Knowledge Session	**Description**	**No. of Hours.**
KS-1	Knowledge sessions on design thinking	2 Hrs.
KS-2	Knowledge session on agile methodologies	2 Hrs.
KS-3	Knowledge session on project development process and evaluation metrics	2 Hrs.
KS-4	Knowledge on Project deliverables & GitHub	2 Hrs.
KS-5	Knowledge session on Problem statement definition, Ideation & Idea Prioritization	2 Hrs.
KS-6	Knowledge session project design, architecture and planning	2 Hrs.
KS-7	Knowledge session on Coding best practices, testing and deployment	2 Hrs.

Major Based Elective:

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM1	Major Based Elective I : Client/Server Technology	**5**		**-**	**4**

OBJECTIVE

- To know the basic concepts of Client/Server and Operating System services.
- To understand the fundamentals of SQL and Relational Database.
- To impart knowledge about Data Warehouses and Client/Server Transaction Processing.
- To understand the relationship between a CORBA Business Object and a Client/Server Business Object.
- To make a study of Hypertext Era, Interactive Era, Distributed object Era.

SYLLABUS

UNIT - I **12 Hours**

Client/server computing: Basic concepts of Client/Server – Characteristics – File Servers – Database Servers – Transaction Servers – Groupware Servers - Object Servers – Web Server – Fat Server or Fat Client – 2-Tier vs. 3-Tier – Client/Server Building Block. Clients, Servers and Operating Systems - Base Services – Extended Services – Client Anatomy.

UNIT - II **12 Hours**

NOS: NOS Middleware – RPC – MOM Middleware – MOM versus RPC. **SQL Database Servers:** The Fundamentals of SQL and Relational Database – Server Architectures – Stored Procedures –Triggers and Rules.

UNIT - III **12 Hours**

Data Warehouses: OLTP – DSS – OLTP versus DSS – Data Warehouses – Elements – Hierarchies – The mechanics of Data Replication- EIS/DSS. **Client/Server Transaction Processing:** ACID properties – Transaction Models – TP Monitors.

UNIT - IV **12 Hours**

Client/Server Groupware: Groupware – Components – CORBA: From ORBs to Business Objects: Distributed objects, CORBA-style – OMGs OMA – CORBA object services. **CORBA Business Objects:** cooperating Business Objects - Anatomy of a CORBA Business Object- Anatomy of a Client/Server Business Object.

UNIT – V **12 Hours**

Web Client/Server: The Hypertext Era - Evolution of the web-client/server web style -URL-HTTP. **Interactive Era:** 3-Tier client/server web-style. **CGI:** server side of the web. **Distributed object Era:** JAVA - The Mobile code system.

TEXT BOOKS

1. Robert Orfali, Dan Harkey and Jeri Edwards ,"The Essential Client/Server Survival Guide", Galgotia publications, Third Edition, 2013.

REFERENCE BOOKS

1. Dawna Travis Dewire, "Client/Server Computing", TMGH, 2003.
2. Patrick Smith, Steve Guenferich , "Client/Server Computing", 2nd edition,PHI,1994.

WEB RESOURCES

1.https://www.tutorialspoint.com/Client-Server-Computing

2. http://www.faadooengineers.com/online-study/post/cse/mobile-computing/185/client-server-computing

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the concepts and techniques in client/servercomputing.	Remember
CO2	Understand the pros and cons of client/server, databases, and challenges.	Understand
CO3	Understand the design considerations in client/server computing	Understand
CO4	Understand and analyze the client server network model, transaction processing and middleware technology.	Apply
CO5	Understand and obtaining the Knowledge on groupware component ,RPC and databases, web client/server model.	Understand and Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	L	M	M	M	M	M	L
CO2	S	S	L	S	S	S	S	S	M	L
CO3	S	M	L	M	S	M	S	L	S	M
CO4	M	M	M	S	S	S	M	S	M	M
CO5	M	L	M	M	M	S	S	M	S	M

S- Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM2	Major Based Elective II: Software Engineering	**5**	**-**	**-**	**4**

OBJECTIVE

- To understand the phases in a software project
- To enhance the basic software engineering methods and practices.
- To understand the fundamental concept of requirements engineering an analysis modeling.
- To learn the techniques for developing software systems.
- To know the major consideration for enterprise integration and development
- To learn various testing and maintenance measures.

SYLLABUS

UNIT-I: 12 Hours

Introduction to Software Engineering: The Evolving role of software - Software process - Software Process Models – The Prototyping Model – RAD Model. **Evolutionary Software Process Models:** Incremental Model – Spiral Model – WINWIN Spiral Model – Concurrent Development Model – Agile Software Development.

UNIT-II: 12 Hours

Analysis concepts and principles: Requirement Analysis – Requirements Elicitation for software – Analysis Principles – Specification. **Analysis Modeling:** Data Modeling – Mechanics of Structured Analysis – The Data Dictionary – Metrics for the Analysis Model.

UNIT-III: 12 Hours

Software Design and Software Engineering - Design concepts and Principles - The Design process – Design Principles –Design concepts – Effective Modular Design – The Design Model. **Architectural Design:** Software Architecture – Data Design.

UNIT-IV: 12 Hours

Software Testing Techniques – Software Testing Fundamentals – White Box Testing – Basic Path Testing – Control Structure Testing – Black Box Testing. Software Testing Strategies: Strategic Issues – Unit Testing – Integration Testing – Validation Testing – System Testing.

UNIT-V: 12 Hours

Software Quality Assurance: Quality Concepts – The Quality Movement – Software Quality Assurance – Software Reviews – Formal Technical Reviews – Formal Approaches to SQA – Statistical Software Quality Assurance – Software Reliability – Mistake Proofing for Software – The SQA Plan.

TEXT BOOKS

1. Roger S.Pressman, "Software Engineering", 5th edition TMH Publishers,2001.

REFERENCE BOOKS

1. Richard Fairly, "Software Engineering Concepts", TMGH, 1997

2. Ian Sommerville, "Software Engineering", Seventh Edition, Pearson Education, 2005.

WEB RESOURCES

1.https://nptel.ac.in/courses/106/105/106105087/

2.https://onlinecourses.swayam2.ac.in/cec20_cs07/preview

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the basic concepts of software engineering	Remember
CO2	To inculcate knowledge on Software engineering concepts in turn gives aroadmap to design a new software project.	Understand/Analyze
CO3	Apply the software engineering models in developing software applications	Apply
CO4	Knowledge on how to do a software project with in-depth analysis.	Apply
CO5	Implement the software design in various projects	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	S	M	S	S	S	M	L
CO3	M	M	M	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	S	M	S	S	M	M	M

S- Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM3	Major Based Elective III : Unix and Shell Programming	**5**	**-**	**-**	**4**

OBJECTIVE

- To understand UNIX Architecture.
- To learn the basic set of commands and utilities in Linux/UNIX systems.
- To learn the important Linux/UNIX library functions and system calls.
- To understand the inner workings of UNIX-like operating systems.

SYLLABUS

UNIT I **12 Hours**

Introduction : The Unix Operating System - The UNIX Architecture and Command Usage: The UNIX Architecture – Features of UNIX – Locating commands – Internal and External Commands – Command Structure – Man Browsing the Manual pages On-Line

UNIT II **12 Hours**

General Purpose Utilities: cal, date, echo, printf, bc, script, who, email basics,mailx,passwd,uname,tty,stty - **The File System:** The file – The parent child relationship – pwd,cd,mkdir,rmdir – Absolute Pathnames - relative Pathnames – ls – The Unix file system – **Handling Ordinary files:** cat,cp,rm,mv,more,file,wc,od,cmp,comm., diff, dos2unix and unix2dos.

UNIT III **12 Hours**

Basic File Attributes: Listing File Attributes – Listing Directory Attributes – File ownerships – File permissions – chmod – Directory Permissions – changing File ownership - The vi Editor

UNIT IV **12 Hours**

The Shell: The shell Interpretive Cycle – Pattern Matching - Escaping and Quoting – Redirection – Pipes – Tee – Command Substitution – Shell variables -The Process: Process Basics – ps – Mechanism of Process creation – Process states and Zombies – Running jobs in background

UNIT V **12 Hours**

Customizing the environment: The Shells – Environment variables -More file attributes : Hard Links – symbolic Links. **Find Simple filters:** pr,head,tail,cut,paste,sort. **Filters using regular expressions:** grep,sed - **Essential Shell Programming:** Shell Scripts – read- Using Command Line Arguments – exit – Conditional execution - if – case – expr – while – for - Looping with a List.

TEXT BOOKS

1. Sumitabha Das, " UNIX – Concepts and Applications", 4thEditionTata McGraw Hill, 2006.

REFERENCE BOOKS

1. Behrouz A. Forouzan and Richard F. Gilberg, "UNIX and Shell Programming", Cengage Learning, 2005.
2. M.G. Venkateshmurthy, "UNIX & Shell Programming", Pearson Education, 2005.
3. Yashavant P. Kanetkar, "UNIX Shell Programming", BPB Publications, 2010.

WEB RESOURCES

1.https://www.tutorialspoint.com/unix/index.htm

2. http://www.ee.surrey.ac.uk/Teaching/Unix/unixintro.html

3. https://www.javatpoint.com/linux-tutorial

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Describe the architecture and features of Unix Operating System and distinguish itfrom other Operating System.	Remember
CO2	Develop Unix utilities to perform File processing, , User Management and display system configuration	Understand & Apply
CO3	Apply and change the ownership and file permissions using advance Unixcommands	Apply
CO4	Develop shell scripts using pipes, redirection, filters and Pipes	Understand
CO5	Build Regular expression to perform pattern matching using utilities andimplement shell scripts for real time applications	Apply& Create

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	M	L
CO2	S	S	S	M	S	M	M	M	M	L

CO3	S	S	S	M	S	M	S	S	S	M
CO4	S	S	S	M	S	M	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM4	Major Based Elective IV : Data Mining and warehousing	**5**		**-**	**4**

OBJECTIVE

- To understand the concept of data mining and data warehousing.
- To know the various data mining techniques such as association rule mining, classification and clustering techniques.
- To understand the characteristics of web and web mining.
- To have a knowledge on multidimensional data and OLAP operations.

SYLLABUS

UNIT I **12 Hours**

Data Warehousing: Introduction – Data Warehouses – Data Warehousing Design – Guidelines for Data Warehousing Implementation – Data Warehouse Metadata. **Online Analytical Processing (OLAP):** Introduction – Characteristics of OLAP System – Multidimensional View and Data Cube – Data Cube Operations.

UNIT II **12 Hours**

Data Mining: Introduction-What is Data Mining? – Data Mining Process – Software Development Approach – The CRISP –DM Approach - Application - Data Mining Techniques – The Future of Data Mining - Data Mining Software – Data Collection and Preprocessing-ETL – ETL Functions – Sources of Errors in the Data – Outliers – Type of Data – Computing distance

UNIT III **12 Hours**

Association Rule Mining: Introduction – Basics – Apriori Algorithm.

Classification: Introduction- Decision tree -Decision Tree Rules –Building a Decision Tree - The Tree Induction Algorithm – Split Algorithm based on Information Theory – Over fitting and Pruning - Naïve Bayes Method – Estimation of Predictive Accuracy of Classification Methods – Other Evaluation Criteria for Classification Methods

UNIT IV **12 Hours**

Cluster Analysis: Cluster Analysis – Desired Features of Cluster Analysis - Types of Cluster Analysis Methods – **Partitional Methods:** K-Means Method – **Hierarchical Methods :** Distance between clusters – Agglomerative Method – Divisive Hierarchical Method – Density based Methods – Dealing with Large Databases – Quality and Validity of Cluster Analysis Methods – Cluster Analysis Software.

UNIT V **12 Hours**

Web Data Mining: Introduction – Web Terminology and Characteristics – Web Content Mining – Web Usage Mining – Web Structure Mining – **Search Engines:** Search Engines Functionality - Search Engines Architecture – Ranking of Web Pages.

TEXT BOOKS

1. G.K. Gupta, "Introduction to Data Mining with Case Studies", PHI, 2012.

REFERENCE BOOKS

1. Arun K. Pujari, "Data Mining Techniques", University Press (India) Limited, Hyderabad, 2006.
2. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, Third Edition, 2012.
3. Dunham, "Data Mining – Introducing and Advanced Topics", Pearson Education, New Delhi, 2003.

WEB RESOURCES

1. https://sites.google.com/a/cmrit.ac.in/data-mining/homework
2. http://www.rdatamining.com/resources/tools
3. http://glaros.dtc.umn.edu/gkhome/cluto/cluto/overview

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Identify data mining tools and techniques in building intelligent machines understand	Remember & Understand
CO2	Analyze various data mining algorithms in applying in real time applications	Understand & Analyze
CO3	Demonstrate the data mining algorithms to combinatorial optimization problems	Understand & Apply
CO4	Illustrate the mining techniques like association, classification and clustering on web mining	Understand & Apply
CO5	Perform exploratory analysis of the data to be used Data warehousing	Apply & create

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	M	S	L	L	M	S	L
CO2	M	S	S	M	S	M	M	L	M	M
CO3	M	S	S	L	M	L	M	M	S	L
CO4	M	M	M	M	M	M	L	L	S	M
CO5	M	S	S	L	S	L	-M	S	M	L

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM5	Major Based Elective VI : **Software Testing**	**6**		**-**	**4**

OBJECTIVE

The main objectives of this course are to:

- To study fundamental concepts in software testing.
- To discuss various software testing issues and solutions in software unit test, integration and system testing.
- To expose the advanced software testing topics, such as object-oriented software testing methods.
- List a range of different software testing techniques and strategies and be able to apply specific automated unit testing method to the projects.

SYLLABUS

Unit I **12 Hours**

Software Development Life Cycle models: Phases of Software project – Quality, Quality Assurance, Quality control – Testing, Verification and Validation – Process Model to represent Different Phases - Life Cycle models- Comparison of various Life Cycle Models

Unit II **12 Hours**

Types of Testing: White-Box Testing: Static Testing – Structural Testing – Challenges in White-Box Testing - Black-Box Testing: What is Black-Box Testing? - Why Black-Box Testing? – When to do BlackBox Testing? – Requirement Based Testing – Equivalence Partitioning – Domain Testing - Integration Testing: System Integration

Unit III **12 Hours**

System and Acceptance Testing: System Testing Overview – Why System testing is done? – Functional versus Non-functional Testing - Functional testing: Deployment Testing – Beta Testing - Non-functional Testing: Scalability Testing – Reliability Testing – Stress testing – Acceptance Testing – Summary of Testing Phases.

Unit IV **12 Hours**

Performance Testing: Factors governing Performance Testing – Methodology of Performance Testing – Tools for Performance Testing – Process for Performance Testing – Challenges. Regression Testing: What is Regression Testing? – Types of Regression Testing – When to do Regression Testing – Best Practices in Regression Testing.

Unit V **12 Hours**

Test Planning, Management, Execution And Reporting: Test Planning – Test Management – Test Process – Test Reporting –Best Practices. Test Metrics and Measurements: What are metrics and Measurements?- Why Metrics in Testing? –Types of Testing- Project Metrics - Release Metrics.

TEXT BOOKS

1 Software Testing Principles and Practices, Srinivasan Desikan & Gopalswamy Ramesh, 2006, Pearson Education. (UNIT-I: 2.1-2.5, 3.1-3.4 UNIT-II: 4.1-4.4, 5.1-5.5 UNIT III: 6 .1-6.7 (UNIT IV: 7.1-7.6, 8.1-8.5 UNIT-V: 15.1-15.6, 17.4-17.7)

2 Limaye M.G., "Software Testing Principles, Techniques and Tools", Second Reprint, TMH Publishers, 2010.

3 Aditya P.Mathur, "Foundations of Software Testing", 2nd Edition, Pearson Education, 2013.

REFERENCE BOOKS

1 Effective Methods of Software Testing, William E. Perry, 3rd ed, Wiley India. 2 Software Testing, Renu Rajani, Pradeep Oak, 2007, TMH.

WEB RESOURCES

1.https://lecturenotes.in/subject/129/software-testing-st/all
2. https://www.tutorialspoint.com/software_testing/index.htm

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Explain the basic concepts and the processes that lead to software testing	Understand
CO2	Design test cases from the given requirements using Black box testing techniques	Apply
CO3	Identify the test cases from Source code by means of white box testing techniques	Apply
CO4	Know about user acceptance testing and generate test cases for it	Analyze
CO5	Examine the test adequacy criteria to complete the testing process	Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	L	L	M	L
CO2	S	S	S	M	M	M	M	M	M	L
CO3	S	S	S	M	S	M	M	M	M	L
CO4	S	S	S	S	S	M	M	M	M	M
CO5	S	S	S	S	S	M	S	S	S	M

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM6	Major Based Elective V : **Internet of Things(IoT)**	**6**		**-**	**4**

OBJECTIVE

- To understand the fundamentals of Internet of Things.
- To know the ways and means of making a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the personal and real-world scenario.
- To learn the latest applications of IoT.
- To study the pros and cons of IoT.

SYLLABUS

UNIT I **12 Hours**

IoT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

UNIT II **12 Hours**

IoT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security.

UNIT III **12 Hours**

IoT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

Unit IV **12 Hours**

WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and cBusiness Intelligence.

Unit V **12 Hours**

IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

TEXT BOOKS

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds),

2."Architecting the Internet ofThings", Springer, 2011. David Easley and Jon Kleinberg, 3."Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010. Olivier Hersent, David Boswarthick, Omar Elloumi.

4."The Internet of Things – Key applicationsand Protocols", Wiley, 2012.

REFERENCE BOOKS

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition,VPT, 2014 Francis daCosta2.

2. "Rethinking the Internet of Things: A Scalable Approach to• ConnectingEverything", 1st Edition, Apress Publications, 2013 CunoPfister.

3. Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-• 4493-9357-1 25

WEB RESOURCES

1.https://www.tutorialspoint.com/internet_of_things/index.htm

2. https://www.javatpoint.com/iot-internet-of-things

3. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	To understand the fundamentals of Internet of Things.	Remember
CO2	To know the basics of communication protocols and the designing principles of protocols.	Understand
CO3	To gain the knowledge of IoT Architecture	Understand & Apply
CO4	Designing and develop Web connectivity in IoT	Understand & Apply
CO5	Analyzing and evaluate the data received through sensors in IOT.	Analyze & Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	M	M	S	S	M	M	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	M	M	S	S	M	S	M

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM7	Major Based Elective VII: **BIG DATA ANALYTICS**	**6**		**-**	**4**

OBJECTIVE

- To learn the basics concepts of Big Data and analytics.
- To become competent in recognizing challenges faced by applications dealing with very large volumes of data.
- To be able to understand how Big Data impacts business intelligence, scientific discovery, and our day-to-day life
- To understand Bigdata Analytics principles and techniques.
- To explore tools and practices for working with big data giving emphasis to Hadoop, MongoDBand MapReduce.

SYLLABUS

UNIT I **12 Hours**

Types of Digital data: Introduction **-** Classification of Digital data-Structured Data – Semi structured data – Unstructured data – **Introduction to Big Data:** Characteristics – Evolution – Challenges – What is Big data ?- Why Big data? – Traditional Business Intelligence versus Big Data – A typical DatawareHouse Environment – A typical Hadoop Environment – Coexistence of Big Data and Data Warehouse

UNIT II **12 Hours**

Big Data Analytics : What is Big Data Analytics? -- What Big Data Analytics Isn't? - Why this sudden Hype Around Big Data Analytics? - Classification of Analytics - Greatest Challenges that Prevent Business from Capitalizing Big Data - Top Challenges Facing Big Data - Why Big Data Analytics Important? - Data Science - Data Scientist - Terminologies used in Big Data

Environments-Shared Nothing Architecture—CAP Theorem - Basically Available Soft State Eventual Consistency (BASE) - Analytics Tools

UNIT III **12 Hours**

Big Data Technology Landscape:NOSQL : Introduction – Types of NoSQL databases – Advantages of NOSQL - Comparison of SQL,NoSQL and New SQL - **Hadoop:** Features – Key Advantages – versions –History - Hadoop Ecosystems – Hadoop Distributions –Hadoop Overview – Hadoop high level Architecture - Hadoop Versus SQL – Cloud based Hadoop Solutions

UNIT IV **12 Hours**

Hadoop Distributed file system: HDFS Daemons – Anatomy of File Read – Anatomy of File Write – Replica Placement Strategy – Processing data with Hadoop **–Introduction to Map Reduce Programming :** Introduction – MapReduce Daemon – How does MapReduce Function? - Mapper – Reducer – Combiner – Partitioner.

UNIT V **12 Hours**

Introduction to MongoDB: What is MongoDB?- Why MongoDB? – Terms used in RDBMS and MongoDB – Data types in MongoDB – MongoDB Query Language:-Insert-Save-Update-Remove-Find-Dealing with Null values-Count,Limit,Sort,Skip-Arrays-Aggregate Functions.

TEXT BOOKS

1. Seema Acharya, SubhasininChellappan, "BIG DATA and ANALYTICS, Wiley Publication, . First Edition,2017.

REFERENCE BOOKS

1. BIG DATA, Black BookTM ,DreamTech Press, 2015 .

2. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.

3. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

WEB RESOURCES

1.https://www.tutorialspoint.com/big_data_analytics/big_data_analytics_pdf_version.htm

2.https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs33/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand Data sources, generations, data formats, Data Evolution, Data from various domains	Remember & Understand
CO2	Understand Big Data Characteristics , Frameworks , components and Limitation of traditional approaches and map Big Vs to Data Domains	Apply
CO3	Understand the Concepts of Data Analytics Phases and Techniques	Understand
CO4	To explore tools and practices for working with big data giving emphasis to Hadoop, MapReduce	Understand & Evaluate
CO5	Analyze various domains of Data Characteristics, Platform, Programming Model and Design Data Analytic ecosystem, and data processing framework	Analyze & Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	S	S	S	M	M	M	S	S

CO2	M	M	N	M	S	S	S	S	S	S
CO3	M	M	M	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	-S	S	S	S

S- Strong; M-Medium; L-Low

SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAM8	**Major Based Elective VIII**: Mobile Computing	**6**	**-**	**-**	**4**

OBJECTIVE

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system .
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

SYLLABUS

UNIT I **12 Hours**

Introduction: Applications - A Simplified Reference Model. Wireless Transmission: Frequencies for radio transmission – Signals – Antennas - Signal Propagation – Multiplexing – Modulation – Spread Spectrum - Cellular System.

UNIT II **12 Hours**

Medium Access Control: Motivation for a Specialized MAC: Hidden and exposed terminals – Near and far terminals – SDMA – FDMA – TDMA: Fixed TDM – Classical Aloha. Reservation TDMA – Multiple Access with Collision Avoidance – Polling – Inhibit Sense Multiple Access. CDMA: Spread Aloha multiple access.

UNIT III **12 Hours**

Telecommunication Systems: GSM: Mobile Services – System Architecture – Radio Interface – Protocols - Localization and Calling – Handover – Security. UMTS and IMT 2000: UMTS

releases and standardization - UMTS System Architecture - UMTS Radio Interface –UTRAN - UMTS Handover.

UNIT – IV **12 Hours**

Satellite System: History – Applications – Basics - Routing– Localization – Handover. Wireless LAN: IEEE 802.11: System Architecture – Protocol Architecture - Physical Layer – Medium Access Control Layer. Bluetooth: User scenarios – Architecture – Radio Layer – Baseband Layer – Link Manager Protocol.

UNIT – V **12 Hours**

Mobile Network Layer: Mobile IP: Goals, Assumption, and Requirements – Entities and Terminology – IP Packet delivery – Agent discovery – Registration. Dynamic Host Configuration Protocol Mobile Transport Layer: Traditional TCP - Congestion Control – Slow Start – Fast Retransmit.

TEXT BOOKS

1. Jochen Schiller, "Mobile Communications", 2 Edition, eighth impression, Pearson Education, 2011.

REFERENCE BOOKS

1. William Stallings, "Wireless Communication and Networks", 2 Edition, Pearson Education, 2005.

2. Theodore Rappaport, "Wireless Communications: Principles and Practice", Prentice Hall Communications,1996.

WEB RESOURCES

1.https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

2. https://www.tutorialspoint.com/mobile_computing/index.htm

3. https://www.javatpoint.com/mobile-computing

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remembering the basic of basics of mobile Computing	Remember
CO2	Describe the generations of telecommunication systems in wireless networks	Understand
CO3	Examine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network	Apply
CO4	Analyze functionality of Transport and Application layers	Analyze
CO5	Analyze the functionality of Mobile IP and Transport Layer	Analyze

MAPPING WITH PROGRAM OUTCOMES

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	L	M	S	M	S	M	M
CO2	S	S	L	S	M	S	M	M	S	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	M	S	M	M	M	S	M	S	M

S- Strong; M-Medium; L-Low

SEMESTER III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22CAUN1	Non-Major Elective Course I:Principles of Internet	**2**		**-**	**2**

OBJECTIVE

- To provide an overview of working principles of Internet.
- To understand and apply the fundamental core java, packages, database connectivity for Computing.
- To enhance the knowledge to server side programming.
- To provide knowledge on Web related Functionalities.

SYLLABUS

UNIT – I **4 Hours**

Introduction to the Internet – Basics of Networks – Topologies of Networks – Types of networks.

UNIT – II **4 Hours**

Basics of Internet – Address and Names for the Internet – Web Objects and Sites – E-mail – World Wide Web.

UNIT – III **4 Hours**

File Transfer – The Telnet – The Usenet – Internet Chat.

UNIT – IV **4 Hours**

The Web Server – Web Browser – Microsoft Internet Explorer – Firewalls – Data Security.

UNIT – V **4 Hours**

Art of creating a website – Hypertext and HTML – HTML Document Features – Document Structuring Tags in HTML – Special Tags in HTML.

TEXT BOOKS

1. Raj Kamal , "Internet and Web Technologies", Mc GrawHill Education,2007.

REFERENCE BOOKS

1. Joe krayank & Joe Habraken, "Internet 6 in 1", Prentice Hall of India Private Limited, New

Delhi, 1998.

2. "Internet Complete", BPB publications, New Delhi, 1998.

WEB RESOURCES

1. https://www.khanacademy.org/computing/ap-computer-science-principles/the-internet
2. https://cs.smu.ca/~porter/csc/465/notes/net/internetprinciples.html#:~:text=The%20Internet%20is%20the%20network,are%20others%20at%20lower%20levels.)
3. https://www.tutorialspoint.com/internet_technologies/internet_overview.htm

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	List the basic concepts of Networkingand protocols	Remember
CO2	Understand the basic concepts of Internet, WWW, browsers and Email	Understand

CO3	Knowledge on file transfer, telnet and chat	Remember &analyze
CO4	Understand the web browser, firewalls and data security	Apply
CO5	Understand and apply the HTML, HTML elements and formatting styles	Understand & Apply

MAPPING WITH PROGRAM OUTCOMES

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

S- Strong; M-Medium; L-Low

SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCAN2	Non-Major Elective Course - II :Internet of Things(IoT)	**2**		**-**	**2**

OBJECTIVE

- To understand the fundamentals of Internet of Things and Design logics.
- To understand IoT enabling technologies
- To apply the concept of Internet of Things in the personal and real-world scenario.
- To Differentiate Internet of Things and Machine to Machine .
- To know the design methodology of Internet of Things.

SYLLABUS

UNIT I **4 Hours**

Introduction to IoT- **Introducton**: Definition and Characteristics of IOT. **Physical Design of IOT:** Things in IOT- IOT Protocols. **Logical Design of IOT:** IoT Functional Blocks-IoT Communication Models- IOT Communication APIs.

UNIT II **4 Hours**

IoT Enabling Technologies: Wireless Sensor Networks-Cloud computing-Bigdata Analytics-Communication Protocols- Embedded Systems.

UNIT III **4 Hours**

Domain Specific IoTs: Introduction. **Home Automation:** Smart Lighting-Smart Appliances-Intrusion Detection- Smoke/ Gas Detection. **Cities:** Smart Parking-Smart Lighting-Smart Road-Structural Health Monitoring-Surveillance- Emergency Response. **Environment:** Weather Monitoring-Air Pollution Monitoring- Noise pollution Monitoring-Forest Fire Detection- River Flood Detection.

UNIT IV **4 Hours**

IoT and M2M: Introduction – M2M- Difference between IoT and M2M. **SDN and NFV for IoT:** Software Defined Networking-Network Function Virtualization.

UNIT V **4 Hours**

IoT Platforms Design Methodology: Introduction- IoT Design Methodology- Case study on IoT system for Weather Monitoring.

TEXT BOOKS

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things – A hands-on approach", Universities Press, 2nd Edition, 2015.

REFERENCE BOOKS

1. Jan Holler, Vlasios Tsiatsis, Catherin Mulligan Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Academic press, 2014.
3. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

WEB RESOURCES

1. https://www.webnms.com/?gclid=EAIaIQobChMIjpu9tfG_1QIVFoaPCh3hsgjqEAAYASAAEgKl1fD_BwE
2. https://www.sap.com/india/trends/internet-of-things.html?campaigncode=CRM-IN17-PPC-1SCCA&source=PPC-India-DSC-OO&gclid=CLCvvcTxv9UCFRPyjgodNWIILw&gclsrc=ds
3. https://www.analyticsvidhya.com/blog/2016/08/10-youtube-videos-explaining-the-real-world-applications-of-internet-of-things-iot/

COURSE OUTCOMES

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Remember the fundamentals of Internet of Things.	Remember
CO2	Acquire sufficient Knowledge about IoT Enabled Technologies	Acquire
CO3	To apply the concept of Internet of Things in the personal and real-world scenario	Apply
CO4	To differentiate the IoT and M2M	Differentiate

CO5	Knowing IoT Design Methodology and Implement on various fields	Knowledge & Implement

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	M	M	S	S	M	M	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	M	M	S	S	M	S	M

S- Strong; M-Medium; L-Low