PROGRAMME STRUCTURE

FOR

DIPLOMA PROGRAMME IN

COMPUTER ENGINEEERING

UNDER RATIONALISED SEMESTER SYSTEM
(IMPLEMENTED FROM ACADEMIC YEAR 2020-2021)

BOARD OF TECHNICAL EDUCATION, GOA STATE

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March 2020

DIPLOMA IN COMPUTER ENGINEERING

(GC101) Communication Skills

1. COURSE OBJECTIVE :

The course aims to develop Communication skills in English by improving students' ability to write ,speak, listen and read effectively. Emphasis is also laid on students' personality development, helping them to build their confidence in interpersonal / group communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	I								
Course code & course title	**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(GC101) Communication Skills	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
	-	**-**	**02**	**32**	**-**	**-**	**25**	**25**	**50**

3 . COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC101.CO1   Understand the essentials of effective Communication.

GC101CO2   Develop reading. writing, speaking , listening and effective presentation skills.

GC101.CO3 Select the appropriate mode of Communication .

GC101.CO4 Demonstrate reading. writing, speaking , listening and effective presentation skills.

4.Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	0	0	0	0	3	3	3
CO2	1	0	1	0	3	3	3
CO3	1	0	1	0	3	3	3
CO4	1	0	0	0	3	3	3

Relationship   : Low-1   Medium-2   High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Phr = Practical hours	CO = Course Outcomes		
Unit		**M**	**Phr**	**CO**
1 UNIT NAME: FUNDAMENTALS OF COMMUNICATION SKILLS		**-**		**CO1 CO2 CO3 CO4**
1.1 **Communication Skills fundamentals** Definition, communication process, importance of Communication Skills, essentials of effective communication			01	

1.2 **Types of communication**: verbal Communication and Nonverbal communication (Body language, facial expressions, gestures, eye contact, posture, dress and grooming/personal appearance, deportment, personal hygiene) Paralinguistic (Volume, pace, pitch, pauses)	02	
1.3 **Barriers to communication:** physical barriers, psychological barriers and cultural barriers	01	
2. Unit: PRESENTATION SKILLS		
2.1 Presentations: Methods and style of presentation, Importance, planning a presentation, venue selection, audience awareness (age, gender, profession background, educational and social background) time and duration, audio visual aids (OHP, LCD projector, flip charts, white/black/green board, computer, microphone)	02	CO2 CO3 CO4
2.2 Public speaking: preparatory steps, tips for good beginning and end, delivery style, techniques for a good speech (repetition, signs, pictures, humor), body language	02	
3 UNIT: TECHNICAL Writing		
3.1 Report **writing** Functions and parts of a report, Qualities of a good report, and types: Report on any institute function, Accident report, Industrial visit Report	04	
3.**2 Business letters** Principles of effective letter writing, parts of a business letter, formats (Full block style, Semi block style, modified block style) Routine/ Generic letters (letter to the heads of the institute, letter to the heads of various departments/sections of the institute) Types of letters: Enquiry Letter, Quotation, Purchase Order, Letter of Complaint	06	CO1 CO2 CO4
3.3 **Job application** Tips for a good C.V and a Resume	02	
4 UNIT GRAMMAR	-	
4.1 Fundamentals of English writing Subject verb agreement, homonyms, homophones, homographs, articles, Punctuation, synonyms, fundamentals of sentence construction	02	CO1 CO2 CO4
4.2 Paragraph Writing: Developing Topics (the main idea), body (supporting sentences), conclusion, proof reading	02	
UNIT V: LANGUAGE WORKSHOP	-	08	CO1

5.1 Reading Skills strategies to use for building vocabulary and reading fluencies (read extensively, identify new words, use of dictionary, online dictionary apps), reading comprehension, pronunciation, debate, role play,			CO2 CO4
5.2 Listening Skills How to listen effectively, listening comprehension			
5.3 Speaking skills speech, group discussion			
5.4 Writing skills précis writing, comprehension			
Total		**32**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, videos, exercises

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	NO of lectures	Marks
1	Fundamental of Communications skills	04	-
2	Presentation Skills	04	-
3	Technical Writing	12	-
4	Grammar	04	-
5	Language workshop	08	-
	Total	32	25

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	**Practical Title: Fundamental of Communications skills**
i.	Comprehension
ii.	Précis writing
iii.	Self-Introduction
2	**Practical Title: Presentation Skills**
iv.	Extempore speech
v.	Presentation on any given Topic
3	**Practical Title: Technical Writing**
vi.	Accident Report
vii.	Report on Institute function
viii.	Industrial visit report
ix.	Generic letters to the heads of various department/ Sections of the institute
x.	Inquiry letter
xi.	Quotation
xii.	Purchase or supply order
xiii.	Complaint letter

xiv.	Job application
4	**Grammar**
xv.	Exercises in subject – verb agreement
xvi.	Exercises in use of preposition
xvii.	Exercises in use of Homophones, homonyms, homographs
xviii.	Exercises in use of punctuation
xix.	Exercises relating to correcting the sentences
xx.	Paragraph writing
5	**Language workshop**
xxi.	Exercises to improve Reading skills
xxii.	Exercises to improve Writing skills
xxiii.	Group discussion
xxiv.	Listening comprehension

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R. C. Sharma & Krishna Mohan	Business Correspondence and Technical Writing	Tata McGraw Hill
2	P. Prasad, Sharma, K. Rajendra	The Functional aspects of communication skills	S.k. Kataria& sons
3	SanjayKumar,Pushpa Lata	Communication Skills	Oxford University Press
4	A.K.Jain,A.M.Shaikh&Pravin S R Bhatia	Professional communication Skills	S.Chand
5	Wren & Martin	High School English Grammar & Composition	S. Chand, N. Delhi

10.Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Raul R. Timm	How to make winning presentations	Sneha Printers
2	Dale Carnegie, Training CPI	Stand and Deliver, How to become a masterful communicator and public speaker	Cox & Wyman, UK
3	John Seely	The Oxford Guide to Effective Writing and speaking	Oxford University Press

Autobiographies, self-help books, Audio speeches given by famous personalities

Internet and Web Resources

https://www.grammarly.com/
https://www.bbc.co.uk/programmes/articles/5QFnVy3xzT5htTh13cmP2P8/teacher-resources
https://Ted.com

Videos and Multimedia Tutorials

https://you.tu.be/AykYRO5d_II

(GC102) Engineering Mathematics I

1. COURSE OBJECTIVE:

1. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2.TEACHING AND EXAMINATION SCHEME

Semester	I							
Course code & course title		Periods/Week (in hours)			Total hours	Examination Scheme		
						Theory Marks		Term Work	Total Marks
(GC102) Engg.Maths I		L	T	P	H	TH	TM	TW	
		4	2	-	96	75	25	25	125

3.COURSE OUTCOMES:

GC102.CO1. Understand the basic mathematical concepts for Engineering applications.

GC102.CO2. Identify and use appropriate formulae for solving practical engineering

problems

GC102.CO3. Apply formulae of algebra, geometry, trigonometry and calculus for solving

problems.

GC102.CO4 . Co-relate mathematical formulae to practical problems.

4.Mapping Course Outcomes with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	2	1	0	0	0	2
CO2	3	3	1	0	1	0	1
CO3	2	2	3	3	2	0	1
CO4	2	3	3	2	1	1	1

Relationship   :Low-1   Medium-2   High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	

Unit	Marks	Thr	CO
1 MATHEMATICS FUNDAMENTAL	**8**	**6**	**CO1**
1.1 **Polynomials: Types** of polynomials, addition subtraction, (no question to be asked), Multiplication and division of polynomials	3	2	
1.2 **: Algebraic equations:**Different types of equations and their geometric meaning(line,circle parabola only) ,equations with one, two and three variables and solving equations with two and three variables Quadratic equations and nature of their solutions	3	2	
1.3: Logarithm: Definition of log, log with base 'e' and base'10' Properties of log, log and antilog , problems using definition and properties of log.	2	2	
2.STRAIGHT LINES AND CIRCLES	15	14	**CO1, CO4**
2.1: Straight line: Intercept, slope, intersection of lines Equations of line: 1. Slope intercept form, slope point form, two points form, parallel and perpendicular lines, angle between lines Perpendicular distance of a point from line	8	7	
2.2: Circle: circle as a locus, Centre, diameter, chord of a circle Equations of circle: Centre radius form, diameter form, general form and sums	7	7	
3. TRIGONOMETRY			**CO1, CO3**
3.1: Angle and measurement, degree and radians and conversion and related sums, arc length and area of sector and sums **3.2:** Trigonometric ratios and identities 3.3: Trigonometric ratios of compound and allied angles 3.4: Product formulae $\sin A+\sin B$, $\cos A+\cos B$ **3.5:** Sum and difference formulae **3.6:** Multiple angle 2A, and their trigonometric ratios, **3.7**: Sine rule, Cosine rule in triangle, solution of triangle	12	15	
4 : MENSURATION	10	6	**CO1, CO4**
4.1: Areas of 2D figures like quadrilaterals, circle triangle etc (no questions to be asked)			

4.2: Surface area and volumes of cube, sphere, cylinder, cone, (no question to be asked) Surface areas and volumes of prism, pyramid, **4.3**: Frustum of cone, pyramid and their surface areas and volumes. **4.4:** Simpson's 1/3 rd rule for area and volume			
5 :CALCULUS	30	23	**CO1, CO2, CO3, CO4**
5.1:Limits 5.1.1 : Pre requisite : Sets , intervals, relation and function (no questions to be asked) 5.1.2 : Limit of a function , algebraic properties of limits 5.1.3: Limits of algebraic, trigonometric, exponential, logarithmic functions	7	6	
5.2 : Derivatives 5.2 .1: Derivative definition by first principle (no question to be asked) 5.2.2: Standard formulae, Algebraic properties of derivative $(u \pm v)$ etc. 5.2.3: Derivatives of algebraic, trigonometric, exponential, logarithmic functions 5.2.4: Derivative of product of functions (uv rule). 5.2.6: Derivative of quotient of functions (u/v rule) 5.2.7: Derivative of composite functions 5.2.8: Derivative of parametric functions 5.2.9: Derivative of implicit functions 5.2.10 : Logarithmic differentiations 5.2.11: Second order derivatives (no question to be asked)	15	12	
5.3 : Applications of derivatives 5.3.1: Application to the geometry: i) derivative as a slope of a tangent ii) to find equations of tangent and normal at given point on the curve 5.3.2: Application to the Linear motion:i) displacement, velocity,acceleration 5.3.3: Application to the rate measure i) to find rate change in area and volume etc 5.3.4 : Maxima and minima	8	5	
Total	**75**	**64**	

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises

7. SPECIFICATION TABLE FOR THEORY

Unit No	Unit	Number of lectures	Marks
1	**Mathematics Fundamental**	06	8
2	**Straight line and circle**	14	15
3	**Trigonometry**	15	12
4	**Mensuration**	06	10
5	**Calculus**	23	30
	Total	**64**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

- Tutorial books should be maintained by students   (5 marks)

- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus

- Topic-wise class assignment   (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	S.B. Gore, M.B.Patil, S.P. Pawar	Applied Mathematics	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers and distributers Pvt.Ltd. ,Pune
3	Set Theory and related topics	Seymour Lipschutz	McGraw-Hill

(GC103) APPLIED PHYSICS-I

1.COURSE OBJECTIVE :

On successful completion of the course, Students completing the Applied Physics I course will be able to demonstrate competency and understanding of the basic concepts found in, Units and Dimensions, Kinematics of motion in one dimension Force Work Power and Energy, Circular Motion and Gravitation, Properties of Matter and Heat and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge

2.TEACHING AND EXAMINATION SCHEME

Semester	I								
Course code & course title	**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(GC103) Applied Physics I	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
	03	**0**	**02**	**80**	**75**	**25**	**25**	**-**	**125**

3.COURSE OUTCOMES:

GC103.CO1: Understand the Fundamental concepts of physical quantities, Force, Power, Energy, Motion, Matter and heat transfer used in Engineering applications.

GC103.CO2: Explain the concepts of Dimensions, Work, Power , Energy ,Motion, properties of matter and heat transfer

GC103.CO3: Apply the Knowledge of Physical quantities, Types of motions, Force, work ,Power, properties of matter and heat transfer in Engineering applications

GC103. CO4: Analyze different types of Physical quantities, motions, properties of matter, and modes of heat transfer

4. Mapping Course Outcomes with Program Outcomes

Relationship: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentatn& Testing	Engg. Practices for Society,Sustainability& Environment	Project Management	Life -long Learning
CO 1	3	1	1	3	2	0	3
CO 2	3	1	2	3	0	0	3
CO 3	3	1	2	2	0	1	1
CO 4	1	1	2	2	0	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Outcomes			

Unit	Thr	M	CO
1 UNIT NAME: UNITS AND DIMENSIONS	**08**	**12**	**CO1, CO2, CO3, CO4**
1.1 Fundamental and Derived units ,			
1.2 Different system of units, SI unit conversion from one system to other,			
1.3 Principle of Homogeneity,			
1.4 Dimensions, dimensional formula,			
1.5 dimensonal correctness of given equation using dimensions			
1.6 least count of vernier calliper and screw gauge			
1.7 zero errors-- in case of vernier calliper and screw gauge			
1.8 Types of error.			
2. UNIT NAME: MOTION IN ONE DIMENSION, FORCE, WORK,POWER AND ENERGY	**10**	**16**	**CO1, CO2, CO3, CO4**
2.1 Distance and displacement,			
2.2 Scalar and Vectors			
2.3**,** Speed and Velocity, Uniform Velocity, ,			
2.4 Uniform acceleration,acceleration due to gravity			
2.5 Equation of motion ($v=u+at$, $v^2=u^2+2as$, $s=ut+1/2at^2$)(no derivation)			
2.6 Motion under gravity. Force and its unit.			
2.7 Work and its unit. Energy, law of conservation of energy,			
2.8. Kinetic and Potential energy equation and examples.			
3. UNIT NAME: Uniform Circular Motion and Gravitation	**10**	**16**	**CO1, CO2, CO3, CO4**
3.1 Unifrom circular motion,			
3.2 Definition angular displacement,angular velocity, ,			
3.3 Conversion from rpm to rad/sec,$v=r\omega$, tangential velocity, radial acceleration			
3.4 Centripetal force and centrifugal force, examples,			
3.5 Banking of roads,superelevation, expression for angle of banking			
3.6 Newtons law of gravitation, acceleration due to gravity ,			
3.7 Expression for acceleration due to gravity. Escape velocity, Critical velocity, and periodic time definition and expression (no derivation)			

3.8. Sattellite, types(Geosationary,communication remote sensing)			
4. UNIT NAME: PROPERTIES OF MATTER	**10**	**16**	**CO1,**
4.1 Elasticity ,			**CO2,**
4.2 Stress, Strain,Hooke's law,			**CO3,**
4.3 Youngs Modulus,			**CO4**
4.4 Bulk Modulus, Rigidity Modulus,			
4.5 Stress v/s Strain graph			
4.6 Yield point, breaking stress,factor of safety, ,			
4.7 Surface tension definition and example			
4.8. Adhesive and cohesive force, application,			
4.9 liquid miniscus and angle of contact, capillarity,			
4.10 Expression for surface tension (no derivation), applications. viscocity,			
4.11 Definition velocity gradient, newtons law of viscocity, terminal velocity,stokes law,			
4.12 Streamline flow and turbulent flow,critical velocity, application of viscocity.			
5. UNIT NAME: HEAT	**10**	**15**	**CO1,**
5.1 Statements of boyles law,charles law,gay lussacs law			**CO2,**
5.2 General gas equation,specific heat definition and unit, Latent heat definition and unit			**CO3,**
5.3 Modes of transfer of heat, conduction, convection and radiation,			**CO4**
5.4 Conduction of heat through a metall rod,			
5.5 Variable and Steady state			
5.6 law of thermal conductivity (With Derivation)			
5.7 Applications of thermal conductivity, ,			
5.8. Thermal expansion of solids			
5.9 linear expansion,superficial expansion,			
5.10 Cubical Expansion			
5.11 Realtion betwenn α,β,γ (no derivation)			
5.12 Engineering applications of expansion of solids.			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	UNITS AND DIMENSIONS	8	12
2	MOTION IN ONE DIMENSION, FORCE, WORK AND ENERGY	10	16
3	UNIFORM CIRCULAR MOTION AND GRAVITATION	10	16
4	PROPERTIES OF MATTER	10	16
5	HEAT	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Basic Conversion Techniques from one system of units to the other	25
2.	Use of Vernier callipers to find the Volume of Hollow cylinder, Block	25
3.	Use of Screw gauge to find the cross-sectional area of a wire and thickness of a clip	25
4.	To find the Coefficient of Viscosity of a given liquid by stokes method	25
5.	To Find the coefficient of Thermal Conductivity by Searle's Method	25
6	To Find the Surface Tension of a given liquid by capillary rise method	25
7	To Find Young's Modulus by Searles Method	25
8	To Find acceleration due to gravity by simple pendulum method.	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC104) Applied Chemistry

1. COURSE OBJECTIVE:

Chemistry is the branch of Science which deals with the study of composition, properties and changes in matter. An understanding of the basic concepts of Applied Chemistry, chemical principles and chemical properties of materials is essential to all the engineers. The emphasis is on applying the knowledge of principles of chemistry in all the fields of engineering wherein students appreciate the significance of chemistry in day to day life. The subject develops in students the habit of scientific enquiry, the ability to investigate cause and effect relationship & the ability to interpret & analyze the results.

2. TEACHING AND EXAMINATION SCHEME

Semester	I								
Course code & course title	Periods/Week (in hours)			Total Credits (Hours)	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(GN104) Applied Chemistry	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	80	75	25	25	-	125

3. COURSE OUTCOMES:

GC 104.CO1: Understand the fundamental concepts of Atomic Structure, electrochemistry, water quality, corrosion and polymers.

GC 104.CO2: Explain the process of Chemical bonding, water softening, electroplating, corrosion control and polymerization

GC 104.CO3: Relate the principles of Chemical Bonding, Electrolysis, water hardness for domestic and Industrial applications and properties of polymers.

GC 104.CO4: Distinguish between types of Chemical bonding, Water softening methods, corrosion control methods, different processes of metal coating and different polymers.

4. Mapping Course Outcomes with Program Outcomes

	PO 1 Basic Discipline & Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimenting & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life-long Learning
CO1	3	2	1	1	2	1	1
CO2	2	3	2	1	3	1	2
CO3	3	2	2	2	3	1	2
CO4	3	2	2	2	2	1	1

Relationship   :   Low-1   Medium-2   High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			

Unit	Mks	Thr	CO
UNIT 1.0 : ATOMIC STRUCTURE AND CHEMICAL BONDING	15	10	CO1 CO2 CO3 CO4
1.1 Atomic Structure 1.1.1 Fundamental particles and their characteristics. 1.1.2 Energy levels - Definition & designation 1.1.3 Sub Energy levels- Definition & designation 1.1.4 Orbital – Concept & shape (s and p only) **1.2** Quantum numbers 1.2.1 Designation, definition, values.			
1.3 Electronic distribution (Elements from atomic Number 1-20) 1.3.1 Bohr – Bury's laws for distribution of electrons in shells (1st three laws only) 1.3.2 Aufbau Principle. for distribution of electrons in sub-shells 1.3.3 Pauli's Exclusion Principle. 1.3.4 Hund's Rule of maximum multiplicity 1.3.5 Orbital Electronic Configuration of elements (from atomic numbers 1 to 20 only).			
1.4 Chemical Bonding 1.4.1 Lewis and Longmuir concept of stable configuration. 1.4.2 Electrovalent - Bond - Concept Formation of Electrovalent Compound (NaCL & MgO) 1.4.3 Covalent Bond – Concept Formation of Colvalent Compounds (Cl_2, O_2, N_2) 1.4.4 Co-ordinate Bond - Concept Formation of Co-ordinate Compounds (O_3) 1.4.5 Properties of Electrovalent, Colvalent & Co-Ordinate compounds.			
UNIT 2.0 : WATER	15	10	

			CO1
2.1 Hardness of Water 2.1.1 Soft and Hard Water - Concept Soap Test (Chemical Equation not expected) 2.1.2 Causes of Hardness 2.1.3 Types of Hardness 2.1.4 Degree of Hardness & Units of Hardness (mg/L & ppm)			CO2 CO3 CO4

2.2 Disadvantages of Hard Water
2.2.1 Domestic Purpose
Drinking, cooking, Washing & Bathing.
2.2.2 Industrial Purpose
    (Paper Industry, Textile & Dyeing Industry, Sugar Industry, Bakery & Concrete Making)
2.2.3 Boilers- Steam Generation Purpose.
    Sludge formation – causes & Disadvantages (No chemical equation expected)			

2.3 Water Softening 2.3.1 Zeolite and Ion Exchange process of water softening			
2.4 Desalination of water 2.4.1 Electrodialysis & Reverse Osmosis process. 2.4.2 pH- Concept, pH scale & Importance of pH			
UNIT 3.0 : <u>ELECTROCHEMISTRY</u>	**12**	**08**	CO1 CO2
3.1 Electrolytic dissociation 3.1.1 Arrhenius theory of Electrolytic dissociation 3.1.2 Factors affecting degree of Ionization- nature of solute, nature of solvent, concentration of solution and temperature.			CO3 CO4

3.2 Electrolysis
3.2.1 Mechanism of Electrolysis.
    Ionization Reactions
    Reactions at cathode, Activity series of Cations.
    Reactions at Anode, Activity series of Anions.
 	
3.2.2 Electrolysis of
    Molten NaCl using Carbon Electrodes.
    Aqueous NaCl using Platinum Electrodes.
    Aqueous $CuSO_4$ using Platinum Electrodes.
    Aqueous $CuSO4$ using copper Electrodes.			

3.3 Electrochemical series – Definition and Significance			
UNIT 4.0 : CORROSION AND ITS CONTROL	**25**	**14**	CO1
4.1 Dry /Direct Chemical corrosion 4.1.1 Definition 4.1.2 Oxidation corrosion			CO2 CO3 CO4

4.1.3 Corrosion due to other gases.			
4.3 Types of Electrochemical corrosion. 4.3.1 Galvanic Cell corrosion 4.3.2 Concentration cell corrosion(Metal ion concentration & differential Aeration)			
4.4 Corrosion Control Protection of metals by: 4.4.1. Using Pure Metals & Metal alloys 4.4.2 Proper designing 4.4.3 Modifying the environment (De- aeration, Deactivation, Dehumidification, Alkaline neutralization) 4.4.4 Cathodic protection (Sacrificial anode and Impressed current cathodic protection) 4.4.5 Metal Coating (Galvanizing, Tinning, Metal-Spraying, Electroplating & powder coating)			
UNIT 5: POLYMERS	08	06	CO1 CO2 CO3 CO4

5.1 Concept of Monomers & Polymers
 	
5.2 Polymerization- Definition.
5. 2.1 Addition polymerization-Definition.
5.2.2 General equation of polymerization of :-
        Ethylene to Polyethylene.
        Vinyl chloride to Polyvinylchloride
        Tetra fluoro ethylene to Poly tetra fluoroethylene(PTFE)
5.2.3 Condensation Polymerization-Definition
5.2.4 General Equation for formation of Phenol formaldehyde Resin.
5.3 Plastics.
5.3.1 Types of plastic (Thermosetting and Thermo softening), Examples
5.3.2 Properties and applications of Poly-ethylene, PVC, polystyrene, Nylons, Bakelite & silicones.			

5.4 Rubber 5.4.1 Natural Rubber 5.4.2 Drawbacks of Crude rubber. 5.4.3 Vulcanization of Rubber (General Equation) 5.4.4 Rubber examples. 5.4.5 Properties of Synthetic Rubber & related applications.			

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**ATOMIC STRUCTURE AND CHEMICAL BONDING**	10	15
2	**WATER**	10	15
3	**ELECTROCHEMISTRY**	08	12
4	**CORROSION & IT'S CONTROL**	14	25
5	**POLYMERS**	06	08
	Total	**48**	**75**

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
	Practical Title
1.	Double Acid-Base Titration using Phenolphthalein.
2.	Acid- Base titration using Methyl orange.
3.	Redox Titration of $KMnO_4$ soln., $FeSO_4$ soln. and Oxalic acid
4.	Determination of degree of Hardness by E.D.T.A method.
5.	Determination of Total Alkalinity of water sample.
6.	Determination of Chloride content of water sample by Mohr's method.
7.	pH- Metric titration.
8.	Conduct metric Titration.
9.	Determination of Conductivity of water samples from different water body sources.
10.	Corrosion Susceptibility of Aluminum to Acid or Base.
11.	Determination of pH of different food items.
	Total Marks: 25
	No Class room Assignments

* Any TEN of the above.

**Term Work Assessment Scheme: 1. Performance:15 marks (Carrying out experiment, Readings, Calculations and Results)

2.Knowledge   :05 Marks(Theory of the experiment)

3. Journal : 05 Marks

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	M.M. Uppal	Text book of Engg. Chemistry	Khanna Publisher
2	V.P.Mehta	Text book of Engg. Chemistry	Jain Bros. Delhi
3	S.N Narkhede	Textbook of Engg. Chemistry	Niraj Prakashan
5	S S Dara	A Textbook of Engg. Chemistry	S Chand & Co
4	P.C. Jain and M.Jain	Engg. Chemistry.	Dhanpat Rai Publishing Co.

(GC105) Basic Engineering Practice (Electronics& Comp.)

1. **COURSE OBJECTIVE:**

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	100	150

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life-long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1   Medium-2   High-3

PART B

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life-long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1   Medium-2   High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Hr = Practical Hours	CO = Course Outcomes		

Unit	M	Hr	CO
1 General Safety, Housekeeping, Fire Fighting & First Aid	10	06	
1.1 Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4 Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.			CO1
2 Fitting Workshop Practice	30	18	
2.1 Introduction to the trade. 2.2 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.3 Types of files and filing methods.			CO1 CO2 CO3

2.4 Drill bits and drilling Processes, using portable and pillar drilling machine.			
2.5 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling			
2.6 Threading using taps and dies.			
3 Carpentry Workshop Practice	20	18	
3.1 Introduction to carpentry			CO1
3.2 Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools			CO2
			CO3
3.3 Wood working processes.			
3.4 Different types of joints and their usage.			
3.5 Introduction to wood working machines:			
3.6 Lathe			
3.7 Circular saw			
3.8 Band saw			
3.9 Wood planner			
3.10 Universal wood working machine			
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety.			CO1
4.2 Use of different hand tools used in electrical trade			CO2
4.3 Collection of details of motors and transformers.			CO3
4.4 Introduction to Control Panel and its various sections/components.			CO4
4.5 Making of wire joints.			
4.6 Measurement of current, voltage, frequency and Power Consumption.			
4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor.			
4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial).			
4.9 Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board			
4.10 Study, connection & use of Energy Meter			
4.11 Testing of components using Series test lamp & Multimeter			
4.12 Study of Fuses & practice replacement of Fuse			
4.13 Study & Troubleshooting of Tube Light			
5 Plumbing	10	06	
5.1 Plumbing tools, pipe fittings and method of joining pvc pipes.			CO1
5.2 Use of spirit level and plumb bob.			CO2
5.3 Minor repairs and replacement of fittings.			CO3
5.4 Reading of plumbing drawings.			
[Note: Plumbing restricted to domestic plumbing and pvc piping.]			
Total	**100**	**80**	

6. COURSE DELIVERY:
The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	Unit	Number of hrs.	Marks
1	General Safety, Housekeeping, Fire Fighting & First Aid	06	10
2	Fitting Workshop Practice	18	30
3	Carpentry Workshop Practice	18	20
4	Electrical Workshop Practice	32	30
5	Plumbing	06	10
	Total	80	100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hrs.
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02

i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES
TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC106) Basic Engineering Practice (Mech & Elect.)

2. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	75	125

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1   Medium-2   High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1   Medium-2   High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Hr = Practical Hours	CO = Course Outcomes			

Unit	M	Hr	CO
1 General Safety, Housekeeping, Fire Fighting & First Aid		06	
1.1 Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4 Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.			CO1
2 Fitting Workshop Practice		18	

2.7 Introduction to the trade. 2.8 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.9 Types of files and filing methods. 2.10 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.11 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.12 Threading using taps and dies.			CO1 CO2 CO3
3 Carpentry Workshop Practice	20	18	
3.10 Introduction to carpentry 3.11Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.12 Wood working processes. 3.13 Different types of joints and their usage. 3.14 Introduction to wood working machines: a.　Lathe b.　Circular saw c.　Band saw d.　Wood planner e.　Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4　Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial). 4.9Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board 4.10 Study, connection & use of Energy Meter 4.11Testing of components using Series test lamp & Multimeter 4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			CO1 CO2 CO3 CO4
5 Plumbing		06	
5.1 Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total		**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	Unit	Number of hrs.	Marks
1	General Safety, Housekeeping, Fire Fighting & First Aid		10
2	Fitting Workshop Practice		30
3	Carpentry Workshop Practice		20
4	Electrical Workshop Practice		30
5	Plumbing		10
	Total		100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hrs.
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES
TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC201) ENGINEERING MATHEMATICS II

1. COURSE OBJECTIVE:

2. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2. TEACHING AND EXAMINATION SCHEME

Semester	II								
Course code & course title		Periods/Week (in hours)			Total hours	Examination Scheme				
						Theory Marks		TERM WORK		Total Marks
(GC201) Engineering Mathematics II		L	T	P	H	TH	TM	TW	PR/OR	
		4	2	-	96	75	25	25	-	125

3.COURSE OUTCOMES:

GC201.CO1: Understand the basic principles of Matrices ,Integration, Determinants and Vectors in engineering problems.

GC201.CO2: Interpret the formulae to solve problems of Matrices ,Integration, Determinants and Vectors.

GC201.CO3: Apply appropriate mathematical methods for solving engineering problems.

GC201.CO4: Analyse the knowledge of Matrices ,Integration, Determinants and Vectors
 for various Engineering applications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	1	1	2	0	2	2
CO2	3	1	1	2	0	2	2
CO3	2	2	2	3	1	2	2
CO4	1	3	2	3	1	2	2

Relationship   : Low-1   Medium-2   High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		

Unit	Marks	Thr	CO
1 .DETERMINANTS AND MATRICES	**15**	**12**	**CO1, CO2, CO4**
1.1 **Determinants**: Definition & order of determinant, value of determinant, properties of determinants(no question), Cramer's rule for solving equations with two & three variables	7	4	
1.2 **Matrices**: - Definition & order of matrix, types of matrices, Equality of matrices, addition & subtraction, multiplication of matrices, adjoint & inverse of a matrix , solution of linear equations with two & three variables using matrices	8	8	
2 .INTEGRATION	20	22	**CO1, CO2, CO4**
Definition, Standard Formulae, properties of Integration for sum, difference and scalar multiplication, integration of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, composite function, Integration by substitution, integration by partial fraction, integration by parts			
3 .DEFINITE INTEGRALS	10	08	**CO3**
Definition of definite integral and Properties of definite integral ,integration by parts Applications:Area under the curves & lines and area between the curves and Volumes (simple problems)			
4 .VECTORS	15	12	**CO1, CO2, CO4**
Definition of scalars & vectors, equality of vectors, Addition & subtraction of vectors, triangle, parallelogram laws for addition, position vector, dot product & cross product and their properties and applications, relation between dot and cross product and scalar triple product and applications			
5 .STATISTICS / COMPLEX NUMBERS	15	10	**CO3**
Statistics : **(ME and Allied courses only)** 5.1:Measures of central Tendency -mean, median, mode for ungrouped & grouped data 5.2:Measures of dispersion –Range, mean deviation, standard deviation, variance, coefficient of variation 5.3: Corrected mean and relation between standard deviation and mean.			

5.Complex Numbers (electronics and Allied courses only) 5.1:Definition of complex number and Argand diagram, equality of complex numbers, 5.2:powers of 'i' ,complex conjugates, 5.3:Addition& subtraction of complex nos. Multiplication& division of complex nos. 5.4: Modulus and argument of a complex number 5.5:Polar form & exponential form of complex no. 5.6: De Moivre's theorem., nth root of complex nos. 5.7:Hyperbolic, exponential, circular functions			CO3
Total	75	64	

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY (GC201)

Unit No	Unit	Number of lectures	Marks
1	**Determinants & Matrices**	12	15
2	**Integration**	22	20
3	**Definite Integrals**	08	10
4	**Vectors**	12	15
5	**Statistics /Complex Number**	10	15
	Total	**64**	**75**

- Tutorial books should be maintained by students   (5 marks)

- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus

- Topic-wise class assignment   (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books /reference books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	Applied Mathematics	S.B. Gore, M.B.Patil, S.P. Pawar	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers Pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers & Distributers Pvt. Ltd. Pune
3	Advanced Engineering mathematics	H.K. Dass	S. Chand

(GC 202) APPLIED PHYSICS- II

1. COURSE OBJECTIVE:

On successful completion of the course, Students completing the Applied Physics II course will be able to demonstrate competency and understanding of the basic concepts found in, Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light and Optics and Sound, and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge.

2.TEACHING AND EXAMINATION SCHEME

Semester	II								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(GC202) Applied Physics- II	L	T	P	H	TH	TM	TW	PR/OR	
	03	0	02	80	75	25	25	-	125

3. COURSE OUTCOMES:

GC202.CO1: Understand the Fundamental Concepts of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.

GC202.CO2: Explain the basic principles of Electrostatics, Current Electricity, Electromagnetism and Electro Magnetic Induction, Light , Optics and sound.

GC202.CO3: Apply the knowledge of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound to specific applications.

GC202.CO4: Compute various parameters in the field of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.

4. Mapping Course Outcomes with Program Outcomes

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1 Basic Discipline Specific Knowledge &	PO 2 Problem Analysis	PO 3 Design and Devlopment of Solutions	PO 4 Engg. Tools, Experimentatn & Testing	PO 5 Engg. Practices for Society,Sustain ability& Environment	PO 6 Project Management	PO 7 Life -long Learning
CO 1	3	3	1	1	2	0	3
CO 2	3	3	1	1	2	0	2
CO 3	3	2	3	3	3	1	1
CO 4	2	2	2	3	1	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives

Unit	M	Thr	CO
1 UNIT NAME: ELECTROSTATICS	**12**	**8**	**CO1, CO2, CO3, CO4**
1.1 Coulomb's law, Electric field,			
1.2 Electric field Intensity, Electric lines of force and properties			
1.3 Electric potential, Definition of Absolute potential			
1.4, Potential difference, Potential of sphere,			
1.5 Potential of earth.			
1.6 Capacitance,			
1.7 Capacitors in Parallel Derivation of Expression			
1.8. Capacitor in series Derivation Of Expression			
2. UNIT NAME: CURRENT ELECTRICITY	**20**	**12**	**CO1, CO2, CO3, CO4**
2.1 Definition of Electric Current and its Unit, Ohm's Law, Resistance,			
2.2 Factors on which resistance depends, Specific resistance. Effect of temperature on resistance Temperature coefficient of resistance,			
2.3 Resistances in Series and parallel			
2.4 EMF and Internal resistance of cell			
2.5 General Equation of ohm's law.			
2.6. Wheatstone's Network and Principle of Meter Bridge			
2.7 Principle of Potentiometer (Vα L) and Applications to compare EMF of given cells by single cell method and sum difference method			
2.8 Determination of Internal resistance of a cell using potentiometer.			
2.9 Electric Power and Electric Energy, KWh			
2.10 Calculation of Energy bills			
2.11 Heating Effect of Electric current. Joule's law.			
2.12 Applications in house hold appliances			
3. UNIT NAME: ELECTROMAGNETISM AND EM INDUCTION	**16**	**10**	**CO1, CO2, CO3, CO4**
3.1 Magnet, Magnetic field, Magnetic flux, and magnetic flux density and its unit			
3.2 Magnetic effect of Current, Oersted's Experiment, Right hand Thumb Rule, Biot Savart law			
3.3 Magnetic field at the center of the coil (no derivation), Magnetic field due to coil (Qualitative discussion only			
3.4 Electromagnet. Force acting on a current carrying conductor placed in magnetic field and expression (no derivation)			
3.5 Fleming's left-hand rule. Electromagnetic Induction. Faraday's Experiment			
3.6. Faraday's laws Lenz's law. Self-Induction and Mutual Induction.			
3.7 Transformer Principle.			
3.8 Step up and Step-down transformer.			
3.9 Induction Heating			
3.10 Induction heater and uses			
4. **UNIT NAME: LIGHT AND OPTICS**	**16**	**10**	**CO1, CO2,**
4.1 Frequency Range of Infrared, ultraviolet and visible light and their uses			

4.2 Reflection, Refraction, Snell's law, refractive index.			**CO3, CO4**
4.3 Refraction through glass slab and prism.			
4.4 Total Internal reflection applications in optical fibers.			
4.5 Advantages of optical fibers. LASER, sources and applications.			
4.6. Luminous Intensity, Intensity of Illumination			
4.7 Inverse square law of Illumination (No derivation)			
4.8 Principle of Photometry, X rays,			
4.9 Production of X Rays by Coolidge tube			
4.10 Properties and applications			
5. **UNIT NAME: SOUND**	**11**	**08**	**CO1, CO2, CO3, CO4**
5.1 Sound as longitudinal wave,wavelength,frequency,time period, amplitude,			
5.2 Free vibration force vibration,resonance, examples,			
5.3 Echo reverberation ,pitch loudeness,intensity of sound,			
5.4 Ultrasonic waves, Piezo electric effect, Principle of Production of ultra-sonics waves			
5.5 Application of Ultra sonics in finding depth of sea,			
5.6. Detection of flaws in metal, soldering, Drilling,			
5.7 Ultrasonic Cleaning			
5.8Ultrasound for medical purposes.(Just Uses)			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	ELECTROSTATICS	8	12
2	CURRENT ELECTRICITY	12	20
3	ELECTROMAGNETISM AND EM INDUCTION	10	16
4	LIGHT AND OPTICS	10	16
5	SOUND	8	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Specific Resistance by Ammeter Voltmeter Method	25
2	Specific Resistance by Meter Bridge Method	25
3	To Verify the Series Law of Resistance by Meter Bridge Method	25
4	To Verify the Parallel Law of Resistance by Meter Bridge Method	25
5	To Compare the emf of two cells by single cell method	25
6	To find the internal resistance of a cell by Potentiometer Method	25
7	To find the velocity of sound by Resonance Tube method	25
8	To find the Refractive index	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC203) ENVIRONMENTAL STUDIES

1. COURSE OBJECTIVE:

Environment is the nurturing force upon which we depend. It decides our well being, our health & quality of our life. The environment is deteriorating at an alarming rate due to increasing human activity and can be saved only by timely human action. The aim of Environmental studies is to sensitize the students towards the need to conserve & protect natural resources & biological support systems. With the aim to develop an attitude of concern for the environment the students will learn to choose environmentally friendly options for sustainable development and live in harmony with nature.

2. TEACHING AND EXAMINATION SCHEME :

Semester	I								
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(GC203) Environmental Studies		L	T	P	H	TH	TM	TW	PR/OR	
		04	-	-	64	75	25	-	-	100

3. COURSE OUTCOMES:

GC203.CO1: Understand the role and importance of various elements of Environment.
GC203.CO2: Identify the concerns related to the natural resources, ecosystems, biodiversity, pollution and social issues of environment.
GC203.CO3: Develop sensitivity towards Environmental issues.
GC203.CO4: Co-relate causes affecting the environment & biodiversity.

4. Mapping Course Outcomes with Program Outcomes :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation &	Engg. Practices for Society,Sustainability	Project Management	Life -long Learning
CO1	2	1	1	0	3	2	2
CO2	2	1	1	0	3	2	2
CO3	1	1	1	0	3	2	2
CO4	1	1	2	0	3	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			Mks	Thr	CO1, CO3, CO4
UNIT 1.0 : Multidisciplinary Nature of Environmental Studies			09	08	
1.1 Environmental studies : Definition , Scope and Importance					
1.2 Need for Public Awareness					
1.3 Environment & Human Health					

1.4 Environmental Ethics			
1.5 Value Education			
1.6 From Unsustainable to Sustainable Development : Concept and Guidelines			
1.7 Concept of Environmental Audit (EA) Environment Impact Assessment (EIA)			
1.8 Ecological Foot Prints			
UNIT 2.0 : ECOSYSTEM AND BIODIVERSITY	15	13	CO1, CO2, CO3, CO4

2.1 Ecosystem
 2.1.1Concept, Structure & functions of ecosystem
     (Function of producer, consumer and decomposer)
 2.1.2 Food chain & Food web- Concept & Examples
 2.1.3 Energy flow in Ecosystem
 2.1.4 Ecological Pyramids (Inverted & Upright)
     Pyramid of Number, Biomass & Energy.
 2.1.5 Ecological Succession (Primary & Secondary Succession)
 2.1.6 Study of Ecosystem: characteristic features structure and functions)
     Terrestrial(Forest, Grassland, Desert) Aquatic(Pond, River & Ocean)			

2.2 Biodiversity 2.2.1 Definition of Biodiversity 2.2.2. Types of Diversity (Genetic, Species & Ecosystem) 2.2.3. Value of Biodiversity (Consumptive , Productive, Social ,Aesthetic Moral & Optional value) 2.2.4 India as a Mega- diversity Nation 2.2.5 Biogeographical classification of India 2.2.6 Extinct, Endangered, Threatened & Endemic Species -Examples (of India) 2.2.7 Threats to Biodiversity (Habitat loss, Poaching of Wild life & Man Wildlife Conflict) 2.2.8 Reasons for loss of Biodiversity 2.2.9 Conservation of Biodiversity (Insitu & Exsitu conservation)			
UNIT 3.0 : NATURAL RESOURCES	18	15	CO1, CO2, CO3, CO4

3.1 Forest Resource
 3.1.1 Direct & Indirect value of Forest
  3.1.2 Deforestation-causes & effects
   3.1.3 Forest Management
 	
 3.2 Water Resource
 3.2.1 Water as a scarce Resourc
 3.2.2Use and over exploitation of surface and ground water
  3.2.3 Need for Water Conservation
  3.2.4   Construction of dams- Benefits and draw backs
    (Rehabilitation & Resettlement of people)
  3.2.5   Rain water Harvesting.
   3.2.6   Watershed Management
 3.2.7 Conflicts over water in India			

3.3 Energy Resource
3.3.1 Renewable & Non-Renewable sources of Energy
  3.3.2 Growing Energy Needs.
  3.3.3 Alternate Source of Energy (Solar ,Wind, Bio, Geothermal, Hydro & Nuclear Energy)			

3.4 Food Resource
3.4.1 Sources of Food
3.4.2 World Food Problems (Undernourishment & Malnourishment)
  3.4.3   Changes caused by agriculture & overgrazing
  3.4.5   Effects of modern agriculture on environment
    (use of synthetic fertilizers & synthetic pesticides in agriculture)
 	
3.5 Mineral Resource
3.5.1   Types of Minerals
3.5.2   Use & Overexploitation of Minerals
 3.5.3   Environmental Impact of Mining.
 	
3.6 Land Resource
3.6.1 Pattern of Land Utilization (In India and World)
3.6.2 Land Degradation – Causes & Control Measures			

UNIT 4.0 : ENVIRONMENTAL POLLUTION- Sources , Effects & Control Measures	**24**	**20**	
4.1 Air Pollution 4.1.1 Definition, sources of air pollution(Primary and Secondary air pollutants with examples) 4.1.2 Effects on human health, animals, plants & Materials 4.1.3 Control of Air Pollution. 4.1.4 Removal of Particulate matter 4.1.5 Principles & Application of Control Equipments (Gravity and Inertial Separators, Cyclones, Filters, Electrostatic precipitators, Wet scrubbers) 4.1.6 Removal of Gaseous Pollutants (Combustion, Adsorption, Absorption) 4.1.7 Global Issues Definition, Cause & effects of Green House effect & Global Warming. Ozone layer Depletion, Acid Rain.			**CO1, CO2, CO3, CO4**
4.6 Noise Pollution :- 4.6.1 Definition. 4.6.2 Sources of Noise Pollution 4.6.3 Effects of Noise Pollution on Human health (Noise Induced hearing loss, Physiological & Psychological Effects) 4.6.4 Control of Noise Pollution.			
4.7. Nuclear Pollution / Radioactive Pollution:-			

4.7.1 Definition 4.7.2. Sources of nuclear Pollution (Natural & Man made) 4.7.3. Effects of Nuclear Pollution 4.7.4. Control of Nuclear Pollution 4.7.5.Disposal of Nuclear waste (Low, Medium & High activity waste) 4.7.6 Nuclear Accidents & Holocaust – case study			

4.8   Solid Waste Pollution.
    Definition: Refuse, Garbage
    Sources of Solid waste
    Types of solid waste (MSW, HW, BMW & EW)
    Effects of Consumerism
    Segregation of Solid waste at source
    Treatment of MSW (Open dumping, Land filling, incineration & composting)
    Waste Utilization (Reuse, Reclaim & Recycle)
    Solid waste Management System – Flow sheet diagram
 	
4.9 Role of an Individual in Prevention of Pollution.			

UNIT 5.0 : **SOCIAL ISSUES & ENVIRONMENT**	09	08	CO2, CO3, CO4

5.1 Environmental Legislation
    Article 47 & Article 51-A(g)of the constitution on Environment.
 5.1.1 Protection
    Functions of Ministry of Environment and Forest Govt. of India
        Objectives & Functions of Central & state pollution Control Boards
 	
    Environmental Protection Act.
    Air (Prevention & Control of Pollution) Act.
    Water (Preventation & Control of Pollution) Act.
    Wildlife Protection Act.
    Forest Conservation Act.
    Motor vehicle Act.			

5.2 Social Issues 5.2.1Women & Child Welfare 5.2.2 Role of IT in Environment & Human Health 5.2.3 AIDS 5.2.4 Population Growth & Variation among Nations 5.2.5 Human Rights			

COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**MULTI-DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**	08	09
2	**ECOSYSTEM AND BIODIVERSITY**	13	15
3	**NATURAL RESOURCES**	15	18
4	**ENVIRONMENTAL POLLUTION**	20	24
5	**SOCIAL ISSUES & ENVIRONMENT**	08	09
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS
9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Erach Bharucha	Textbook of Environmental Studies	Universities Press (India) Private Ltd.
2	Dr. Suresh K. Dhameja	Environmental studies	S.K. Kataria & Sons
3	Y. Anjaneyulu	Introduction to Environmental Science	B.S Publications
4	S. Deswal & A. Deswal	A Basic Cource in Environmental Studies	Dhanpat Rai & Co.
5	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Pandya and Camy	Environmental Engineering	Tata McGraw Hill
2	Asthana D.K. and Asthana Meera	Environmental Problems and Solutions	S. Chand & Co.
3	Gilbert M. Masters	Introduction to Environmental Engineering and Science.	Prentice Hall of India (PHI)
4.	M N Rao & HVN Rao	Air Pollution	Tata McGraw Hill

FIELD ACTIVITIES (OPTIONAL)
1. Visit to Selaulim/ Anjunem Dam.
2. Visit to show Hill cuttings, mining areas.
3. Visit to show Rain water harvesting project / Vermicomposting plant / watershed management project. (Krishi Vigyan Kendra – Old Goa)
4. Visit to Garbage treatment plant.
*On Completion of visit Report to be submitted.**

GC204) ENGINEERING DRAWING

1. Course Objective: Drawing is a graphical language of engineering field. Engineering technician irrespective of his/her field of operation in an industry is expected to possess a thorough understanding of drawing, which includes visualization of objects and the proficiency in reading and interpreting a wide variety of engineering drawings. It is the skill, which translates an engineering idea into lines and dimensions. Besides this he/she is also expected to possess a certain degree of drafting skills- depending upon his/her job.

2. **TEACHING AND EXAMINATION SCHEME:**

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme					Total Marks
					Theory Marks		Practical Marks			
(GC204)	L	T	P	H	TH	TM	TW	PR/OR		
Engineering Drawing	-	-	5	80	-	-	50	50		**100**

3. Course Outcomes:

On successful completion of the course the student will be able to:
GC204.CO1: Understand different methods of projection, sectioning of solids and development of surfaces.
GC204.CO2: Select the relevant procedural methods for preparing Engineering Drawing.
GC204.CO3: Draw Isometric views and orthographic projection of full and sectioned objects and development of surfaces
GC204.CO4: Examine and Interpret Engineering Drawings

4. Mapping Course Outcomes with Program Outcomes

Relationship- 1:Slight (low) 2:Moderate(Medium) 3: Substantial(High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	Basic and discipline specific knowledge	Problem analysis	Design & development of solution	Engg tools exptn and & testing	Engg Practice for society,sustainability and environment	Project management	Lifelong learning
CO1	3	2	1	3	1	1	1
CO2	3	1	2	3	1	2	2
CO3	2	2	2	3	1	2	2
CO4	2	2	2	2	1	2	3

5. Detailed course Contents/ Micro lesson plan

M=Marks   Prhr= Teaching Hrs   CO=Course Outcomes

Unit	Mark	Prhr	CO
1. Introduction 1.1 Importance of engineering drawing as a means of communication. 1.2 Planning of drawing sheet as per SP 46(latest revision) 1.3 Indian standard practices of laying out and folding of drawing 1.4 Different types of lines used in engineering drawing. 1.5 Importance of scale in Engineering Drawings. 1.6 Lettering 1.7 Methods of dimensioning, Dimensioning terms and notation -use of SP 46(latest revision), General rules for dimensioning, Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, countersunk hole, taper.	05	05	CO2
2. Geometrical construction & Engineering Curves 2.1Construction of an Equilateral and Isosceles triangle, Square, Regular pentagon & Regular hexagon given length of a side using general method of construction 2.2Construction of Engineering curves like: Ellipse- by focus & directrix method and arcs of circles method Parabola- by focus & directrix method and rectangle method Hyperbola- Focus and directrix method 2.3 Cycloid- by generating circle rolling on a straight line 2.4 Involutes of a circle. 2.5 Draw normal & tangents to the above curves from given point on the curve Curves to be explained with the help of applications.	05	15	CO2
3. Orthographic projection 3.1 Definitions of various terms associated with orthographic projections. Planes of projections. Concept of Quadrants. 3.2 First and third angle method of projection. 3.3 Projection of points 3.4Projection of lines	18	30	CO1, CO2, CO3, CO4

Parallel to both Principal planes			

Parallel to one and Perpendicular to other Principal plane.

Inclined to one plane and parallel to other plane.

3.5 Projection of planes:Triangle, Square, circle when inclined to one principal plane & perpendicular to other plane.

3.6 Projection of solids: Cylinder, cone.

Right regular solids such as

      (i) Prism: Square& Pentagonal
      (ii) Pyramid: Triangular & Square.

Projections of above mentioned solids when axis is inclined to one principal plane & Parallel to other principal plane.

3.7 Conversion of simple pictorial views into orthographic views.

Problems where one end of the line is in one quadrant & other end in other quadrant and traces are to be excluded.

Problems where apparent shape of plane are given, true shape & slope angle are to be drawn are excluded.

4. Section of solids Development of lateral surfaces **4.1** Concept of sectioning planes, Auxiliary planes and true shape of section. 4.2 Drawing section of solids like square prism, square pyramid, cylinder and cone with sectioning plane inclined to one principal plane and Perpendicular to the other principal plane (Axis of solid perpendicular to one principal plane and parallel to the other) 4.3Concept and importance of surface development in the engineering field. Methods of development of surfaces-Radial & Parallel line method. Development of surfaces for solids like square prism, square pyramid, cylinder and cone. *Development of solids standing on its base & cut by a plane inclined to HP and perpendicular to VP is also included.*	10	15	CO1, CO3
5. Isometric Views 5.1Difference between Isometric projection & Isometric view. 5.2Isometric view of geometrical planes and solids.	12	15	CO3, CO4

	No. Of Practical Hrs.	Marks	
5.3Conversion of orthographic views into isometric views.			
5.4Construction of Isometric view for any real object.			
Total	50	80	

6. Course Delivery:

The course will be delivered through Practicals, class room interaction and exercises.

7. Specification table for Practical/Macro Lesson Plan

Unit No.	Unit	No. Of Practical Hrs.	Marks
1	Introduction	05	05
2	Geometrical construction & Engineering Curves	15	05
3	Orthographic projection	30	18
4	Section of solids Development of lateral surfaces	15	10
5	Isometric Views	15	12
	Total	**80**	**50**

8. Specification table for Practical/ Termwork:

No.	Practical
1	TYPES OF LINES, LETTERING, DIMENSIONING.
2	GEOMETRICAL CONSTRUCTIONS
3	ENGINEERING CURVES
4	PROJECTION OF POINTS & LINES
5	PROJECTION OF PLANES
6	PROJECTIONS OF SOLIDS
7	ORTHOGRAPHIC PROJECTIONS (First angle)
8	ORTHOGRAPHIC PROJECTIONS(Third angle)
9	SECTIONS AND DEVELOPMENT OF SOLIDS
10	ISOMETRIC VIEWS

9. Learning Resources:

Text Books

S.No.	Author	Title	Publisher
1	N.D. Bhatt	Engineering Drawing	Charoter Publisher,Anand
2.	R. K. Dhawan	Engineering Drawing	S. Chand Publishing
3.	K.R. Gopalakrishna	Engineering Drawing	Subhas Publications.

Reference Books only for further study

S.No.	Author	Title	Publisher
1	P.S. Gill	Geometrical Drawing	Kataria & Sons
2	P.S. Gill	Machine Drawing	Kataria & Sons
3	N.D. Bhatt	Machine Drawing	Charoter Publisher,Anand

Indian and International codes needed

S.No.	Author	Title	Publisher
1.	BIS, India	SP 46. (Latest revision).	BIS, India

(GC205) ENGINEERING MATERIALS

1. COURSE OBJECTIVE:

This course is introduced with an objective of providing knowledge to students regarding properties and composition of materials for engineering applications and enabling them to make comparative study of materials while selecting the appropriate material for various engineering applications.

2. TEACHING AND EXAMINATION SCHEME

Semester	II								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks	Total Marks
(GC205) ENGINEERING MATERIALS		L	T	P	H	TH	TM	TW	PR/OR	
		3	--	--	48	75	25	--	--	100

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC205.CO1: List out the properties of materials used in engineering applications.

GC205.CO2: Explain the composition and properties of various engineering materials.

GC205.CO3: Classify materials based on composition and properties.

GC205.CO4: Select the appropriate material/s for the given engineering application/s.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge &	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	3	2	0	0	0	0	1
CO2	3	2	1	0	0	0	1
CO3	2	2	2	1	1	0	1
CO4	2	3	3	2	1	0	1

Relationship : Low-1   Medium-2   High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 INTRODUCTION TO ENGINEERING MATERIALS			**08**	**04**	
1.1 Classification of Materials: Metal and Non-metal, Ferrous Metal & Non-ferrous Metals, Differences between Metals & Non-metals					**CO1, CO2, CO3, CO4**
1.2 Properties of Materials:(Note: Properties to be explained with relevant examples.)					
1.2.1 Physical properties – Melting point, Freezing point, Boiling point,					

Density, Linear co-efficient of expansion, Thermal conductivity, Electrical resistivity			
1.2.2 Mechanical properties – Strength, Elasticity, Plasticity, Ductility, Malleability, Toughness, Brittleness, Hardness, Fatigue, Creep.			
1.2.3 Electrical properties – Resistivity, Conductivity, Temperature coefficient of resistance, Dielectric strength, Thermo-electricity, Super conductivity			
1.2.4 Magnetic properties – Permeability and Coercive force			
1.2.5 Chemical properties - Corrosion resistance and Chemical composition			
2 FERROUS & NON-FERROUS METALS & ITS ALLOYS	**18**	**12**	
2.1 FERROUS ALLOYS: 1.1.1 Low carbon steel, Medium carbon steel, High carbon steel, their carbon percentage, properties & uses. 1.1.2 Cast iron: grey cast iron, white cast iron, their properties & uses 1.1.3 Alloy steels: Constituents of alloy steels such as Phosphorous, Sulphur, Silicon, Manganese and their effect on properties of materials. 1.1.4 Stainless steel, Nickel-chromium-molybdenum steel, its properties & uses. 1.1.5 Tool steel – composition, HSS, properties & uses			**CO1, CO2, CO3, CO4**
2.2 NON-FERROUS METALS & ALLOYS: 2.2.1 Aluminium – Properties & uses 2.2.2 Aluminium alloys – constituents of alloy & their effect on properties of metal 2.2.3 Properties & uses of Duralumin, Y-alloy and Al-Si alloy 2.2.4 Copper – Properties & uses. 2.2.5 Copper alloys – Constituents of alloy & their effect on properties of metal 2.2.6 Properties & uses of Copper – Zinc alloys such as Muntz metal, manganese, bronze, Copper-Tin alloys such as Bronze, Copper-Aluminium alloys such as Aluminium bronzes. 2.2.7 Lead and its hazard to the environment			**CO1, CO2, CO3, CO4**
3 NON-METALLIC MATERIALS	**18**	**10**	
3.1 CONSTRUCTION MATERIALS 3.1.1 Classification of rocks, common building stones and their applications. 3.1.2 Cement: Types of cement, composition and applications 3.1.3 Bricks: Composition, properties, Classification, Special bricks-Refractory and fly-ash bricks and uses 3.1.4 Clay: Types, products of clay- tiles and pipes 3.1.5 Sand- sources – river, crushed aggregates, applications			**CO1, CO2, CO3, CO4**
3.2 ENGINEERING CERAMICS 3.2.1 Refractories: Desirable properties, Properties and Applications of Fire clay and Silica Refractory, Difference between acid, basic & neutral refractories 3.2.2 Glass: Properties & uses of soda glass, borosilicate glass and fibre glass 3.2.3 Glass wool: Composition, properties & uses 3.2.4 Timber: Common varieties of timber, uses of wood products, veneer and plywood 3.2.5 Natural & Synthetic abrasive materials: Introduction, Properties & uses			**CO1, CO2, CO3, CO4**
4 CONDUCTOR, SEMI -CONDUCTOR, AND INSULATING	**16**	**12**	CO1,

MATERIALS			CO2, CO3, CO4
4.1 Classification of Materials as Conductor, Semiconductor and Insulating materials			
4.2 Conductor Material: 4.2.1 High conductivity materials: Copper, Aluminium, Carbon, Silver, Lead & Tungsten, their properties as conducting materials and applications. 4.2.2 High resistivity materials: nichrome, constantan, manganin and their applications			
4.3 Insulating Materials: Introduction and Characteristics of Good Insulating materials 4.3.1 Solid Insulating materials- wood, paper, rubber, mica, glass fibre, porcelain, PVC, resins, their characteristics as insulating materials and applications			
4.4 Semiconductor Materials: Silicon & Germanium, their specifications as semiconductor material and uses.			
Unit 5 MAGNETIC & COMPOSITE MATERIALS	**15**	**10**	
5.1 Magnetic Materials: Classification as Diamagnetic, Paramagnetic, Ferromagnetic, List of these materials and their applications			CO1, CO2, CO3, CO4
5.2 Composite Materials: metal matrix, ceramic matrix and polymer matrix composites, types of reinforcement materials and their applications			
5.3 Paints & Lubricants: 5.3.1 Classification: oil based and polymer based paints 5.3.2 Constituents of Paints – resin, binder, pigment, additives, solvents 5.3.3 Lubricants – Functions of lubricants, Types of Lubricants, Composition and Applications			
Total	**75**	**48**	

6. COURSE DELIVERY: The Course will be delivered through lectures and class room interactions

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit Name	Number of lectures (hrs)	Marks
1	Introduction to Engineering Materials	04	08
2	Ferrous & Non-Ferrous Metals & its alloys	12	18
3	Non-Metallic Materials	10	18
4	Conductor, Semi-Conductor, & Insulating Materials	12	16
5	Magnetic & Composite Materials	10	15
		48	**75**

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.S. Khurmi	Material Science	S. Chand
2	R. Srinivasan	Engineering Materials & Metallurgy	Tata McGraw Hill
3	TTTI Madras	Electrical Engineering Materials	McGraw Hill Education, 2004
4	S. K. Hajra Choudhury	Material Science and Processes	Indian book distribution
5	P. C. Varghese	Building Materials	PHI
6	J. B. Gupta	Electrical and Electronic Engineering Materials	Katson

(CM301) COMPUTER ORGANIZATION

1. COURSE OBJECTIVES: In this course the students will be able to describe the structure, function and characteristics of computer systems. Learn the basic concepts of CPU and Input/output (I/O) organization. Classify computer memory; learn the functioning of DMA and IOP.

2. PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
CM301 Computer Organization		L	T	P	H	TH	TM	TW	PR/OR	
		4	-	-	4	75	25	-	-	100

4. COURSE OUTCOMES: On successful completion of the course, the students will be able to:
CM301.CO1: List the functional and organizational units of basic computer system.
CM301.CO2: Explain CPU, Memory and Input/output organization.
CM301.CO3: Classify various functional components of a computer system.
CM301.CO4: Compare various functional components of a computer system.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation& Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life -long Learning
CO1	2	1	0	0	0	0	0
CO2	2	1	0	0	0	0	0
CO3	2	1	1	0	1	0	1
CO4	2	1	1	0	1	0	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	1	1
CO4	1	1

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**
UNIT I	**1 BASIC ORGANIZATION OF COMPUTER** 1.1 Basic organization of Computer (Von Neumann Machine) - Input Unit, Memory unit, Arithmetic and Logic Unit, Output unit, Control Unit 1.2 Features of Von Neumann Model and Von Neumann Bottleneck 1.3 Basic Operational Concepts 1.3.1 Connections between the processor and the main memory 1.3.2 Functions of different registers Program Counter (PC), Instruction Register (IR), Memory Address Register (MAR), Memory Data Register (MDR), General purpose Registers. 1.3.3 Execution of a program (Steps taking place while execution of a program) 1.3.4 Concepts of Interrupt and Interrupt Service Routine (ISR) 1.4 Introduction to Buses-Concept of a bus, Data bus, Address Bus and Control Bus, System bus. 1.4.1 Bus Structures- Single bus structure, multiple bus structure, Traditional bus configuration, High speed bus configuration 1.4.2 Definitions of Bus Design Parameters-Bus Types – Dedicated and Multiplexed, Method of Arbitration – Centralized and Distributed, Bus Timings, Bus width, Data transfer types		15	13	CO1, CO2, CO3, CO4
UNIT II	**2 BASIC CPU ORGANIZATION** 2.1 Internal Structure of CPU 2.1.1 Major Components of CPU – control, Register set, ALU 2.1.2 CPU Operation (flowchart showing major functions of Processor) 2.2 Accumulator Based CPU Organization 2.3 Typical CPU with general purpose register organization. 2.4 Stack Organization- Register Stack, Memory Stack 2.5 Instruction Cycle 2.5.1 Instruction Fetch Cycle 2.5.2 Instruction Decode/Execute Cycle 2.6 Control Unit 2.6.1 Hardwired Control Unit		15	12	CO1, CO2, CO3, CO4

		2.6.2 Micro programmed/Soft-Wired Control Unit			
		2.7 Characteristics of Complex Instruction Set Computers (CISC) & Reduced Instruction Set Computers (RISC)			
UNIT III	**3**	**MEMORY ORGANIZATION**	15	13	CO1, CO2, CO3, CO4
		3.1 Introduction to memory and memory parameters			
		3.2 Classification of memory			
		3.2.1 Primary/Semiconductor Memory based on: Principal of operation, Physical Characteristics, Mode of access, Terminology used for fabrication			
		3.2.2 Secondary memory based on Sequential and Random-access methods.			
		3.3 Memory Hierarchy- two, three and four levels			
		3.4 Main Memory			
		3.4.1 RAM- Definition of Static RAM (SRAM), Definition of Dynamic RAM(DRAM), Comparison between SRAM &DRAM, Definition of Synchronous DRAM (SDRAM), Definition of Double-Data-Rate Series (DDRAM), Comparison between DRAMs &SDRAMs			
		3.4.2 ROM-Overview of PROM, EPROM, EEPROM			
		3.5 Cache memory			
		3.5.1 Introduction Cache memory			
		3.5.2 Cache memory Terminology-Hit rate, Cache Miss, Program locality, Locality of reference, Block fetch			
		3.5.3 Cache organizations-Look-aside, Look-through			
		3.5.4 Elements of cache design: Cache size, Mapping Function, Replacement algorithms -Least- Recently –Used (LRU), First-In-First-Out (FIFO), Least-Frequency-Used (LFU), Random			
UNIT IV	**4**	**INPUT & OUTPUT ORGANIZATION**	15	13	CO1, CO2, CO3, CO4
		4.1 Input Output (I/O) Systems			
		4.1.1 Requirements of input output (I/O) systems			
		4.1.2 Input Output (I/O) interfacing techniques: Memory mapped I/O, I/O mapped I/O			
		4.2 Types of Data Transfer techniques			
		4.2.1 Program controlled I/O or polling control			
		4.2.2 Interrupt program controlled I/O or interrupt driven I/O			

	4.2.3 Hardware controlled I/O			
	4.2.4 I/O control by handshake signals			
	4.3 Interrupt driven I/O			
	4.3.1 Interrupt Hardware / Hardware interrupt			
	4.3.2 Enabling and disabling interrupts, Vectored interrupts, Interrupt Nesting, Interrupt priority			
	4.3.3 Flowchart of Interrupt and response to interrupt			
	4.4 Comparison between Programmed I/O and Interrupt Driven I/O			
UNIT V	**5 DMA ORGANIZATION AND I/O PROCESSOR**	15	13	CO1, CO2, CO3, CO4
	5.1 Direct memory Access			
	5.1.1 Introduction to DMA			
	5.1.2 Drawbacks in Programmed I/O and Interrupt Driven I/O			
	5.1.3 DMA operation with flowchart of Interaction of CPU and DMA			
	5.1.4 Comparison of I/O program Controlled Transfer and DMA transfer.			
	5.1.5 Use of DMA in a Computer system			
	5.1.6 Bus Arbitration			
	5.1.7 Types of Bus Arbitration: Centralized and Distributed			
	5.1.8 Centralized Arbitration: Daisy Chaining, Polling method and Independent Request			
	5.2 I/O Processor			
	5.2.1 Features and functions of IOP			
	5.2.2 Block diagram of IOP			
	Total	75	64	

7. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions and exercises.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. BASIC STRUCTURE/ORGANIZATION OF COMPUTER** 1.1 Basic organization of Computer (Von Neumann Machine) 1.2 Features of Von Neumann Model and Von Neumann Bottleneck 1.3 Basic Operational Concepts 1.4 Introduction to Buses-Concept of a bus, Data bus, Address Bus and Control Bus, System bus.	13	15

II	**2. BASIC CPU ORGANIZATION**
	  2.1 Internal Structure of CPU
	  2.2 Accumulator Based CPU Organization
		12	15

	2.3 Typical CPU with general purpose register organization. 2.4 Stack Organization- Register Stack, Memory Stack 2.5 Instruction Cycle 2.6 Control Unit 2.7 Characteristics of Complex Instruction Set Computers (CISC) & Reduced Instruction Set Computers (RISC)			
III	**3. MEMORY ORGANIZATION** 3.1 Introduction to memory and memory parameters 3.2 Classification of memory 3.3 Memory Hierarchy- two, three and four levels 3.4 Main Memory 3.5 Cache memory	13	15	
IV	**4. INPUT & OUTPUT ORGANIZATION** 4.1 Input Output (I/O) Systems 4.2 Types of Data Transfer techniques 4.3 Interrupt driven I/O 4.4 Comparison between Programmed I/O and Interrupt Driven I/O	13	15	
V	**5. DMA ORGANIZATION** 5.1 Direct memory Access 5.2 I/O Processor	13	15	
	Total	64	75	

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

There are no practical in this course and hence it is not applicable.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	A.P. Godse and D.A. Godse	Computer Organisation and Architecture/ Computer Architecture and Organisation	Technical Publication
2	William Stallings	Computer Organisation and Architecture	Prentice Hall

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Morris Mano	Computer System and Architecture	Pearson publication

Internet and Web Resources

S. No.	Description
1	https://nptel.ac.in/courses/106106092/
2	http://www.ddegjust.ac.in/studymaterial/msc-cs/ms-07.pdf

Videos and Multimedia Tutorials

S. No.	Description
1	https://youtube.com/watch?v=MIWTxHbPBA0

(CM302)   OPERATING SYSTEM

1. COURSE OBJECTIVES: In this course the students will learn the basic concepts of operating system, its functions, types and structure. They will understand about process and how the operating system manages the processes and memory of a computer. They will familiarize with deadlocks and various deadlock strategies. They will also study security management in operating system.

2. PRE-REQUISITES: Knowledge of Computer Hardware.

3. TEACHING AND EXAMINATION SCHEME

Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
CM302 Operating System		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	-	125

4. COURSE OUTCOMES: Student will be able to:

CM302.CO1: Explain the basic concepts of operating systems.
CM302.CO2: Use various concepts of an Operating System.
CM302.CO3: Classify various concepts of an Operating System.
CM302.CO4: Compare various concepts of an Operating System.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentati on& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	0	0	0	1
CO2	2	1	1	0	0	0	1
CO3	2	1	2	1	0	0	1
CO4	2	1	2	1	0	0	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
UNIT			**M**	**Thr**	**CO**

UNIT I	**1. INTRODUCTION**
	1.1 Definition of Operating System
	1.2 Functions of Operating System
	1.3 Types of Operating System and their features
	    1.3.1 Batch Processing
	    1.3.2 Multiprogramming
	    1.3.3 Real time System
	    1.3.4 Time Sharing
	    1.3.5 Distributed
	    1.3.6 Multimedia
	1.4 Definitions: Assembler, Compiler, interpreter, linker, loader and editor
	1.5 OS Structure
	    1.5.1 Layered
	    1.5.2 Monolithic
	    1.5.3 Micro Kernel
				15	8	CO1,
						CO2,
						CO3,
						CO4

UNIT II	**2. PROCESS MANAGEMENT**
	2.1 Definition of Process
	2.2 Concept of Context Switching
	2.3 Process States
	2.4 Process Transition Diagram
	2.5 Process Control Block
	2.6 Process Scheduling
	    2.6.1 Scheduling Objectives
	    2.6.2 Scheduling Philosophies
	    2.6.3 Scheduling Levels
	    2.6.4 Scheduling Algorithms: First Come First Serve (FCFS), Round Robin (RR), Priority Based, Priority Class
				15	10	CO1,
						CO2,
						CO3,
						CO4

UNIT III	**3. DEADLOCKS AND INFORMATION MANAGEMENT**
	3.1 Deadlocks
	    3.1.1 Concept
	    3.1.2 Graphical Representation Deadlock
	    3.1.3 Deadlock Pre-requisite
	    3.1.4 Concepts of deadlock Strategies: Deadlock Ignorance, Deadlock Detection, Deadlock Recovery, Deadlock Prevention, Deadlock Avoidance
	3.2. Information management
	    3.2.1 Simple File System: File Attributes
	    3.2.2 File Access Methods: Sequential File Access, Direct/Random/Relative Access, Indexed Sequential Access
	    3.2.3 Directory Structure: Hierarchical Directory Systems, Access Paths, Directory
				15	9	CO1,
						CO2,
						CO3,
						CO4

	Operations 3.2.4 File Protection: Access Control			

UNIT IV	**4. MEMORY MANAGEMENT**
	4.1 Functions
	    4.1.1 Issues in memory management scheme:
	        Relocation and address translation,
	        Protection and sharing, Evaluation
	4.2 Contiguous Real Memory Management
	   Techniques
	    4.2.1 Single Contiguous Memory Management
	    4.2.2 Fixed Partitioned Memory Management
	    4.2.3 Variable Partitioned Memory Management
	    4.2.4 Fragmentation –Internal and External
	4.3 Non-Contiguous Real Memory Management
	    4.3.1 Paging: Introduction, Relocation and address
	        Translation, General Methodology,
	        Implementation of PMT (Software
	        Method)
	    4.3.2 Segmentation: Introduction, Relocation and
	        address Translation
	4.4 Concept of Virtual Memory
	    4.4.1 Introduction
	    4.4.2 Definitions: Locality of Reference, Page
	        Fault, Working set, Page Replacement
	        Policy (FIFO, NRU, and LRU), Dirty
	        Page/Dirty Bit, Demand Paging.
		15	11	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5. SECURITY MANAGEMENT**
	5.1 Security Management
	    5.1.1 Introduction
	    5.1.2 Security Threats
	    5.1.3 Attacks on Security
	    5.1.4 Computer Worm: Mode of Operation,
	        Safeguard against worm\
	    5.1.5 Computer virus: Types of viruses, Infection
	        Methods, Mode of Operation, Virus
	        Detection, Removal and Prevention
	    5.1.6 Security Design Principles
	    5.1.7 Authentication: Password, Artifact,
	        Biometrics
		15	10	CO1,
				CO2,
				CO3,
				CO4

	Total	75	48	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks

I	**1. INTRODUCTION**
	    1.1 Definition of Operating System
	    1.2 Functions of Operating System
	    1.3 Types of Operating System and their features
	    1.4 Definitions: Assembler, Compiler, interpreter, linker, loader and editor
	
	    1.5 OS Structure
		8	15

II	**2. PROCESS MANAGEMENT**
	    2.1 Definition of Process
	    2.2 Concept of Context Switching
	    2.3 Process States
	    2.4 Process Transition Diagram
	    2.5 Process Control Block
	    2.6 Process Scheduling
		10	15

III	**3. DEADLOCKS AND INFORMATION MANAGEMENT**
	    3.1 Deadlocks
	    3.2 Information management
		9	15

IV	**4. MEMORY MANAGEMENT**
	    4.1 Functions
	    4.2 Contiguous Real Memory Management Techniques
	    4.3 Non-Contiguous Real Memory Management
	    4.4 Concept of Virtual Memory
		11	15

V	**5. SECURITY MANAGEMENT** 5.1 Security Management	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of Disk Operating System (Internal and External commands)
2	Installation of Windows Operating System
3	Study of Windows Operating System: (Architecture and functionality)
4	Installation of Linux Operating System
5	Study of Linux Operating System: (Architecture and functionality)
6	Study of Linux Commands
7	Study of Linux shell programming

8	Study of process scheduling algorithms.
9	Study of Antivirus: Types of Antiviruses, installation and usage.
10	Case Study on Android and IOS7

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Achyut S. Godbole	Operating System	Tata Mc-Graw Hill
2	Silberschatz Galvin John Wiley and Sons	Operating System Concepts	John Wiley & Sons
3	William Stallings	Operating System	Pearson
4	Sumitabha Das	Unix Concept and Programming	Tata Mc-GrawHill

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Andrew Tanenbaum	Modern Operating systems	PHI
2	Kumar Saurabh	UNIX Programming	Wiley India

Internet and Web Resources

S. No.	Description
1	https://nptel.ac.in/courses/106108101/
2	https://nptel.ac.in/downloads/106108101/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=MaA0vFKt-ew

(CM303)   COMPUTER PROGRAMMING

1. COURSE OBJECTIVES: In this course the students will study the syntax of C programming language. Develop, execute, test and debug programs using C programming language.

2. PRE-REQUISITES: Knowledge of computer programming terminology.

3. TEACHING AND EXAMINATION SCHEME

Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
CM303 Computer Programming		L	T	P	H	TH	TM	TW	PR/OR	
		3	1	2	6	75	25	25	25	150

4.COURSE OUTCOMES: Student will be able to:

CM303.CO1: Explain the elements of C programming language.
CM303.CO2: Write C programs using modular programming concepts.
CM303.CO3: Compare various C language constructs.
CM303.CO4: Develop simple applications using C.

5.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	2	1	0	0	0	1
CO2	2	3	3	1	0	1	1
CO3	2	2	1	0	0	0	1
CO4	2	3	3	1	1	2	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	3	3
CO3	2	2
CO4	3	3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**

UNIT I	**1. INTRODUCTION TO C**
	1.1 Basic Elements of C
	   1.1.1 History of C
	   1.1.2 Characteristics of C
	   1.1.3 Simple C programs
	   1.1.4 Structure of a C Program
	   1.1.5 The character set of C
	   1.1.6 C Tokens: Identifiers, Keywords, Constants,
	       Basic data types and sizes, Variables,
	       Variable declarations
	1.2 Operators and Expressions
	   1.2.1 Arithmetic operators
	   1.2.2 Relational Operators
	   1.2.3 Logical operators
	   1.2.4 Assignment operators
	   1.2.5 Unary operators
	   1.2.6 Conditional expressions
	   1.2.7 Bitwise operators
	   1.2.8 Operator precedence and associativity
	1.3 Standard Input and Output in C
	   1.3.1 I/O Functions
	   1.3.2 Formatted output – The printf function
	   1.3.3 Unformatted output – putchar and puts
	       function
	   1.3.4 Formatted input – The scanf function
	   1.3.5 Unformatted input – getchar and gets
	       functions
			15	9	CO1,
					CO2,
					CO3,
					CO4

UNIT II	**2. CONDITIONAL PROGRAM EXECUTION, PROGRAM LOOPS AND ITERATIONS**
	2.1 Branching: The if-else statement
	2.2 Nested if statement
	2.3 Dangling else problem
	2.4 The if-else-if ladder
	2.5 The switch statement
	2.6 The goto statements and labels
	2.7 Loops
	   2.7.1 The while statement
	   2.7.2 The do while statement
	   2.7.3 The for statement
			15	10	CO1,
					CO2,
					CO3,
					CO4

	2.7.4 Nested for statement			
	2.8 The break statement			
	2.9 The continue statement			

UNIT III	**3. ARRAYS AND STRINGS**
	  3.1 Arrays
	    3.1.1 Array notation and representation
	    3.1.2 Array declaration and defining
	    3.1.3 Storing elements in array
	    3.1.4 Manipulating array elements
	    3.1.5 Two-dimensional and multi-dimensional
	          arrays
	  3.2 Strings and String handling functions
	    3.2.1 String length
	    3.2.2 Using strcpy to copy strings
	    3.2.3 Concatenating strings using strcat
	    3.2.4 String compare
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	**4. STRUCTURES, POINTERS AND FILE MANAGEMENT**
	  4.1 Structures
	    4.1.1 Introduction
	    4.1.2 Defining a structure
	    4.1.3 Initializing of a structure
	    4.1.4 Accessing and processing a structure
	    4.1.5 Array of Structures
	  4.2 Pointers
	    4.2.1 Pointer concept
	    4.2.2 Pointer declaration
	    4.2.3 Initializing pointer variable
	    4.2.4 Accessing variable through pointer
	  4.3 File Management
	    4.3.1 Introduction to file management
	    4.3.2 Defining and opening a file
	    4.3.3 Closing a file, input/output operations
	          On files
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5 MODULAR PROGRAMMING**
	  5.1 Introduction
	  5.2 User-defined functions in C
	  5.3 Function – Basics
	  5.4 General form of a function
	      5.4.1 Declaring function/function prototype
	      5.4.2 Accessing a function
	  5.5 Scope rules
	  5.6 Function arguments
		15	09	CO1,
				CO2,
				CO3,
				CO4

5.6.1 Call by value			
5.6.2 Call by reference			
5.7 Return statements			
5.7.1 Returning from a function			
5.7.2 Return values			
5.7.3 Functions of type void			
5.8 Recursive functions			
5.9 Standard Library functions			
Total	75	48	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1 INTRODUCTION TO C** 1.1 Basic Elements of C 1.2 Operators and Expressions 1.3 Standard Input and Output in C	9	15
II	**2 CONDITIONAL PROGRAM EXECUTION, PROGRAM LOOPS AND ITERATIONS** 2.1 Branching: The if-else statement 2.2 Nested if statement 2.3 Dangling else problem 2.4 The if-else-if ladder 2.5 The switch statement 2.6 The goto statements and labels 2.7 Loops 2.8 The break statement 2.9 The continue statement	10	15
III	**3 ARRAYS AND STRINGS** 3.1 Arrays 3.2 Strings and String handling functions	10	15
IV	**4 STRUCTURES, POINTERS AND FILE MANAGEMENT** 4.1 Structures 4.2 Pointers 4.3 File Management	10	15

V	**5 MODULAR PROGRAMMING** 5.1 Introduction 5.2 User-defined functions in C 5.3 Function – Basics 5.4 General form of a function 5.5 Scope rules 5.6 Function arguments 5.7 Return statements 5.8 Recursive functions 5.9 Standard Library functions		9	15
		Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Write a C program to implement Input / Output Functions
2.	Write a C program to implement Operators and Expression
3.	Write a C program to implement Conditional statements
4.	Write a C program to implement Loops
5.	Write a C program to implement Arrays
6.	Write a C program to implement Strings
7.	Write a C program to implement Structures
8.	Write a C program to implement Pointers
9.	Write a C program to implement Functions
10.	Write a C program to implement File Management
No	Tutorial Exercise
1	At least 2 problems on each unit given above

10. LEARNING RESOURCES
Text Books

S. No.	Author	Title of Books	Publishers
1	E. Balagurusamy	Programming in ANSI C	Tata McGraw Hill.
2	Yeshavant Kanetkar	Let us C	BPB Publication

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	J. S. Katre, Deitel, Deitel	C- How to program	Deitel Publication.
2	P Godse, D. A. Godse	Computer Programming using C	Technical Publication

Internet and Web Resources

S. No.	Description
1	Introduction to C Programming Language, http://www.learnconline.com/2010/03/introduction.html
2	Comp.lang.C Frequently Asked Questions, http://www.c-faq.com
3	C Tutorial, http://www.cprogramming.com/tutorial/c-tutorial.html

Videos and Multimedia Tutorials

S. No.	Description
1	https://nptel.ac.in/courses/106105085/4
2	https://nptel.ac.in/courses/106104128/

(CM304) WEB DESIGNING

1. COURSE OBJECTIVES: In this course students will learn the basic concepts of World Wide Web and protocols of Internet Technology. They will also learn HTML, CSS and JavaScript and create webpages and develop website.

2. PRE-REQUISITES: Basic Engineering Practice (Comp.)

3. TEACHING AND EXAMINATION SCHEME

Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
CM304 Web Designing		L	T	P	H	TH	TM	TW	PR/OR	
		3	1	2	6	75	25	25	25	150

4. COURSE OUTCOMES: On successful completion of the course, the students will be able to:

CM304.CO1: Explain basics of World Wide Web.
CM304.CO2: Write HTML, CSS and JavaScript code.
CM304.CO3: Compare various web technologies for web designing.
CM304.CO4: Design simple web applications.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	0	0	0	1	0	1
CO2	2	2	2	2	1	2	0
CO3	2	1	1	1	0	0	1
CO4	2	2	2	2	1	2	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	3	3
CO3	2	2
CO4	3	3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
		UNIT	M	Thr	CO

UNIT I	**1 INTRODUCTION TO WORLD WIDE WEB**
	1.1 Basics of world wide web
	1.2 The Internet and its applications
	1.3 Secure Connections
	1.4 The Web Browser
	1.5 Search Engine
	1.6 The concept of a tier
	      1.6.1 One-tier application
	      1.6.2 Two-tier application
	      1.6.3 Three-tier application: Presentation tier,
	            business tier, database tier
	1.7 Web Pages
	      1.7.1 Static Web Pages: Introduction, Advantages
	          and Disadvantages
	      1.7.2 Dynamic Web Pages: Introduction, Advantages
	          and Disadvantages
	      1.7.3 Active Web Pages: Introduction, Advantages
	          and Disadvantage
		15	9	CO1,
				CO2,
				CO3,
				CO4

UNIT II	**2 DNS, FTP, HTTP AND EMAIL**
	2.1 Domain Name System
	      2.1.1 Name Space: Flat Name Space, Hierarchical
	          Name Space
	      2.1.2 Domain Name Space: Label, Domain Name,
	          Domain
	      2.1.3 Distribution of Name Space: Hierarchy of Name
	          Servers, Zone, Root server, Primary and
	          Secondary Servers
	      2.1.4 DNS in the Internet: Generic Domain, Country
	          Domain, Inverse Domain
	2.2 File transfer and Access Using FTP and TFTP
	      2.2.1 Understanding FTP
	      2.2.2 FTP Process Model
	      2.2.3 Trivial File Transfer Protocol
	2.3 Hypertext Transfer Protocol
	      2.3.1 Understanding Uniform Resource Locator(URL)
	      2.3.2 Understanding HTTP commands: GET, HEAD,
	          PUT, POST, DELETE, LINK, UNLINK
	2.4 Electronic Mail
	      2.4.1 Conceptual Components of an E-mail System
	      2.4.2 Email address format
	      2.4.3 Email Services Protocols: Simple Mail Transfer
	          Protocol, Post Office Protocol, Internet Message
	          Access Protocol
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT III	**3 HTML**	15	10	CO1,
	3.1 Introduction to HTML			CO2,
	3.1.1 HTML Tags: Container tag, Standalone tag			CO3,
	3.1.2 HTML Page Structure: Head and Body			CO4
	3.1.3 Document Structure Tags: \<HTML\>,\<HEAD\>,			
	\<BASE\>, \<META\>, \<LINK\>, \<SCRIPT\>,			
	\<TITLE\>, \<BODY\>			
	3.2 Formatting Tags			
	3.2.1 Text Formatting Tags:			
	\<B\>, \<BASEFONT\>, \<BIG\>, \<FONT\>, \<I\>,			
	\<STRIKE\>, \<SMALL\>, \<SUB\>, \<SUP\>, \<U\>			
	3.2.2 Block Formatting Tags:			
	\<BR\>, \<DIV\>, \<HR\>, \<H1\>….\<H6\>, \<P\>			
	3.3 List Tags			
	3.3.1 List Item - \<LI\>			
	3.3.2 Ordered List - \<OL\>			
	3.3.3 Unordered List - \<UL\>			
	3.3.4 Definition List - \<DL\>			
	3.4 Hyperlink - \<A\> (Attributes -href, Name, Target)			
	3.5 Image -\<IMG\> (Attributes -src, Alt, Width, Height, Border)			
	3.6 Table			
	3.6.1 The Table tags:			
	\<TABLE\>, \<CAPTION\>, \<THEAD\>,			
	\<TFOOT\>, \<TBODY\>, \<COLGROUP\>,			
	\<COL\>, \<TR\>, \<TD\>, \<TH\>			
	3.6.2 Attributes of \<TABLE\>tag :			
	border, bordercolor, cellpadding, cellspacing,			
	width, height, bgcolor, background, align,			
	hspace, vspace			
	3.6.3 Attributes of \<TR\>tag :			
	align, valign, bgcolor, background, bordercolor			
	3.6.4 Attributes of \<TD\>tag :			
	align, valign, width, height, colspan, rowspan,			
	bgcolor, background, bordercolor			
	3.6.5 Spanning multiple rows and columns			
	:colspan,and rowspan			
	3.7 Frames			
	3.7.1 Application of frames			
	3.7.2 The \<FRAMESET\> tag			
	3.7.3 Nesting \<FRAMESET\> tag			
	3.7.4 Placing content in frames with the \<FRAME\>			
	tag (Attributes - src, name, scrolling, noresize,			
	frameborder, bordercolor, marginwidth,			
	marginheight)			
	3.7.5 Targeting named frames			
	3.7.6 Creating Floating Frames - \<IFRAME\> tag			
	(Attributes - align, height, width, name, src,			
	frameborder)			

	3.8 Forms
	    3.8.1 Creating Forms- The <FORM> tag (Attributes
	        - url, method, name, target, onSubmit,onReset)
	    3.8.2 Form Elements: The Input Tag (Attributes –
	        type, name, value, size, maxlength, checked,
	        disabled, readonly), Single line text field, text
	        area (multiline input - <textarea>), password,
	        submit button, reset button, radio-buttons,
	        checkboxes, list boxes (<select> and
	        <option>tags)
	    3.8.3 Grouping Related Fields (<fieldset> and
	        <legend>tags)
	    3.8.4 Passing form data (method and action attribute
	        of <form>tag)
	3.9 Multimedia (<embed>tag)
	3.10 HTML 5
	    3.10.1 New Input Types in HTML5 - color, date,
	        datetime, datetime-local, email, month,
	        number, range, search, tel, time, url, week			

UNIT IV	**4 CSS**
	4.1 Basics of CSS
	    4.1.1 Understanding the Syntax of CSS
	    4.1.2 Inserting CSS in an HTML Document: Inline
	        style, Internal style sheet, External style sheet
	4.2 CSS Selectors - universal selector, type selector, class
	    selector, id selector, attribute selector
	4.3 Font properties in CSS (font-family, font-size, font-
	    size-adjust, font-stretch, font- style, font-variant, font-
	    weight)
	4.4 Introducing Web Font
	4.5 Text formatting properties, border properties
	4.6 Aesthetics with CSS
	    4.6.1 Using the text shadow property
	    4.6.2 Gradient Properties
	    4.6.3 Background of a Web Page
	    4.6.4 Definitions of CSS Transitions, Transformations,
	        Animations
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5 JAVASCRIPT**
	5.1 Origin of JavaScript, Advantages of java script, Java
	    script syntax.
	5.2 Variables, Data Types, Operators, Literals
	5.3 JavaScript Control Statements
	5.4 Arrays and Functions
	5.5 Dialog Boxes
	5.6 Introduction to Objects: object definition, properties,
	    methods
	5.7 Core JavaScript built-in objects
	    5.7.1 Date object: getDate(), setDate()
		15	9	CO1,
				CO2,
				CO3,
				CO4

	5.7.2 Math object: max(x,y,z,....,n), min(x,y,z,....,n), pow(x,y), round(x), sqrt(x)		
	5.7.3 String object: charAt(), concat(), indexOf(), lastIndexOf(), slice(), toUpperCase(), toLowerCase()		
	5.8 Events and Event Handlers		
	5.8.1 General information about events		
	5.8.2 Defining event handlers onclick (), onload(), onsubmit(), onreset())		
	Total	75	48

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions and exercises.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1 INTRODUCTION TO WORLD WIDE WEB** 1.1 Basics of world wide web 1.2 The internet and its applications 1.3 Secure Connections 1.4 The Web Browser 1.5 Search Engine 1.6 The concept of a tier 1.7 Web Pages	9	15
II	**2 DNS, FTP, HTTP AND EMAIL** 2.1 Domain Name System 2.2 File transfer and Access Using FTP and TFTP 2.3 Hypertext Transfer Protocol 2.4 Electronic Mail	10	15
III	**3 HTML** 3.1 Introduction to HTML 3.2 Formatting Tags 3.3 List Tags 3.4 Hyperlink - <A> (Attributes - href, Name, Target) 3.5 Image - <IMG> (Attributes - src, Alt, Width, Height, Border) 3.6 Table 3.7 Frames 3.8 Forms 3.9 Multimedia (<embed>tag) 3.10 HTML 5	10	15
IV	**4 CSS** 4.1 Basics of CSS 4.2 CSS Selectors 4.3 Font properties in CSS	10	15

		4.4 Introducing Web Font 4.5 Text formatting properties, border properties 4.6 CSS color Modes 4.7 Aesthetics with CSS		
V		**5 JAVASCRIPT** 5.1 Origin of JavaScript, Advantages of java script, Java script syntax. 5.2 Variables, Data Types, Operators, Literals 5.3 JavaScript Control Statements 5.4 Arrays and Functions 5.5 Dialog Boxes 5.6 Introduction to Objects 5.7 Core JavaScript built-in objects 5.8 Events and Event Handlers	9	15
		Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

S. No	Practical
1	Study of Web Browser and Search Engine
2	Study of Web pages, HTTP and its commands
3	Implement image, hyperlinks and lists tags in HTML
4	Implement table tag in HTML
5	Implement frame and frameset in HTML
6	Design form using HTML
7	Implement inline, internal and external CSS
8	Implement HTML5 tags
9	Implement in-built and event handling JavaScript functions
10	Mini project: Develop Website using HTML, CSS and JavaScript
No	Tutorial Exercise
1	At least 2 problems on each unit given above

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Achyut Godbole	Web Technologies	Wesley Publishing Co
2	Behrouz.A.Forouzan	Data Communication and Networking	Mc Graw Hill
3	Kogent Learning Solutions Inc	Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax	Dreamtech Press

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Duckett, Jon	Beginning Web Programming with HTML, XHTML, and CSS	Wrox
2	Bhumika S. Zalavadia	Static and Dynamic Webpage Development with HTML, CSS, JavaScript, jQuery, PHP, MySQL and AJAX	Penram International Publishing (India) Pvt.Ltd.

Internet and Web Resources

S. No.	Description
1	https://www.w3schools.com/html/default.asp
2	https://www.tutorialspoint.com/

Videos and Multimedia Tutorials

S. No.	Description
1	https://nptel.ac.in/courses/124107002/18
2	http://www.nptelvideos.in/2012/11/internet-technologies.html

(CM305) COMPUTER LABORATORY-I

1. COURSE OBJECTIVES: In this course the students will learn to design and setup a computer/server room, installation and configuration of computer systems and to diagnose the faults and troubleshoot the computer system.

2. PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						**Theory Marks**		**Practical Marks**		**Total Marks**
CM305 COMPUTER LABORATORY-I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		-	1	2	3	-	-	25	50	75

4. COURSE OUTCOMES: Student will be able to:

CM305.CO1: Identify various parts of a computer system.

CM305.CO2: Use various components to assemble a computer system.

CM305.CO3: Devise specification for computer systems.

CM305.CO4: Manage a computer system and its peripherals.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	0	0	0	1
CO2	2	1	2	2	0	1	1
CO3	2	2	2	2	1	2	1
CO4	2	2	2	2	1	2	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	1
CO2	3	2
CO3	3	2
CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO

UNIT I	**1 PRE-INSTALLATION PLANNING AND INSTALLATION**
	 1.1 Design of computer room considering factors: Location, Earthing, Computer Room Pollution, Air Room Conditioning, False Flooring and False Ceiling, temperature, humidity, Fire Protection Systems.
	 1.2 Power Supply: Clean Power Supply, Power Supply Problems, Power Conditioning, Power Supply Characteristics (noise level, Ripple, Efficiency, Rated wattage)
	     1.2.1 UPS: Types of UPS and working principle
	     1.2.2 SMPS: working principle, Power Connectors (24-pin ATX, NLX, adapter cables) and color codes
			10	6	CO1, CO2, CO3, CO4

UNIT II	**2 PC SYSTEM**
	 2.1 System Unit
	     2.1.1 Front Panel Controls
	     2.1.2 Motherboard: Different Forms of Motherboard, Motherboard and its Components, Rear side Connectors of Motherboard, Motherboard Selection criteria, Form Factors, Expansion Slots: PCI, PCI-E, PCI-Express, PCMCIA
	 2.2 Display Unit
	     2.2.1 Types of Displays
	     2.2.2 Working Principle of Displays
	 2.3 Input Devices
	     2.3.1 Keyboard: Types of keyboards, Working Principle
	     2.3.2 Mouse: Working principle of mice, Different types of mice
	 2.4 Ports, Cables, Connectors
	 2.5 USB Connectors and Features
			10	8	CO1, CO2, CO3, CO4

UNIT III	**3 UNDERSTANDING MEMORY AND DRIVES** 3.1 Memory: DRAM, SRAM, DIMM DDR1, DDR2, DDR3 3.2 Hard Disk Drive: 3.2.1 Construction: Hard Disk Drive, Sub-		10	6	CO1, CO2, CO3, CO4

	assemblies, Tracks, Sectors, Clusters, Sector Interleaving , Landing Zone 3.2.2 Working of HDD: Reading and Writing operation 3.2.3 Interfaces, Installation 3.3 Types of Optical Drives, Optical Disk 3.4 Installing and Configuring an Optical Drive			

UNIT IV	**4 OTHER PERIPHERAL DEVICES**
	  4.1 Printers
	     4.1.1 Types of Printers: Impact and Non-impact printers
	     4.1.2 Ink-Jet Printer: Working Principle, Advantages and Disadvantages
	     4.1.3 Laser Printer: Working Principle, Advantages and Disadvantages
	     4.1.4 Dot Matrix Printer: Working Principle, Advantages and Disadvantages
	  4.2 Scanner: Working Principle of Scanners
	  4.3 Modem: Types of Modem
		10	6	CO1, CO2, CO3, CO4

UNIT V	**5 MAINTENANCE AND TROUBLESHOOTING**
	  5.1 Maintenance- Preventive and remedial maintenance
	     5.1.1 Preventive maintenance –Problem causes, Problem Source, Effects and actions taken for printers, keyboards
	     5.1.2 General Precautions
	     5.1.3 Computer faults-Nature –Solid or Intermittent, hardware and Software fault. Customer provided information and its synthesis.
	  5.2 Troubleshooting
	     5.2.1 Classical steps to successful troubleshooting
	     5.2.2 Understanding how components fail
	     5.2.3 Disk drives failures and troubleshooting
	     5.2.4 Safety precautions in trouble shooting.
	     5.2.5 Equipment used in trouble shooting.
	     5.2.6 Diagnostic software.
	     5.2.7 POST
		10	6	CO1, CO2, CO3, CO4

	Total	50	32	

7. COURSE DELIVERY
The Course will be delivered through practical and exercises.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks

I	**1 PRE-INSTALLATION PLANNING AND INSTALLATION**
	    1.1 Design of computer room considering factors
	    1.2 Power Supply problems, Characteristics
		6	10

II	**2 PC SYSTEM**
	    2.1 System Unit
	    2.2 Display Unit
	    2.3 Input Devices
	    2.4 Ports, Cables, Connectors
	    2.5 USB Connectors and Features
		8	10

III	**3 UNDERSTANDING MEMORY AND DRIVES**
	    3.1 Memory: DRAM, SRAM, DIMM DDR1, DDR2, DDR3
	    3.2 Hard Disk Drive
	    3.3 Types of Optical Drives, Optical Disk
	    3.4 Installing and Configuring an Optical Drive
		6	10

IV	**4 OTHER PERIPHERAL DEVICES**
	    4.1 Printers
	    4.2 Scanner
	    4.3 Modem: Types of Modem
		6	10

V	**5 MAINTENANCE AND TROUBLESHOOTING**
	    5.1 Maintenance- Preventive and remedial maintenance
	    5.2 Troubleshooting
		6	10

	Total	32	50

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Case study of a computer lab and a server room.
2	Design a computer room for a given need.
3	Study of various types of UPS.
4	Study of SMPS and identifying various voltage levels.
5	Identifying front and rear panel indicators, switches and connectors/ports of a computer system.
6	Study of motherboard.
7	Study of different types of Computer Memory
8	Installation of HDD and CD ROM Drive.
9	Study of different types of Printers.
10	Study of Maintenance of a computer system.
11	Study of different types of computer faults and troubleshooting mechanism.
12	Assembling of a computer system
No	**Tutorial Exercise**
1	At least 2 problems on each unit given above

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B. Govindrajalu	IBM PC and Clones, Hardware, Troubleshooting and Maintenance	Tata McGraw-Hill
2	D Balasubramanian	Computer Installation and Servicing	McGraw-Hill

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Robert Bruce Thompson and Barbara Bruce Thompson	Repairing and Upgrading your PC	O'Reilly
2	K. L. James	Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance	PHI Learning

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/computer_fundamentals/computer_hardware.html
2	Nji.gov.ng/images/Workshop_Papers/2017/IT_Workshop/s3.pdf

Videos and Multimedia Tutorials

S. No.	Description
1	Computer Basics Hardware – https://www.youtube.com/watch?v=ctAVC2JwEwl

(CC309) DIGITAL ELECTRONICS

1. COURSE OBJECTIVES:

The students need to learn basic concepts of digital circuits and system which leads to design of complex digital system such as microprocessors.

The students need to know combinational and sequential circuits using digital logic fundamentals. This is the first course by which students get exposure to digital electronics world.

The students will able to

1. To understand various number representations and conversion between different representation in digital electronic circuits.
2. To introduce the students to various logic gates, SOP, POS and their minimization techniques.
3. To analyze logic processes and implementation of logical operations using combinational logic circuits.
4. To understand, analyze and design sequential circuits

2. TEACHING AND EXAMINATION SCHEME

Semester	III								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
Digital Electronics CC309	L	T	P	C	TH	TM	TW	PR/OR	
	03	-	02	05	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1: Relate the knowledge of Number Systems in Digital Applications.
CO2: Build different Sequential and Combinational Circuits.
CO3: Simplify logical problems using digital circuits.
CO4: Develop basic digital electronics circuits.
.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	3	3	0	0	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	0	3
CO4	3	3	3	3	2	2	3

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			**M**	**Thr**	**CO**
1 Number System			14	09	CO1
1.1 **Digital and Analog Signals**. Definition of digital and analog signals, Comparison between Analog and Digital signals					
1.**2 Number System**:- Decimal, Binary, Hexadecimal. Introduction to Decimal, Binary and Hexadecimal Number Systems. Counting in each system. Conversion from one system to other.					
1.3 Codes:- introduction and importance of Codes. BCD code, GRAY code conversion of Gray to Binary, Binary to Gray, BCD to binary and Binary to BCD. Represent Decimal Numbers in BCD and Gray codes. ASCII code and its importance.					
1.4 Binary Addition (upto 4 bits), 1's complement of a Binary number, 2's complement of a Binary number. Binary Subtraction using 2's complement method. Addition of signed decimal numbers.					
2 Combinational Circuits			19	12	CO1,CO2,CO3
2.1 Logic Gates:- Symbol, Expression and Truth Tables of Basic gates(AND,OR,NOT) and Combinational gates(NOR,NAND,EXOR,EXNOR).					
2.2 Boolean Algebra:- DeMorgan's Theorems, Laws of Boolean Algebra , Duality Theorem,					
2.3 Simplification of Boolean Expressions using Boolean Algebraic laws and by using K-Maps Techniques (upto 4 Variables in SOP Form),					
2.4 Universal Gates:- Implementation of NOT,OR,AND,EXOR gates using NOR and NAND Gates					
2.5 Adders:- Half Adder circuit using logic gates , Full Adder circuit using logic gates, block diagram of 4 bit parallel adder. Subtractors:- Half subtractor circuit using logic gates, Full					

Subtractor using logic gates			
2.6Combinational circuits:- Block diagram and Implementation using basic gates:-Multiplexers(4 to 1), Demultiplexer(1 to 4), Encoder (4 to 2), Decoder(2 to 4). BCD to 7 segment Decoder driver (Common Cathode).			
3 Flip Flops	**12**	**08**	**CO1,CO2,**
3.1 Definition of FlipFlop. Applications. Symbol, Truth Tables, Operation and timing diagrams of RS F/F using NAND gates. ,			
3.2 Symbol, Truth Tables, Operation and timing diagrams of clocked RS F/F using NAND Gates, Concept of Asynchronous inputs(Preset and Clear)			
3.3 Symbol, Truth Tables, Operation of Clocked D F/F			
3.4 Symbol, Truth Tables, Operation of Clocked JK F/F, Excitation table of JK flip flop			
3.5 Race around condition in JK F/F. Symbol, Truth Tables, Operation of JK master slave F/F.			
3.6 Symbol, Truth Tables, Operation of T F/F,			
4 Registers And Counters	**19**	**12**	**CO1,CO2,CO4**
4.1 Registers: Definition of Shift Registers, Applications of Registers Symbols and Logic block diagram of SISO,SIPO,PISO and PIPO Registers,			
4.2 Serial IN Serial Out Register (size of the register 4 bits) Logic Diagram and Operation of SISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams			
4.3 Serial IN Parallel Out Register (size of the register 4 bits) Logic Diagram and Operation of SIPO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams.			
4.4 Parallel IN Serial Out Register (size of the register 4 bits) Logic Diagram and Operation of PISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams			
4.5 Parallel In Parallel Out Register (size of the register 4 bits) Logic Diagram and Operation of PISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams . Concept of Shift right, Shift left, Ring Counter.			
4.6 Counters: Introduction to counters, Modulus of			

counters. Count sequence, No of Flip Flops required for Specified counters			
4.7 Asynchronous Counters:- 4 bit UP counter using JK Flip Flops only and 4 bit DOWN counter using JK Flip Flops only.			
4.8 Synchronous Counters:- 4 bit UP counter using JK Flip Flops only and 4 bit DOWN counter using JK Flip Flops only, Decade (Mod 10) using JK Flip Flops only			
4.9 Design of Synchronous counters(upto 4 bit) using only JK Flip Flops			
5 DAC and ADC and Memories	**11**	**7**	**CO1,CO4**
5.1 Definitions, Types of DAC and ADC(no Description),Applications		1	
5.2 Binary Ladder Network for DAC:- Logic circuit and operation. Simple numerical problems Successive Approximation ADC .:- Logic circuit and operation. Simple numerical problems.		4	
5.3Memories: Introduction, Semiconductor memories and its types –ROM,RAM,PROM, EPROM,EEPROM(only definition and applications)		2	
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Number System**	09	14
2	**Combinational Circuits**	12	19
3	**Flip FLops**	08	12
4	**Registers And Counters**	12	19
5	**DAC and ADC**	07	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (Perform any 8)	Marks
1.	Verification of Logic gates and Demorgan's Theorems	
2.	Universal gates (NAND and NOR)	
3.	Verification of Boolean Expression	
4.	Half Adder and Full Adder using logic gates	
5.	Half Subtractor and Full Subtractor using logic gates	

6.	MUX and D-MUX		
7.	RS F/F, D F/F and JK F/F		
8.	Assemble and Test Binary Counter/Decade counter		
9.	Assemble and test DAC using DAC0808		
10.	Assemble and test ADC using ADC0808		
		Total	25
...			
No	Class room Assignments		
	At least 2 assignments		
No	**Tutorial Exercise**		**Marks**
1	NIL		
...		Total	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.P.Jain,	Modern Digital Electronics	Fourth Edition, Tata McGraw-Hill Education.
2	Malvino & Leach,	Digital Principles and Applications	Seventh Edition, McGraw-Hill Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Thomas L. Floyd,	Digital Fundamentals	10th Edition, Pearson Education Inc, 2011
2	. By A.K. Maini,	Digital Electronics: Principles and Integrated Circuits	Wiley India Publications

SEMESTER IV

Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
FOURTH	CM401	Microprocessors	3	−	2	5	75	25	−	25	125
	CM402	Introduction to Database Management Systems	3	1	2	6	75	25	25	25	150
	CM403	Object Oriented Programming	3	1	2	6	75	25	25	25	150
	CM404	Internet Technologies	3	−	2	5	75	25	25	−	125
	CM405	Data Communication & Computer Networks	3	−	2	5	75	25	−	25	125
	CM406	Computer Laboratory-II	−	-	2	2	−	−	50	25	75
			15	2	12	29	375	125	125	125	750

L- Lecturers T – Tutorials P – Practicals H- Hours TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks

(CM401) MICROPROCESSORS

1. AIM: To provide basic knowledge of Microprocessor, Assembly Language Programming and Microcontrollers.

2. COURSE OBJECTIVES: In this course the students will learn the following:
1. Architecture of 8086 microprocessor
2. Addressing modes and instruction set of Microprocessor.
3. 8086 interrupt types, interrupt handling process.
4. Differentiate between Microprocessor and Microcontroller.

3. PRE-REQUISITES: Knowledge of Digital Electronics and Computer Organization.

4. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						**Theory Marks**		**Practical Marks**		**Total Marks**
CM401		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Microprocessors and Applications		3	-	2	5	75	25	25	-	125

5.COURSE OUTCOMES: Student will be able to:
CM401.CO1: Explain basic concepts of Microprocessor and Microcontroller.
CM401.CO2: Use 8086 Microprocessor instructions.
CM401.CO3: Select appropriate addressing mode.
CM401.CO4: Develop assembly language programs.

6.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	1	0	0	1	0	1
CO2	2	2	1	0	0	0	1
CO3	2	2	1	0	0	0	1
CO4	2	2	2	2	0	2	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	2	1

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO

UNIT I	1. 8086 – INTRODUCTION AND ARCHITECTURE
	1.1 Organization of a Microprocessor-Based System (Microprocessor, Memory, Input/Output, System Bus)
	1.2 Introduction to 8086
	    1.2.1 Salient features of 8086
	    1.2.2 8086 Internal Block Diagram
	    1.2.3 Bus Interface Unit: Segment registers, Instruction Queue, Instruction pointer
	    1.2.4 Execution Unit: General purpose Registers, Flag register, Control Unit, Pointer registers, Base and Index Registers
	1.3 Pin diagram and signal description
	    1.3.1 Pins used in minimum mode and its description
	    1.3.2 Pins used in maximum mode and its description
	    1.3.3 Pins common in both the modes
	1.4 Memory Organization of 8086
	    1.4.1 Memory Segmentation
	    1.4.2 Generation of 20-bit physical address
			15	10	CO1, CO2, CO3, CO4

UNIT II	2. ADDRESSING MODES AND INSTRUCTION SET OF 8086
	2.1 Classification of addressing Modes
	    2.1.1 Immediate addressing Mode
	    2.1.2 Register addressing Mode
	    2.1.3 Memory addressing Mode: Direct, Register Indirect, Indexed, Based, Based-Indexed
	    2.1.4 Relative addressing Mode: Register Relative, Relative Based Indexed
	    2.1.5 Implied addressing Mode
	    2.1.6 Port addressing Mode
	2.2 Assembler Directives- Segment, db, dw, ends, endp, endm, assume, start, end, proc, equ, dup
	2.3 Instruction set and Programming
	    2.3.1 Data Transfer Instructions- MOV, IN, OUT, PUSH, POP, PUSHF, POPF, XCHG
	    2.3.2 Arithmetic Instructions- ADD, ADC, INC, DAA, SUB, SBB, DEC, CMP, MUL, DIV, CBW, CWD
	    2.3.3 Bit Manipulation Instructions- AND, OR, NOT, XOR, SHL, SHR, SAL, SAR,
			15	10	CO1, CO2, CO3, CO4

	ROR, ROL, RCR, RCL			
	2.3.4 String Instructions- MOVSB/W, CMPSB/W, LODSB/W, SCASB/W, STOSB/W String prefix: REP, REPE/REPZ			
	2.3.5 Processor Control Instructions -STC, CLC, CMC, STD, CLD, STI, CLI, NOP			

UNIT III	**3.ASSEMBLY LANGUAGE PROGRAMMING CONCEPTS**
	3.1 Branch Instructions
	    3.1.1 Unconditional: CALL-NEAR and FAR, RET, JMP-NEAR and FAR
	    3.1.2 Conditional: JC, JNC, JZ, JNZ, JP, JNP, JO, JNO, JS, JNS
	    3.1.3 Structures: If - then, if - then - else, multiple if – then – else, Repeat - Until
	3.1 Overview of Stack
	    3.2.1 Stack operations (PUSH, POP)
	    3.2.2 Stack pointer
	3.3 Overview of Procedures
	    3.3.1 Types of procedures: Reentrant and Recursive
	    3.3.2 Brief overview of CALL and RET instructions for implementing procedure
	3.4 Overview of Macros
	3.5 Comparison between Macros and Procedures
	3.6 Assembly Language Program Development Tools
	    3.6.1 Editor
	    3.6.2 Assembler
	    3.6.3 Linker
	    3.6.4 Loader
	    3.6.5 Debugger
	    3.6.6 Emulator
		15	10	CO1, CO2, CO3, CO4

UNIT IV	**4. INTERRUPTS AND BUS OPERATIONS**
	4.1 Interrupt Instructions - INTO, INT, IRET
	4.2 Types of 8086 interrupts
	    4.2.1 Hardware interrupts, software interrupts and interrupts due to error conditions
	    4.2.2 Interrupt response with diagram
	    4.2.3 Interrupt pointer table
	    4.2.4 Priority of interrupts
	4.3 8259 Interrupt Controller - Block Diagram & its description
	4.4 8086 Bus operations
	    4.4.1 Timing diagram of 8086 read machine cycle
	    4.4.2 Timing diagram of 8086 write machine cycle
		15	9	CO1, CO2, CO3, CO4

UNIT V	**5. ADVANCED MICROPROCESSORS AND MICROCONTROLLERS**
	5.1 Salient features of 80286, 80386 and 80486 processors
	5.2 Architectural features of Pentium Processor
	5.3 Salient features of latest processors
	     5.3.1 Dual core
	     5.3.2 Core 2 duo
	     5.3.3 i3, i5, i7 processors
	5.4 Introduction to Microcontroller
	     5.4.1 Definition of a Microcontroller
	     5.4.2 Microprocessor vs Microcontroller
	     5.4.3 Microcontroller features: On-chip Oscillator, Large number of special purpose registers, Harvard architecture, On-chip program memory, On-chip data memory, On-chip I/O ports, Powerful Interrupt structure, Built-in ADC
	     5.4.4 Applications of Microcontroller
		15	9	CO1,
				CO2,
				CO3,
				CO4

	Total	75	48	

8. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. 8086 – INTRODUCTION AND ARCHITECTURE** 1.1 Organization of a Microprocessor-Based System 1.2 Introduction to 8086 1.3 Pin diagram and signal description 1.4 Memory Organization of 8086	10	15
2	**2. ADDRESSING MODES AND INSTRUCTION SET OF 8086** 2.1 Classification of addressing Modes 2.2 Assembler Directives 2.3 Instruction set and programming	10	15
3	**3.ASSEMBLY LANGUAGE PROGRAMMING CONCEPTS** 3.1 Branch Instructions 3.2 Overview of Stack 3.3 Overview of Procedures 3.4 Overview of Macros	10	15

	3.5 Comparison between Macros and Procedures		
	3.6 Assembly Language Program Development Tools		
4	**4. INTERRUPTS AND BUS OPERATIONS** 4.1 Interrupt Instructions - INTO, INT, IRET 4.2 Types of 8086 interrupts 4.3 8259 Interrupt Controller -Block Diagram & its description 4.4 8086 Bus operations	9	15
5	**5. ADVANCED MICROPROCESSORS AND MICROCONTROLLERS** 5.1 Salient features of 80286, 80386 and 80486 processors 5.2 Architectural features of Pentium Processor 5.3 Salient features of latest processors 5.4 Introduction to Microcontrollers	9	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of 8086 Microprocessor- Registers, Memory, Flags, Instruction classification.
2	Study of Assembly Language Program Development Tools.
3	Assembly Language Program on Data transfer instructions.
4	Assembly Language Program on basic Arithmetic Operations
5	Assembly Language Program on Logical Instructions.
6	Assembly Language Program on Rotate and Shift Instructions.
7	Assembly Language Program on String instructions.
8	Assembly Language Program on Branch Instructions.
9	Assembly Language Program on Processor control instructions.
10	Comparative study of Microprocessor and Microcontroller
11	Microprocessor based mini project.

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Douglas V. Hall	Microprocessors and Interfacing: Programming and Hardware	Tata McGraw-Hill Education
2	A. K. Ray and K. M.Bhurchandi	Advanced Microprocessors and Peripherals	Tata McGraw-Hill Education
3	Ajit Pal	Microcontrollers-Principles and Applications	Asoke K. Ghosh, PHI Learning Pvt. Ltd.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Mohamed Rafiquzzaman	Microprocessors and Microcomputer - Based System Design	CRC Press, 1990
2	Barry B. Brey	The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions	Pearson Education

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/microprocessor/microprocessor_tutorial.pdf
2	http://www.vssut.ac.in/lecture_notes/lecture1428551326.pdf
3	https://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/pdf/Teacher_Slides/mod1/M1L3.pdf
4	http://www.gabrielececchetti.it/Teaching/CalcolatoriElettronici/Docs/i8086_instruction_set.pdf

Videos and Multimedia Tutorials

S. No.	Description
1	https://nptel.ac.in/courses/108105102/62
2	https://www.youtube.com/watch?v=DmwOSdwzZ3E
3	https://www.youtube.com/watch?v=zMtErZsJ1o8

(CM402) INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

1. AIM: To provide broad understanding of the basic concepts of database management system in particular relational database system.

2. COURSE OBJECTIVES: In this course the students will learn the following:
1. Understand the need and uses of database.
2. Learn designing of a database.
3. Use data manipulation language to query, update and manage a database.
4. Understand the concepts of transactions and database security.

3. PRE-REQUISITES: Elementary knowledge about computers and computer programming.

4. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						**Theory Marks**		**Practical Marks**		**Total Marks**
CM402		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Introduction to database management systems		3	1	2	6	75	25	25	25	150

5.COURSE OUTCOMES: Student will be able to:

CM402.CO1: Explain the concepts of database management system.

CM402.CO2: Use the concepts of Database management system.

CM402.CO3: Formulate SQL queries.

CM402.CO4: Design a simple Database System.

6.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Developme nt of Solutions	Engg. Tools, Experiment	Engg. Practices for Society, Sustainabilit y Environmen	Project Managemen t	Life -long Learning
CO1	2	2	0	0	0	0	0
CO2	2	3	2	2	0	2	0
CO3	2	3	3	3	0	0	2
CO4	2	3	3	3	3	2	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	3	3
CO3	3	3
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

| M=Marks | Thr= Teaching hours | CO = Course Outcomes |

UNIT		M	Thr	CO
UNIT I	**1. INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS** 1.1 Database - an introduction 1.2 The database management system 1.3 Advantages of using a database 1.4 Features of data in a database 1.5 Components of a DBMS 1.6 The three-level architecture for a database system 1.7 Data modeling 1.7.1 Introduction 1.7.2 Types of data models: Record based logical models (Relational Model, Network Model, Hierarchical Model) Object based data models: Object Oriented Model 1.7.3 Advantages and Disadvantages of Relational, Network, Hierarchical, Object Oriented Model 1.7.4 Comparison between Relational, Network, Hierarchical, Object Oriented	15	10	CO1, CO2, CO3, CO4
UNIT II	**2. INTRODUCTION TO RELATIONAL DATABASE MANAGEMENT SYSTEM** 2.1 Relational Model 2.1.1 Relational Database Primer**:** Tabular Representation of data**,** Some terminology**,** Domains 2.1.2 Relational Database Characteristics 2.2 Relational Algebra 2.2.1 Relational Algebra Operators: Restrict, Project, Product, Union, Intersection, Difference, Join, Divide 2.3 Relational Calculus 2.4 Database Integrity 2.4.1 Constraints 2.4.2 Declarative and Procedural Constraints: Type Constraints, Attribute Constraints, Instance Constraints, Database	15	10	CO1, CO2, CO3, CO4

	Constraints
	2.5 Keys
	    2.5.1 Super key and key
	    2.5.2 Composite key
	    2.5.3 Candidate key
	    2.5.4 Primary key
	    2.5.5 Alternate key or Secondary key
	    2.5.6 Foreign key			

UNIT III	**3. DATABASE DESIGN & ER MODELLING**
	3.1 Entity/Relationship (E/R) Modelling
	    3.1.1 Components of an ER model: Entities,
	          Attributes
	    3.1.2 Entity Relationship Diagram (ERD):
	          Symbols in ER diagram
	    3.1.2 Relationships: Degree, Cardinality,
	          Dependency
	3.2 Functional Dependency
	3.3 Normalization and Normal Forms
	    3.3.2 Introduction to Normalization: Need of
	          Normalization: Advantages of
	          Normalization
	    3.3.2 Definitions of Normal Forms: First
	          Normal Form, Second Normal Form,
	          Third Normal Form
		15	9	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	**4. STRUCTURED QUERY LANGUAGE**
	4.1 Structured Query Language
	    4.1.1 SQL - an introduction
	    4.1.2 Advantages of SQL
	    4.1.3 SQL commands
	    4.1.4 SQL data types and literals
	    4.1.5 SQL operators
	4.2 Queries
	    4.2.1 DDL Queries: Create table, Create table
	          as select, Alter table add, Alter table
	          modify, Drop table, Renaming a table
	    4.2.2 DML queries: Insert, Update, delete
	    4.2.3 Select query: The select, from, where
	          clause, SQL operators in queries
	    4.2.4 Aggregate functions: avg, min, max,
	          sum, count
	    4.2.5 Set operations (union, intersect, except)
	    4.2.6 Grouping while selecting
	    4.2.7 Joins: Need for joins, Use of Aliases,
	          Equijoins & Non-Equijoins
	    4.2.8 Order by
	    4.2.9 Having
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5. TRANSACTION PROCESSING AND DATABASE SECURITY**	15	9	CO1, CO2,

	5.1 Transaction			CO3, CO4
	5.1.1 Transaction – Need and Mechanism			
	5.1.2 Transaction Processing (TP) Monitor			
	5.1.3 Transaction Properties			
	5.2 Recovery			
	5.2.1 Classification of recovery			
	5.2.2 System recovery			
	5.2.3 Failure recovery			
	5.2.4 Media recovery			
	5.3 Two phase commit			
	5.4 Database Security			
	5.4.1 Introduction			
	5.4.2 Database users			
	5.4.3 Types of database users			
	5.4.4 Database privileges			
	Total	75	48	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS** 1.1 Database - an introduction 1.2 The database management system 1.3 Advantages of using a database 1.4 Features of data in a database 1.5 Components of a DBMS 1.6 The three-level architecture for a database system 1.7 Data modeling	10	15
2	**2. INTRODUCTION TO RELATIONAL DATABASE MANAGEMENT SYSTEM** 2.1 Relational Model 2.2 Relational Algebra 2.3 Relational Calculus 2.4 Database Integrity 2.5 Keys	10	15
3	**3. DATABASE DESIGN & ER MODELLING** 3.1 Entity/Relationship (E/R) Modelling 3.2 Functional Dependency 3.3 Normalization and Normal Forms	9	15
4	**4. STRUCTURED QUERY LANGUAGE** 4.1 Structured Query Language 4.2 Queries	10	15
5	**5. TRANSACTION PROCESSING AND DATABASE SECURITY**	9	15

	5.1 Transaction 5.2 Recovery 5.3 Two phase commit 5.4 Database Security		
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Designing E-R diagrams for given applications.
2	Tabular representation of E-R diagrams.
3	Overview and comparison of different database softwares. (MySQL, Oracle, Microsoft SQL Server)
4	Installation and Configuration of DBMS.
5	Creating & Executing DDL commands with Integrity constraints on table in SQL.
6	Creating & Executing DML commands in SQL.
7	Build and execute SQL queries using various Arithmetic, Conditional and Logical
8	Build and execute SQL queries using the DQL Commands with various clauses and aggregate functions.
9	Build and execute queries using various types of Join operations.
10	Build and execute queries for implementing Set Operations.
11	Study of Transaction processing and Database Security concepts.
12	Mini Project: Design and implement Database Management Systems

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Isrd Group	Introduction to Database Management Systems	McGraw Hill Education (India) Private Limited
2	Atul Kahate	Introduction to Database Management Systems	Pearson
3	AviSilberschatz, Henry F. Korth, S. Sudarshan	Database System Concepts	Tata McGraw Hill

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Shilbhadra Dasgupta, Rini Chakrabarti	Advanced Database Management System	Dreamtech Press
2	An Introduction to Database Systems	Date, C. J.	PearsonEducation

Internet and Web Resources

S. No.	Description
1	http://holowczak.com/oracle-sqlplus-tutorial/
2	http://www.roseindia.net/programming-tutorial/Database-Tutorials
3	http://www.w3schools.com/sql/

Videos and Multimedia Tutorials

S. No.	Description
1	ER Model - https://www.youtube.com/watch?v=Wv1c9K4788A
2	Join Operations - https://www.youtube.com/watch?v=zYH-e6tUYbw

(CM403) OBJECT ORIENTED PROGRAMMING

1. AIM: To develop Object Oriented Programming skills.

2. COURSE OBJECTIVES: In this course the students will learn the following:
1. Understand basic skills of object oriented programming.
2. Develop object oriented programs.
3. Build strong foundation for advanced programming.

3. PRE-REQUISITES: Knowledge of Computer Programming.

4. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
CM403 Object Oriented Programming		L	T	P	H	TH	TM	TW	PR/OR	
		3	1	2	6	75	25	25	25	150

5.COURSE OUTCOMES: On successful completion of the course, the student will be able to:
CM403.CO1: Explain the concepts of Object-Oriented programming.
CM403.CO2: Use the features of Object-Oriented programming in computer programs.
CM403.CO3: Compare various Java programming constructs.
CM403.CO4: Develop simple java programs.

6.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability &	PO 6 Project Management	PO 7 Life-long Learning
CO1	0	2	0	0	0	0	0
CO2	0	3	2	0	0	0	0
CO3	2	3	3	3	2	2	1
CO4	2	3	3	3	3	3	2

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	3	3
CO3	2	2
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**

UNIT I	**1. INTRODUCTION TO JAVA**
	1.1 Basic concept of object-oriented programming
	    1.1.1 Objects & classes
	    1.1.2 Data abstraction & encapsulation
	    1.1.3 Inheritance
	    1.1.4 Polymorphism
	    1.1.5 Dynamic binding
	    1.1.6 Message communication
	    1.1.7 Advantages & applications of OOP.
	1.2 Java features
	    1.2.1 Compiled & interpreted
	    1.2.2 Platform independent & portable
	    1.2.3 Object oriented
	    1.2.4 Robust & secure
	    1.2.5 Distributed
	    1.2.6 Simple, small & familiar
	    1.2.7 Multithreaded & interactive
	    1.2.8 High performance
	    1.2.9 Dynamic & extensible
	1.3 Java Environment
	1.4 Overview of Java language
	    1.4.1 Java program structure
	    1.4.2 Tokens
	    1.4.3 Java statements
	1.5 Constants, variables & data types
	    1.5.1 Constants
	    1.5.2 Variables
	    1.5.3 Data types
	    1.5.4 Declaration of variables
	    1.5.5 Giving values to variables
	    1.5.6 Scope of variables
	    1.5.7 Symbolic constants
	    1.5.8 Type casting
	    1.5.9 Standard default values
	1.6 Operators & expressions
	    1.6.1 Arithmetic operators
	    1.6.2 Relational
	    1.6.3 Logical operators
	    1.6.4 Assignment operators
	    1.6.5 Increment/decrement operators
	    1.6.6 Conditional operators
	    1.6.7 Bitwise operators
	    1.6.8 Special operators
	    1.6.9 Arithmetic expressions
	    1.6.10 Evaluation of expression
			15	9	CO1,
					CO2,
					CO3,
					CO4

	1.6.11 Precedence of arithmetic operators			
	1.6.12 Type conversion in expression			
	1.6.13 Operator precedence & associativity			
	1.7 Decision making, branching & looping			
	1.7.1 if statement			
	1.7.2 if-else, nested if-else, if-else if ladder			
	1.7.3 switch			
	1.7.4 while			
	1.7.5 do-while			
	1.7.6 for			
	1.7.7 jumps in loops (break, continue)			
	1.7.8 Labeled loop			
	1.7.9 Nested loops			

UNIT II	**2. CLASSES, OBJECTS &ARRAY**
	2.1 Classes & objects
	    2.1.1 Introduction
	    2.1.2 Defining a class
	    2.1.3 Field declaration
	    2.1.4 Method declaration
	    2.1.5 Creating objects
	    2.1.6 Accessing class members
	    2.1.7 Constructors
	    2.1.8 Method overloading
	    2.1.9 Static methods
	    2.1.10 Nesting of methods
	2.2 Visibility control
	2.3 Arrays, Strings & Vectors
	    2.3.1 One dimensional array
	    2.3.2 Creating an array
	    2.3.3 Two-dimensional array
	    2.3.4 Strings: String array, String methods, String buffer class
	    2.3.5 Enumerated types
		15	10	CO1, CO2, CO3, CO4

UNIT III	**3. INHERITANCE, INTERFACES AND PACKAGES**
	3.1 Inheritance
	    3.1.1 Defining a subclass
	    3.1.2 Subclass constructor
	    3.1.3 Multilevel inheritance
	    3.1.4 Hierarchical inheritance
	    3.1.5 Overriding methods
	    3.1.6 Final variables & methods
	    3.1.7 Final classes
	    3.1.8 Finalizer method
	    3.1.9 Abstract methods & classes
	3.2 Interfaces
	    3.2.1 Introduction
	    3.2.2 Defining interfaces
	    3.2.3 Extending interfaces
		15	10	CO1, CO2, CO3, CO4

	3.2.4 Implementing interfaces			
	3.2.5 Accessing interface variables			
	3.3 Packages			
	3.3.1 Introduction			
	3.3.2 Java API packages			
	3.3.3 Using system packages			
	3.3.4 Naming conventions			
	3.3.5 Creating packages			
	3.3.6 Accessing a package			
	3.3.7 Adding a class to a package			
	3.3.8 Hiding classes			

UNIT IV	**4.EXCEPTION HANDLING AND MULTITHREADING**
	 4.1 Exception handling
	   4.1.1 Types of errors
	   4.1.2 Exceptions
	   4.1.3 Syntax of exception handing code
	   4.1.4 Multiple catch statements
	   4.1.5 Using finally statements
	   4.1.6 Throwing our own exception
	 4.2 Multithreaded Programming
	   4.2.1 Creating threads
	   4.2.2 Extending the thread class
	   4.2.3 Stopping & Blocking the thread
	   4.2.4 Lifecycle of a thread
	   4.2.5 Using thread methods
	   4.2.6 Thread exceptions
	   4.2.7 Thread priority
	   4.2.8 Synchronization
	   4.2.9 Implementing the runnable interface
		15	10	CO1, CO2, CO3, CO4

UNIT V	**5. GRAPHICS ANDAPPLETS**
	 5.1 Graphics Programming
	   5.1.1 Graphics class
	   5.1.2 Lines & rectangles
	   5.1.3 Circles & ellipses
	   5.1.4 Drawing arcs
	   5.1.5 Drawing polygon
	 5.2 Applet Programming
	   5.2.1 Introduction
	   5.2.2 Applet lifecycle
	   5.2.3 Building Applet code
	   5.2.4 Creating an executable Applet
	   5.2.5 Designing a webpage
	   5.2.6 Applet tag
		15	09	CO1, CO2, CO3, CO4

	5.2.7 Adding Applet to a HTML file 5.2.8 Running the Applet 5.2.9 Aligning the display			
	Total	75	48	

8. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO JAVA** 1.1 Basic concept of object-oriented programming 1.2 Java features 1.3 Java Environment 1.4 Overview of Java language 1.5 Constants, variables & data types 1.6 Operators & expressions 1.7 Decision making, branching & looping	9	15
2	**2. CLASSES, OBJECTS &ARRAY** 2.1 Classes & objects 2.2 Visibility control 2.3 Arrays, Strings & Vectors	10	15
3	**3. INHERITANCE, INTERFACES AND PACKAGES** 3.1 Inheritance 3.2 Interfaces 3.3 Packages	10	15
4	**4.EXCEPTION HANDLING AND MULTITHREADING** 4.1 Exception handling 4.2 Multithreaded Programming	10	15
5	**5. GRAPHICS ANDAPPLET** 5.1 Graphics Programming 5.2 Applet Programming	9	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Program to implement constants, variables, operators and expressions.
2	Program to Implement if-else.
3	Program to implement loops.
4	Program to implement switch-case.
5	Program to implement arrays and strings.
6	Program to implement Inheritance.

7	Program to implement packages.
8	Program to implement interfaces.
9	Program to implement multithreading.
10	Program to implement exception handling.
11	Program to implement applets and graphics.
12	Object Oriented Programming based mini project.
No	Tutorial Exercise
1	At least 2 problems on each unit given above

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	E Balagurusamy	Programming in Java	Tata Mc Graw Hill Education
2	Timothy Budo	An Introduction to Object-Oriented Programming with Java	Pearson Education
3	Danniel Liang	Introduction to Java programming	Pearson Education
4	Sachin Malhotra &Saurabh Chaudary	Programming in Java	Oxford University

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Herbert Schildt	Java 2: The Complete Reference	Tata Mc Graw Hill Education
2	David Flanagan	Java Examples in a Nutshell	O'Reilly Media

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/java/
2	https://docs.oracle.com/javase/tutorial/java/TOC.html
3	https://beginnersbook.com/java-tutorial-for-beginners-with-examples/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=r59xYe3Vyks&vl=en
2	https://www.youtube.com/watch?v=3u1fu6f8Hto
3	https://www.youtube.com/watch?v=uWYPVz_i7W4

(CM404) INTERNET TECHNOLOGIES

1. AIM: To develop web programming skills of the students for building dynamic and interactive web-based applications using PHP.

2. COURSE OBJECTIVES: In this course the students will learn the following:
1. Understand basic PHP constructs.
2. Develop web pages using PHP.
3. Establish database connectivity using PHP.
4. Build dynamic websites.

3. PRE-REQUISITES: Knowledge of Web Designing.

4. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						**Theory Marks**		**Practical Marks**		**Total Marks**
CM404 Internet Technologies		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	-	2	5	75	25	-	25	125

5. COURSE OUTCOMES: Student will be able to:

CM404.CO1: Explain the basics of PHP for web development.
CM404.CO2: Use in-built functions of PHP.
CM404.CO3: Compare PHP constructs for Internet Programming.
CM404.CO4: Develop basic programs using PHP.

6. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability &	Project Management	Life-long Learning
CO1	2	3	3	0	0	0	2
CO2	2	3	2	2	2	0	3
CO3	2	3	3	3	2	2	3
CO4	2	3	3	3	3	3	3

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	2
CO2	3	3
CO3	2	2
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**
UNIT I	**1. INTRODUCTION OF PHP** 1.1 Relationship between Apache and PHP 1.2 Steps to Install & test web server 1.3 Steps to Configure Apache to use PHP 1.4 Creating First PHP Page 1.5 Mixing HTML and PHP 1.6 Printing string and values 1.7 Adding comments to PHP Code 1.8 Working with variables 1.9 Storing data in variables 1.10 Creating constants 1.11 Understanding PHP's internal Data Types		15	9	CO1, CO2 CO3, CO4

UNIT II	**2. OPERATORS, FLOW CONTROL AND LOOPS**
	2.1 Operators
	    2.1.1 Math operator
	    2.1.2 Assignment operator
	    2.1.3 String Operator
	    2.1.4 Bit-wise Operator
	    2.1.5 Operator Precedence
	    2.1.6 Comparison operator
	    2.1.7 Logical Operator
	    2.1.8 Ternary operator
	2.2 Flow Control
	    2.2.1 If Statement
	    2.2.2 Else Statement
	    2.2.3 Else If Statement
	    2.2.4 Switch Statement
	2.3 Loops
	    2.3.1 For Loop
	    2.3.2 While Loop
	    2.3.3 Do While Loop
	    2.3.4 Foreach Loop
			15	10	CO1,
					CO2,
					CO3,
					CO4

UNIT III	**3. STRINGS, ARRAYS AND FUNCTIONS**
	3.1 Strings
	    3.1.1 The string function
	    3.1.2 Conversion of string variables
	    3.1.3 Formatting text strings
	3.2 Arrays
	    3.2.1 Building arrays
	    3.2.2 Modifying the data in arrays
	    3.2.3 Deleting array elements
	    3.2.4 Handling array with loops
	    3.2.5 The PHP array function
	    3.2.6 Extracting data from array
	    3.2.7 Sorting arrays
			15	10	CO1,
					CO2,
					CO3,
					CO4

	3.2.8 Using array operator
	3.2.9 Comparing array to each other
	3.2.10 Handling multidimensional array
	3.2.11 Splitting and merging array
	3.3 Functions
	    3.3.1 Creating function in PHP
	    3.3.2 Passing and return of data, array
	    3.3.3 PHP conditional function
	    3.3.4 PHP variable function			

UNIT IV	**4. READING DATA IN WEB PAGES AND WORKING WITH DATABASES IN PHP**
	4.1 Setting up web pages to communicate with PHP
	    4.1.1 Handling Web Components
	    4.1.2 Text Fields
	    4.1.3 Text areas
	    4.1.4 Check boxes
	    4.1.5 Radio buttons
	    4.1.6 List boxes
	    4.1.7 Password controls
	    4.1.8 Hidden controls
	4.2 Database Connection using PHP
	    4.2.1 Creating MYSQL database
	    4.2.2 Creating and accessing a table
	    4.2.3 Inserting new data items into a table
	    4.2.4 Updating existing data from a table
	    4.2.5 Deleting records from a table
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5. COOKIES, SESSION ANDFILE HANDLING**
	5.1. Cookies
	    5.1.1. Introduction of cookies
	    5.1.2. Setting a cookie
	    5.1.3. Reading Cookie variables
	    5.1.4. Setting cookies expiration
	    5.1.5. Deleting cookies
	5.2. Sessions
	    5.2.1. Introduction of Session
	    5.2.2. Start PHP session
	    5.2.3. Manage PHP session variable
	    5.2.4. Destroy session
	5.3. File Handling
	    5.3.1. Opening file using fopen
	    5.3.2. File handling functions: feof(), fgets(), fgetc(), file_get_contents(), file_exists(), fclose()
		15	09	CO1,
				CO2,
				CO3,
				CO4

	Total	75	48	

8. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises.

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION OF PHP** 1.1 Relationship between Apache and PHP 1.2 Steps to Install & test web server 1.3 Steps to Configure Apache to use PHP 1.4 Creating First PHP Page 1.5 Mixing HTML and PHP 1.6 Printing string and values 1.7 Adding comments to PHP Code 1.8 Working with variables 1.9 Storing data in variables 1.10 Creating constants 1.11 Understanding PHP's internal Data Types	9	15
2	**2. OPERATORS, FLOW CONTROL AND LOOPS** 2.1 Operators 2.2 Flow Control 2.3 Loops	10	15
3	**3. STRINGS, ARRAYS AND FUNCTIONS** 3.1 Strings 3.2 Arrays 3.3 Functions	10	15
4	**4. READING DATA IN WEB PAGES AND FILE HANDLING** 4.1 Setting up web pages to communicate with PHP 4.2 Database Connection using PHP	10	15
5	**5.COOKIES, SESSION AND WORKING WITH DATABASES IN PHP** 5.1 Cookies 5.2 Sessions 5.3 File Handling	9	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Install and configure Apache web server and test web page
2	Write a PHP script to implement following: Variables. Data Types Comments

3	Write a PHP script to demonstrate following: arithmetic operators comparison operators logical operators
4	Write PHP Script to implement following: if-else Nested if-else
5	Write PHP Script to implement following: while loop do-while loop for loop
6	Write PHP Script to implement String functions.
7	Write PHP Script to implement following: One dimensional array Multi-Dimensional array Array functions
8	Write PHP Script to implement following: Conditional Functions Variable Functions
9	Write PHP Script to implement Forms for: Submitting data to self-webpage using GET and POST methods Submitting data to other webpage using GET and POST methods
10	Write PHP Script to implement MySQL database connection for achieving following: Create table Insert data into table Update data from table View data from table Delete data from table
11	Write PHP script to implement File functions.
12	Mini Project: Create a dynamic web site using PHP and MySQL.

11. LEARNING RESOURCES
Text Books

S. No.	Author	Title of Books	Publishers
1	PHP: The Complete Reference	Steven Holzner	McGraw-Hill
2	Learning PHP, MySQL, JavaScript,CSS& HTML5, Third Edition	Robin Nixon	O'reilly Media
3	DT Editorial services	HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and AJAX Black Book	DreamTech Press

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Julie C. Meloni	Teach yourself PHP, MySQLand Apache All in One , 5thEdition	Pearson Education
2	W. Jason Gilmore	Beginning PHP and MySQL	Apress

Internet and Web Resources

S. No.	Description
1	http://www.w3schools.com/PHP
2	https://www.tutorialspoint.com/php/
3	https://www.homeandlearn.co.uk/php/php.html

Videos and Multimedia Tutorials

S. No.	Description
1	PHP - https://www.youtube.com/watch?v=OK_JCtrrv-c

(CM405) DATA COMMUNICATION & COMPUTER NETWORKS

1. AIM: To provide students with an overview of the concepts and fundamentals of data communication and computer networks.

2. COURSE OBJECTIVES: In this course the students will learn the following:
1. Understand the concept of Data Communication
2. Learn Data encoding/decoding techniques, Basics of Computer Networks, Switching Techniques and Network Topologies
3. Understand OSI Model, Transmission Control Protocol/Internet Protocol Suite, Data link layer protocols
4. Study Network and Transport layer services and Protocols.

3. PRE-REQUISITES: Knowledge of Computer Hardware and peripherals.

4. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						**Theory Marks**		**Practical Marks**		**Total Marks**
CM405		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Data Communication & Computer Networks		3	-	2	5	75	25	25	-	125

5. COURSE OUTCOMES: Student will be able to:

CM405.CO1: Explain Data Communication Systems, Computer Networks and its components.
CM405.CO2: Examine the different modulation techniques, network topologies, OSI layers and TCP/IP model.
CM405.CO3: Compare different data communication techniques, networking methodologies and protocols.
CM405.CO4: Design a Local Area Network.

6. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	3	1	0	0	0	2
CO2	3	3	3	0	0	0	2
CO3	2	3	1	0	0	0	2
CO4	2	3	3	3	2	2	3

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	2	1
CO2	2	1
CO3	2	1
CO4	2	1

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes

UNIT		M	Thr	CO

UNIT I	**1. FUNDAMENTALS OF DATACOMMUNICATION**
	1.1 Introduction to data communication
	1.2 Data Communication System/Model-Transmitter-Medium-Receiver
	1.3 Concept of Signal and Data
	1.4 Concept of channel and channel characteristics – The Electromagnetic Spectrum, Channel noise, Channel bandwidth, Channel data transmission rate (bit rate), channel capacity, transmission time, propagation time, throughput, channel utilization.
	1.5 Communication modes - Simplex, half duplex and full duplex.
	1.6 Digital Data Transmission-Parallel transmission and Serial transmission- Serial Data Transmission modes - Synchronous and Asynchronous transmission.
	1.7 Transmission media
	   1.7.1 Guided media/bounded media:
	     Twisted pair – Unshielded Twisted Pair (UTP) – Category 1 to Category 6 and Shielded Twisted Pair (STP)
	     Co-axial cable – Baseband and Broadband coaxial cable, Standards for co-axial cable, connectors.
	     Optical Fibre – Fibre optics communication components/system - Light Source, Transmission media, Light Detector.
	     Advantages & disadvantages of Optical fibre,
	   1.7.2 Unguided media -Radio, Microwave, Satellite and Infrared transmission,
		15	10	CO1, CO2, CO3, CO4

	Cellular phones.			

UNIT II	**2. DATA MODEMS AND MULTI CHANNEL DATA COMMUNICATION**
	2.1 Concept of Modulation – need of modulation
	2.2 Types of modulation
	    2.2.1 Analog Data, Analog Signal: Amplitude Modulation, Frequency Modulation, Phase Modulation
	    2.2.2 Analog data, Digital signal: Pulse Code Modulation (PCM)
	    2.2.3 Digital data, Analog Signal/Modem Modulation Techniques: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying
	    2.2.4 Digital data, Digital Signal/Encoding Techniques: Unipolar-NRZ (NRZ-L, NRZ-I), RZ
	2.3 Introduction to Modem
	    2.3.1 Building blocks of modem
	    2.3.2 Types of Modems -half Duplex, Full Duplex
		15	9	CO1, CO2, CO3, CO4

UNIT III	**3.NETWORKING FUNDAMENTALS**
	3.1 An overview of networking
	    3.1.1 Need of computer networks
	    3.1.2 Classification of computer networks based on: Transmission technology –Broadcast networks and Point to Point networks
	    Geographical area covered: LAN, MAN, WAN
	    Acknowledgement sent by receiver- Connectionless and connection-oriented communication
		15	10	CO1, CO2, CO3, CO4

	3.2 Switching techniques:
	     3.2.1 Circuit Switching
	     3.2.2 Packet switching
	     3.2.3 Message switching
	     3.2.4 Cell switching (ATM)
	 3.3 Network Topologies
	     3.3.1 Types of Topologies:
	         Bus topology: Examples of bus topology: Ethernet, Local Talk
	         Ring topologies, Examples of Token Ring Topology: IBM Token Ring, FDDI (Fiber Distributed Data Interface)
	         Star topologies, Example of Star Network: ATM (Asynchronous Transmission Mode)
	         Tree Topology, Mesh Topology				

UNIT IV	**4.OSI MODEL, TCP/IP SUITE AND DATA LINK PROTOCOLS**
	 4.1 Network architectures
	     4.1.1 Layering the communication process
	     4.1.2 The need for layered solutions
	 4.2 Open system Interconnection (OSI) model
	     4.2.1 Functions of all 7 Layers
	     4.2.2 Data transmission in OSI Model
	 4.3 TCP/IP Protocol suite
	     4.3.1 TCP/IP Reference model layers
	     4.3.2 LAN Protocol and OSI
	     4.3.3 Data transmission by TCP and Ethernet
	     4.3.4 Data Encapsulation
	     4.3.5 Data Routing
	 4.4 Data Link Protocol
	     4.4.1 Protocol
	     4.4.2 Transmission Control Procedure: Synchronous protocols, Asynchronous Data Link Control (DLC) Protocols
	     4.4.3 Character Oriented Protocols (COP): Binary synchronous Protocol (Bisync or BSC)
	     4.4.4 Bit Oriented Protocols (BOP): High level Data Control Protocol (HDLC)
		15	10	CO1,
				 CO2,
				 CO3,
				 CO4	

UNIT V	**5.NETWORK LAYER AND TRANSPORT LAYER**
	
	5.1 Network Layer Protocols
	  5.1.1 Overview of Internet Protocol: IP Addressing Scheme (Dotted Decimal Notation, Loopback Address, IP Multicast Addresses)
	  IP version 6 (Limitations of IP version 4, Features of IP version 6, General IPv6 Packet Format)
	  5.1.1 Address Resolution Protocol: Resolution through Dynamic Binding, Address Resolution Cache
	  5.1.2 Reverse Address Resolution Protocol
	  5.1.3 Internet Control Message Protocol: Error Reporting by ICMP (Destination Unreachable, Source Quench, Redirect, Time Exceeded), ICMP Message Delivery
	5.2 Transport Layer Protocols
	  5.2.2 Transmission Control Protocol: Features of TCP, Understanding the TCP Connection (Establishing, Terminating and Resetting a TCP Connection)
	  5.2.3 Features of User Datagram Protocol (UDP)
	  5.2.4 Difference between TCP and UDP
		15	9	CO1, CO2, CO3, CO4

	Total	75	48	

8. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions and exercises.

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. FUNDAMENTALS OF DATA COMMUNICATION** 1.1 Introduction to data communication 1.2 Data Communication System/Model 1.3 Concept of Signal and Data 1.4 Concept of channel and channel characteristics 1.5 Communication modes 1.6 Digital Data Transmission 1.7 Transmission media	10	15

2	**2.DATA MODEMS AND MULTI CHANNEL DATA COMMUNICATION** 2.1 Concept of Modulation 2.2 Types of modulation 2.3 Introduction to Modem	9	15
3	**3.NETWORKING FUNDAMENTALS** 3.1 An overview of networking 3.2 Switching techniques 3.3 Network Topologies	10	15
4	**4.OSI MODEL, TCP/IP SUITE AND DATA LINK PROTOCOLS** 4.1 Network architectures 4.2 Open system Interconnection (OSI) model 4.3 TCP/IP Protocol suite 4.4 Data Link Protocol	10	15
5	**5.NETWORK LAYER AND TRANSPORT LAYER** 5.1 Network Layer Protocols 5.2 Transport Layer Protocols	9	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of Data Communication fundamentals.
2	Study of different types of communication modes.
3	Study of different types of communication media.
4	Study of different types of modulation techniques.
5	Study of Modem
6	Study of different types of computer networks.
7	Study of network topologies.
8	Comparative study of OSI and TCP/IP model.
9	Study of Data link protocols.
10	Study of Network protocols.
11	Study of Transport protocols.
12	Implementation of LAN.

11. LEARNING RESOURCES
Text Books

S. No.	Author	Title of Books	Publishers
1	ISRD Group	Data Communication and Computer Networks	Tata McGraw-Hill, ace series
2	Prakash C. Gupta	Data communications and Computer Networks	PHI Learning Private Limited,2014
3	Rajneesh Agrawal and Bharat Bhushan Tiwari	Data Communication and Computer Networks	Vikas Publishing house Ltd, 2005

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Behrouz A Forouzan	Data Communication and Networking	Tata McGraw-Hill,2008
2	William Stallings	Data and Computer Communications	Pearson Education, 2008

Internet and Web Resources

S. No.	Description
1	The TCP/IP Guide, by Charles M. Kozierok, Free online Resource, http://www.tcpipguide.com/free/index.htm

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=VDkYgGGtDnc
2	https://www.youtube.com/watch?v=UXMIxCYZu8o

(CM406) COMPUTER LABORATORY-II

1. AIM: To introduce various tools and technologies to create professional and interactive websites.

2. COURSE OBJECTIVES: In this course the students will learn the following:

1. Select and use web-based applications.
2. Manage web content and develop graphical user interfaces of website.
4. Create and publish web documents.

3. PRE-REQUISITES: Knowledge of Web Designing

4. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)				Total Hours	Examination Scheme				
Course code & course title							**Theory Marks**		**Practical Marks**		**Total Marks**
CM406 Computer Laboratory II		**L**	**T**	**P**	**H**		**TH**	**TM**	**TW**	**PR/OR**	
		-	-	2	2		-	-	25	50	75

5. COURSE OUTCOMES: Student will be able to:

CM406.CO1: Discuss web based applications, web Content Management Systems, animation and data reporting tools.

CM406.CO2: Use web based applications, web Content Management Systems, animation and data reporting tools.

CM406.CO3: Prepare Graphical user interfaces, animations and informative reports.

CM406.CO4: Design and publish web documents.

6. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	1	0	1	1	0	0	1
CO2	1	0	1	2	1	0	1
CO3	1	1	2	2	1	1	1
CO4	1	1	2	2	2	1	1

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CO1	1	1
CO2	2	2
CO3	2	2
CO4	2	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr = Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**
UNIT I	1. **INTRODUCTION TO WEB BASED APPLICATIONS** 1.1 Creating Email account (like Gmail) 1.2 Email compose and reply 1.2.1 Streamlined compose pane 1.2.2 Checking mail while typing 1.2.3 Formatting options 1.2.4 Keyboard shortcuts 1.2.5 Drag and drop addresses, files 1.2.6 Compose two messages at once 1.2.7 Draft 1.2.8 Create signatures, labels, filters 1.2.9 Contacts 1.2.10 Create groups and mailing lists 1.2.11 Import contacts, contacts picker 1.3 Chat 1.4 Calendar 1.4.1 Scheduling 1.4.2 Setting up reminders 1.4.3 Sharing 1.5 Working with Documents 1.5.1 Word, Excel 1.5.2 Creating form 1.6 Drive 1.6.1 Setting up file storage and synchronization services (like Google drive) 1.6.2 Organize, find, share, open and preview files		10	4	CO1, CO2, CO4
UNIT II	2. **WORKING WITH CONTENT MANAGEMENT SYSTEM (LIKE WORDPRESS)** 2.1. Introduction to Content management system (CMS) 2.2. Downloading and Installing CMS on web server (like XAMPP) 2.3. Menus on the Administration Screen 2.4. Dashboard: Website management functions of CMS 2.5. Themes 2.5.1. Installing and handling themes 2.5.2. Editing the appearance of themes		10	8	CO1, CO2, CO4,

	2.5.3. Theme configurations			
	2.5.4. Adjusting different elements of installed themes like slideshow, post, pages			
	2.6. Posts			
	2.6.1. Adding new post			
	2.6.2. Modifying existing posts			
	2.6.3. Placing images, videos to the posts			
	2.6.4. Adding categories to publishing the posts on the websites			
	2.7. Pages			
	2.7.1. Adding new webpages			
	2.7.2. Modifying existing webpages			
	2.7.3. Placing images, videos, mp3 on the pages			
	2.7.4. Publishing the pages on the websites			
	2.8. Menus			
	2.8.1. Creating Custom Menus			
	2.8.2. Modifying themes default menu			

UNIT III	**3. WORKING WITH CONTENT MANAGEMENT SYSTEM (LIKE WORDPRESS)**
	3.1. Media
	    3.1.1. Uploading pictures, videos
	    3.1.2. Editing images and publishing them on the websites
	    3.1.3. Embedding videos from external source (like YouTube) to website
	3.2. Links
	    3.2.1. Adding New links
	    3.2.2. Editing the links
	    3.2.3. Adding categories to the links
	    3.2.4. Managing Categories
	3.3. Widgets
	    3.3.1. Adding widgets to the theme
	    3.3.2. Editing widgets to the theme
	3.4. Plugins
	    3.4.1. Introduction to plugins
	    3.4.2. Installing plugins
	    3.4.3. Editing plugins.
	3.5. Managing the user accessibility to the website/blog.
		10	6	CO1, CO2, CO4,

UNIT IV	**4. USING ANIMATION CREATION TOOL (LIKE ALICE)** 4.1. Code Editor, methods panel, control panel/tiles,	10	8	CO1, CO2, CO3,

	scene editor, galleries			CO4,
	4.2. Camera Navigation control: turn camera left/right, forward/backward, Move camera			
	4.3. Creating first animation: open, save and run the project, add and position objects			
	4.4. Animation using Do in order, on together, Move up, down, forward, backward, right, left			
	4.5. Animation using control structures			
	4.6. Using memory variables			
	4.7. Using user-defined procedures			
	4.8. Add rotation and randomization: Examples of human objects walk, sit, run			
	4.9. Use keyboard controls			
	4.10. Develop small animation			

UNIT V	**5. DATA REPORTING TOOL (LIKE DATA VISION)**
	 5.1. Introduction
	 5.2. Installing Data Reporting Tool
	 5.3. Starting Data Reporting Tool
	      5.3.1. Launching Data Reporting Tool
	      5.3.2. Running Data Reporting Tool from
	          Command Line
	 5.4. Data Reporting Tool User Interface
	      5.4.1. The File Menu
	      5.4.2. The Edit Menu
	      5.4.3. The Insert Menu
	      5.4.4. The Format Menu
	      5.4.5. The Database Menu
	      5.4.6. The Report Menu
	      5.4.7. The Help Menu
	  5.5 Creating Report
	      5.5.1 Connecting to a Database
	      5.5.2 Adding fields and text
	  5.6 Running Report
	      5.6.1 Displaying a Report On-screen
	      5.6.2 Saving a Report's Output
	      5.6.3 Printing a Report's Output
		10	6	CO1, CO2, CO3, CO4,

	Total	50	32	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR PRACTICAL PLAN

Unit No	Unit	Number of Practical Hours	Marks
I	1 **INTRODUCTION TO WEB BASED APPLICATIONS** 1.1 Creating Email account 1.2 Email compose and reply 1.3 Chat 1.4 Calendar 1.5 Working with Documents 1.6 Drive	4	10
II	**2. WORKING WITH CONTENT MANAGEMENT SYSTEM (LIKE WORDPRESS)** 2.1. Introduction to CMS 2.2. Downloading and Installing CMS on web Server 2.3. Menus on the Administration Screen 2.4. Dashboard: Website management functions of CMS 2.5. Themes 2.6. Posts 2.7. Pages 2.8. Menus 2.9. Modifying themes default menu	8	10
III	**3. WORKING WITH CONTENT MANAGEMENT SYSTEM (LIKE WORDPRESS)** 3.1. Media 3.2. Links 3.3. Widgets 3.4. Plugins 3.5. Managing the user accessibility to the website/blog.	6	10

IV	**4. USING ANIMATION CREATION TOOL (LIKE ALICE)**	8	10
	4.1 Code Editor, methods panel, control panel/tiles, scene editor, galleries		
	4.2 Camera Navigation control		
	4.3 Animation using Do in order, on together, Move up, down, forward, backward, right, left		
	4.4 Animation using control structures		
	4.5 Using memory variables		
	4.6 Using user-defined procedures		
	4.7 Add rotation and randomization		
	4.8 Use keyboard controls		
	4.9 Develop small animation		
V	**5. DATA REPORTING TOOL (LIKE DATA VISION)**	6	10
	5.1. Introduction		
	5.2. Installing Data Reporting Tool		
	5.3. Starting Data Reporting Tool		
	5.4. Data Reporting Tool User Interface		
	5.5. Creating Report		
	5.6. Running Report		
	Total	32	50

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Create Email Account. Test various mail utilities such as compose mail, send mail, forward mail, reply mail, attach a file, creating signature, draft.
2.	Test calendar functionality.
3.	Test Online documents, file storage and synchronization services.
4.	Create group, share information, send messages to a group.
5.	Download and install Content Management System on web server.
6.	Work with Content Management System administration menu and Dashboard
7.	Create page and post with text and images.
8.	Create a menu to help visitors navigate pages and posts.
9.	Install animation creation application and study code editor, scene editor, methods panel, control panel and galleries.
10.	Write, debug and test control statement-based programs using animation creation application.
11.	Develop animation using Do in order, on together, Move up, down, forward, backward, right, left
12.	Develop and test small animation applications.
13.	Install and study Data Reporting Tool user interface.
14.	Create reports using Data Reporting Tool.
15.	Mini Project to demonstrate use of animations, reports in website developed using Content Management System.

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Sams Teach Yourself WordPress 3 in 10 Minutes	Chuck Tomasi, Kreg Steppe	SAMS
2	Learning to Program with Alice, 3rd Edition	Dann, Cooper and Pausch	Prentice Hall (Pearson Education)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Hal Stern, David Damstra, Brad Williams	Professional Wordpress Design and Development	Wrox
2	Joel Adams	Alice 3 in Action Computing Through Animation	Cengage Learning

Internet and Web Resources

S. No.	Description
1	http://learn.wordpress.com
2	http://www.1stwebdesigner.com/wordpress/wordpress-step-by-step-beginners-guide/
3	http://www.graphicrating.com/2009/07/31/wordpress-tutorials-and-resources-for-designers-and-developers/
4	http://www.alice.org/3.1/materials_download (Lab exercises for Alice)
5	http://datavision.sourceforge.net/DataVision/DataVision.html
6	http://www.learn-it-with-examples.com/development/reporting-tools/other-tools/data-vision-reporting-tool.html

Videos and Multimedia Tutorials

S. No.	Description
1	http://www.alice.org/3.1/materials_videos (Video tutorial for Alice)
2	http://www.andrew.cmu.edu/user/dslater/screencasts/index.html (Video tutorial for Alice)

SEMESTER V

Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
FIFTH	TR501	Industrial Training	–	–	15	15	–	–	30	70	GRADE
	CM501	Computer Security	3	–	2	5	75	25	25	-	125
	CC502	Essentials of Entrepreneurship Development	–	–	2	2	–	–	–	25	25
	CC601	Industrial Organization & Management	3	–	–	3	75	25	–	–	100
		Elective -I	3	–	2	5	75	25	25	25	150
	AC101	Essence of Indian Knowledge and Tradition	2	–	–	2	–	–	–	–	–
			11	–	21	32	225	75	80	120	400

L- Lecturers T – Tutorials P – Practicals H-Hours TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks

(TR501) INDUSTRIAL TRAINING

1. COURSE OBJECTIVES:

The students need to have industry exposure, where they can experience real life situations related to Man, machine and materials. It is a Training programme designed to expose & prepare the students for the Industrial work situation. This exposure and hands on experience, will further encourage the studentsto take up the industrial projects and enhance their prospects for better employment in their relevant fields.

2. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(TR501) INDUSTRIAL TRAINING	L	T	P	H	TH	TM	TW	PR/OR	GRADE
	-	-	15	15	-	-	70	30	

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

TR501.CO1: Describe the functioning of various departments and processes in the

industry. TR501.CO2: Demonstrate interpersonal skills to achieve the desired

objectives.

TR501.CO3: Use trending software and hardware technologies

TR501.CO4: Prepare technical documents related to the work undertaken or observed.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life -long Learning
TR501.CO1	3	2	1	3	2	2	2
TR501.CO2	2	1	1	2	2	3	3
TR501.CO3	3	3	3	3	3	3	3
TR501.CO4	2	1	1	2	1	3	3

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
TR501.CO1	3	3
TR501.CO2	2	3
TR501.CO3	3	3
TR501.CO4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**
	Students are required to study and have hands-on experience wherever possible in the following areas (depending on availability): 1. Company Profile 2. Organizational Structure 3. Company Product Range 4. Manufacturing Facilities Available /Services provided 5. Plant / Facility Layout 6. Operations / Production Processes 7. Production Planning and Control 8. Detail study of Latest Equipment/ Technologies Used 9. Stores Functions 10. Material Handling Systems/ Equipments 11. Quality Management Systems / Functions 12. Maintenance and Repair Practices 13. Safety Practices / Safety Equipments 14. Utilities 15. Logistics 16. Sales and Marketing 17. Ethics, Statutory Rules and Regulations followed 18. Product Design and Development 19. Any other area specific to the Industry providing Training				CO1, CO2, CO3, CO4

6. COURSE DELIVERY:

The Course will be delivered through placement of the students in various industries

7. TERM WORK & PRACTICALS

Evaluation Scheme					
TW				**PR/OR**	TOTAL Marks
Attendance Marks*	Industrial Mentor's assessment Marks	Institute Mentor's assessment Marks	Training Report	Report Assessment & Seminar/Viva	
10	**20**	**20**	**20**	**30**	**100**

* 01 mark shall be deducted for every Absence (with or without permission).

Daily Dairy:

The daily dairy should-be maintained in a book. It should reflect the day to day activities performed by the student (including task, men and materials involved). It should be counter signed by the Industry Mentor. It will become the basis for writing reports on the complete training.

Training Report

The training report should be submitted by the training students should include the following salient points- Certificate from institute, Certificate of training from company, detailed write up as per daily dairy,detailed drawings, working drawings, photographs, safety precautions, techniques for work minimizationon site, organizational chart, Importance of project to the society, special methods/techniques/equipment should be separately high lightened, including environmental aspects. The report should be informative and technical, typed with double spacing on good quality bond paper and bound. Assessment of Training Report be based on Knowledge, Presentation and Quality of contents and Sketches.

Note:

a. Student/s undergoing Industrial Training shall follow Rules and Regulations of the Industry.

b. Industrial Training will generally be organized and conducted in accordance with Industrial Training Manual duly prescribed by the Board.

8. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS

Unit No	Name of the Unit	Teaching Hours	Marks
1	**PR/OR**	**08 weeks**	**30**
2	**TW**		**70**
	Total	**08 weeks**	**100**

Note:

1. For Industrial training Grades will be awarded based on marks scored as follows:

   80% and above Marks – Grade 'A'60% to 79% Marks – Grade 'B' 40% to 59% Marks – Grade 'C' Marks below 40% - Grade 'D'

2. TW and PR/OR shall be separate heads of passing. Student has to secure minimum Grade 'C' for passing.

(CM501) COMPUTER SECURITY

1. **COURSE OBJECTIVES:** In this course the students will learn the basic concepts of computer security, types of attacks and fundamentals of Cryptography.

2. **PRE-REQUISITES:** Knowledge of Mathematics and Data Communications and Computer Networks

3. **TEACHING AND EXAMINATION SCHEME**

Semester	V					Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
CM501 Computer Security		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	-	125

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM501.CO1: List the various computer security threats, attacks, cryptographic techniques, Internet security protocols and systems.

CM501.CO2: Identify different types of security threats, attacks, internet security protocols andsystems.

CM501.CO3: Use different cryptography techniques and network security systems.

CM501.CO4: Implement internet security solution in a web-based application and computernetworks.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CM501.CO1	2	2	1	1	1	1	2
CM501.CO2	3	2	1	2	1	1	2
CM501.CO3	2	2	1	2	2	2	2
CM501.CO4	2	2	2	2	2	2	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM501.CO1	1	2
CM501.CO2	2	2
CM501.CO3	2	2
CM501.CO4	2	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT	**M**	**Thr**	**CO**
UNIT I	**1. INTRODUCTION TO THE CONCEPTS OF SECURITY** 1.1 The need for security- Basic Concepts 1.2 Security management practices 1.3 Principles of security- confidentiality, authentication, integrity, non-repudiation, access control, availability, Ethical and legal issues. 1.4 Types of attacks 1.4.1 A general view- criminal attacks, publicity attacks, legal attacks. 1.4.2 A technical view- Theoretical concepts: interception, fabrication, modification, interruption, Passive and active attacks 1.4.3 Practical side of attacks- Application level attacks, network level attacks 1.4.4 Programs that attack- virus, worms, Trojan horse. 1.4.5 Specific attacks- sniffing and spoofing, phishing, pharming. 1.5 User Authentication mechanism 1.5.1 Introduction and authentication basics 1.5.2 Password – Introduction, Clear text password – working and problems 1.5.3 Problems with passwords 1.5.4 Biometric Authentication: Introduction, Working of Biometric, Biometric techniques - Physiological and behavioral techniques	15	10	CO1, CO2, CO3, CO4
UNIT II	**2. CRYPTOGRAPHY TECHNIQUES** 2.1 Introduction- cryptography, cryptanalysis, cryptology. 2.2 Plain Text and cipher text 2.3 Substitution techniques: Caesar Cipher 2.4 Transposition techniques 2.4.1 Rail-fence technique 2.4.2 Simple columnar transposition technique 2.5 Encryption and decryption	15	10	CO1, CO2, CO3, CO4

	2.6 Symmetric and asymmetric key cryptography
	    2.6.1 Problem of key distribution
	2.7 Steganography
	2.8 Key range and key size
	2.9 Possible type of attacks
	    2.9.1 Cipher-text only attack
	    2.9.2 Known plain-text attack
	    2.9.3 Chosen plain-text attack
	    2.9.4 Chosen cipher-text attack
	    2.9.5 Chosen-text attack.
	2.10 Algorithm types and modes
	    2.10.1 Algorithm types- stream ciphers and block Ciphers
	    2.10.2 Algorithm modes- Electronic Code book, Cipher chaining, Cipher Feedback mode			

UNIT III	3. **SYMMETRIC KEY AND ASYMMETRIC KEY CRYPTOGRAPHY, MESSAGE AUTHENTICATION AND HASH FUNCTIONS**
	3.1 An overview of symmetric-key cryptography
	3.2 Data encryption standard (DES) – Basic Principles
	3.3 Overview of asymmetric–key cryptography
	3.4 Asymmetric –key cryptography algorithms- The RSA Algorithm
	    3.4.1. Introduction
	    3.4.2. Examples of RSA
	    3.4.3. Security of RSA- Plain-text attacks, chosen-cipher text attack, factorization attack, attacks on the encryption key, attack on the decryption key.
	3.5 Comparison between symmetric and asymmetric key cryptography
	3.6 Digital signatures
	    3.6.1 Introduction
	    3.6.2 Message digests (Hash Functions): Introduction, Idea of a message digests, Requirements of a message digest.
	3.7 Problems with public key exchange.
	3.8 Digital certificates
	    3.8.1 The concepts of digital certificates,
	    3.8.2 Certification Authority (CA)
	    3.8.3 Technical details of a digital certificate.
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	4. **INTERNET SECURITY PROTOCOLS AND EMAIL SECURITY**
	4.1 Secure Socket Layer (SSL)
	    4.1.1 Introduction
	    4.1.2 The position of SSL in TCP/IP protocol suite
		15	9	CO1,
				CO2,
				CO3,
				CO4

	4.1.3 The working of SSL: The handshake protocol, The record protocol, The Alert protocol 4.1.4 Closing and resuming SSL connections 4.2 Secure Electronic Transaction (SET) 　4.2.1 Introduction 　4.2.2 SET participants 　4.2.3 SET Process 4.3 Email Security 　4.3.1 Privacy Enhanced mail – Introduction, working of PEM 　4.3.2 Pretty Good Privacy (PGP) – Working of PGP			
UNIT V	**5. INTRUSION DETECTION AND FIREWALL** 5.1 Intruders - Masquerader, misfeasor, clandestine user 5.2 Audit records 5.3 Intrusion detection 　5.3.1 Statistical anomaly detection 　5.3.2 Rule based detection 　5.3.3 Honey pots 5.4 Firewalls 　5.4.1 Introduction and Characteristics 　5.4.2 Types of Firewalls- Packet Filters, Application Gateways (Working) 　5.4.3 Demilitarized Zone (DMZ) Networks 　5.4.4 Limitations of firewall	15	9	CO1, CO2, CO3, CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. INTRODUCTION TO THE CONCEPTS OF SECURITY** 1.1 The need for security- Basic Concepts 1.2 Security approaches-trusted systems 1.3 Security models- No security, Security through obscurity, host security, network security. 1.4 Security management practices 1.5 Principles of security- confidentiality, authentication, integrity, non-repudiation, access control, availability, Ethical and legal issues. 1.6 Types of attacks 1.7 User Authentication mechanism	10	15

II	**2. CRYPTOGRAPHY TECHNIQUES** 2.1 Introduction- cryptography, cryptanalysis, cryptology. 2.2 Plain Text and cipher text 2.3 Substitution techniques: Caesar Cipher 2.4 Transposition techniques 2.5 Encryption and decryption 2.6 Symmetric and asymmetric key cryptography 2.7 Steganography 2.8 Key range and key size 2.9 Possible type of attacks 2.10 Algorithm types and algorithm modes	10	15
III	**3. SYMMETRIC KEY AND ASYMMETRIC KEY CRYPTOGRAPHY, MESSAGE AUTHENTICATION AND HASH FUNCTIONS** 3.1 An overview of symmetric-key cryptography 3.2 Data encryption standard (DES) 3.3 Overview of asymmetric–key cryptography, 3.4 Asymmetric –key cryptography algorithms- The RSA Algorithm 3.5 Comparison between symmetric and asymmetric key cryptography 3.6 Digital signatures 3.7 Digital Signature Techniques **-** RSA and Digital Signature 3.8 Problems with public key exchange. 3.9 Digital certificates	10	15
IV	**4. INTERNET SECURITY PROTOCOLS AND EMAIL SECURITY** 4.1 Secure Socket Layer (SSL) 4.2 Secure Hyper Text Transfer Protocol (SHTTP) 4.3 Secure Electronic Transaction (SET) 4.4 Email Security	9	15
V	**5. INTRUSION DETECTION AND FIREWALL** 5.1 Masquerader, misfeasor, clandestine user 5.2 Intrusion techniques: one-way encryption/function, access control 5.3 Intrusion detection 5.4 Firewalls	9	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Write a program to apply XOR logic on the given string (char pointer) and display the result.
2	Write a program to encrypt and decrypt data using Caesar Cipher.
3	Write a program to encrypt and decrypt data using Rail-fence technique.
4	Write a program to implement simple columnar transposition technique.
5	Write a program to implement Symmetric and Asymmetric key cryptography algorithm logic using in-built functions.
6	Study of attacks on security.
7	Study and implementation of in-built message digest functions in PHP and Java.
8	Study of Internet Security Protocols.
9	Case study on Intrusion Detection.
10	Study of Firewall.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Atul Kahate	Cryptography and Network Security	Tata McGraw-Hill
2	William Stallings	Cryptography and Network Security, Principles and Practice	Prentice Hall
3	Nina Godbole	Information Systems Security: Security Management, Metrics, Frameworks and best practices	Wiley India Publications.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Rick Lehtinen, Deborah Russell, G.T. Gangemi Sir	Computer Security Basics	Oreilly
2	Dieter Gollmann	Computer Security	Wiley
3	Alan G. Konheim	Computer Security and Cryptography	Wiley

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/computer_security/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=5jpgMXt1Z9Y
2	https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7

(CC502) ESSENTIALS OF ENTREPRENEURSHIP DEVELOPMENT

1. COURSE OBJECTIVES:

Today Entrepreneurship is given importance by the government to bring the youth of our country to overcome the problem of unemployment and bring them in the main stream of global business to strengthen Indian economy by Make in India philosophy. Government has announced various financial schemes for young youth and women to support them for setting up an enterprise. To fulfill this, youth are to be prepared for setting an enterprise. The students undergoing this course will be able to develop entrepreneurial traits and confidence within themselves and choose entrepreneurship as a career to brighten their future.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(CC502) ESSENTIALS OF ENTREPRENEURSHIP DEVELOPMENT	L	T	P	H	-	-	PR/OR	TW	25
	-	-	2	2	-	-	-	25	

3. COURSE OUTCOMES:

CC502.CO1: Recognize the type of entrepreneur and enterprises. CC502.CO2:

Describe basic financial & legal aspects of business. CC502.CO3:

Conceptualize a business idea.

CC502.CO4: Develop the project report for new enterprise.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CC502.CO1	1	0	0	0	2	3	2	1	2
CC502.CO2	2	0	0	0	0	3	2	1	2
CC502.CO3	0	1	2	0	0	0	2	1	2
CC502.CO4	3	2	2	0	2	0	2	1	2

Relationship: Low-1, Medium-2, High-3

5. DETAILED COURSE CONTENTS

M=Marks	Phr= Practical hours	CO – Course Outcomes		
Unit		**M**	**Phr**	**CO**
1.INDIAN BUSINESS ENVIRONMENT				
1.1 Introduction to Entrepreneurship Development (EDP) 1.2 Brief details of following terms: India GDP, IIP data, Govt. business policies, Environmental policy, Effects of global policies, Anti-dumping duty, Effects of national budget on start-ups and businesses.			4	CO1
2. VARIOUS TYPES OF BUSINESSES				
2.1 Brief details of following businesses: Cyclical and Non-cyclical business, Seasonal and Non-seasonal business, Monopoly and Duopoly business, Concept base business, Commodity and Non-commodity business, Asset light business, b2b and b2c business, 2.2 Difference between Subsidiary and Associate company			6	CO1
3. SELECTION OF BUSINESS				
3.1 Types of Sectors, Steps in sectoral analysis, factors to pick up a Sector, Data collection of Sectors. 3.2 Terminologies: Sector rotation, Gross block addition. 3.3 Steps to read Outline of balance sheet, profit-loss statement, cash flow statement. 3.4 Data analysis on following factors: i) Market growth ii) Sector consolidation. 3.5 Brief details of following: Profitability, Effect of Govt policies, Pricing power, Debt, working capital, return on capital employed, Cash conversion cycle, Companies with peer group.			4	CO1 CO2
4 SETTING UP OF BUSINESS				
4.1 Various Govt depts. and organization supporting business ideas. 4.2 Methods to raise capital (difference between Banks and NBFC). 4.3 Factors in machine, material, manpower procurement, advertising, product specialty, 4.4 Micro, Small and Medium Enterprises (MSME), Govt support for MSME, Private Limited and Public Limited Enterprises, 4.5 Goods & Service Tax(GST), Registering for GST and go ahead, 4.6 Various income tax slabs, 4.7 Application for various utility connections, various permissions required to set up business.			10	CO1 CO2 CO3
5. EXPANSION OF BUSINESS				
5.1 Types of investors: angel investors, venture capitalist, promoters. 5.2 Terminology: 5.2.1 EPS, EPS growth, P/E ratio, 5.2.2 Market capital, paid up capital, authorized share capital, 5.2.3 Corporate governance, Related party transactions, business insiders, assets and inventory turnover, break even analysis, brown field and green field expansion.			8	CO1 CO2 CO3 CO4

5.3 Listing start up on stock exchange &Govt support. 5.4 Business report writing, Reading of Red Herring prospectus			
Total		32	

6. COURSE DELIVERY:

Videos / Lectures/ Practicals /Expert lectures / Industry visits/ documentaries/moviesSuggested expert talk on

- various Govt schemes
- GST
- Financial literacy
- Any relevant topic

7. SPECIFICATION TABLE FOR PRACTICALS

Unit No.	Topic	Teaching Hours/ Semester
1	Indian business environment	4
2	various types of businesses	6
3	selection of business	9
4	Setting up of business	9
5	Expansion of business	4
TOTAL		32

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICAL HOURS

No	Classroom Assignments	Marks
1.	Prepare a Case Study on leading enterprise or small-scale unit	**6**
2.	Prepare a report on various government schemes for startup.	**4**
3.	Prepare SWOT analysis for a new business idea.	**5**
4.	Prepare Project Report for a new business idea.	**10**
OR		
1.	Preparing a project report on basis of draft Red Herring prospectus	**25**

9. LEARNING RESOURCES

S. No.	Author	Title of Books	Publisher
1.	Sharadjawadekar, shobhadodlani,	Business entrepreneurship	Suvichar prakashan mandal pune,
2.	S.S. Khanna	Entrepreneurship development	S. Chand & Co. Ltd, New Delhi,
3.	Vasant Desai	Management of small-Scale Industry in India	Himalaya Publishing House
4.	Dilip Sarwate	Entrepreneurial development Concepts and practices	Everest Publication House, Pune
5.	CB Gupta and P Srinivasan	Entrepreneurship Development	S. Chand and Sons, New Delhi

Internet and Web Resources

S. No.	Description
1	https://ncert.nic.in/ncerts/l/leac203.pdf
2	https://ncert.nic.in/ncerts/l/leac204.pdf
3	https://www.wirc-icai.org/images/publication/IND-AS-BOOK.pdf
4	https://cma.org.sa/en/Awareness/Publications/booklets/Booklet_4.pdf
5	https://www.icsi.edu/media/portals/25/IPO.pdf
6	https://old.mu.ac.in/wp-content/uploads/2017/01/FINANCIAL-STATEMENT-ANALYSIS.pdf
7	https://ncert.nic.in/textbook/pdf/jess202.pdf
8	https://dea.gov.in/sites/default/files/
10	https://dea.gov.in/monthly-economic-report-table
11	https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0HSIE_F.PDF
12	https://ncert.nic.in/textbook/pdf/lebs202.pdf
13	https://www.oecd.org/industry/inv/investmentfordevelopment/33806126.pdf
14	https://www.youtube.com/watch?v=NV8Ew6PcQhY
15	file:///C:/Users/User/Downloads/1-s2.0-S0970389617304664-main.pdf

(CC601) INDUSTRIAL ORGANISATION AND MANAGEMENT

1. COURSE OBJECTIVES:

Management is the basic need of any organization. Organization consists of multiple activities which are to be systematically managed for effective output. The course covers various principles related to organization and management. The areas covered are finance, human resource, project management etc. After completion of the course, the student will be acquainted with management and other related aspects so that he/she will be able to apply this knowledge in order to achieve the organizational goals.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (in hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CC601 INDUSTRIAL ORGANISATION AND MANAGEMENT	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES

On successful completion of the course, the student will be

able to: CC601.CO1: Describe types of business

organizations.

CC601.CO2: Apply the principles of managing Men, Machines, and Materials in an

industry.CC601.CO3: Evaluate financial status of an industrial organization.

CC601.CO4: Develop problem solving skills in project management**.**

4. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CC601.CO1	2	0	0	0	0	1	0	1	2
CC601.CO2	2	1	1	1	1	2	2	1	2
CC601.CO3	3	2	1	2	3	3	2	1	2
CC601.CO4	3	3	2	2	2	3	3	2	2

Relationship: Low-1   Medium-2 High-3

5. DETAILED COURSE CONTENTS/ MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO= Course Outcomes		
Unit		**M**	**Thr**	**CO**
1.BUSINESS ORGANIZATION **1.1** Types of business organizations: Individual proprietorship, Partnership, Joint Stock Companies: Private Ltd and Public Ltd, Co-operative societies, Public sector **1.2** Structure of business organization: Line organization, Functional Organisation, Line and staff organization, Project organization		10	6	CO1 CO2
2.BUSINESS MANAGEMENT **2.1:** Concept of management and administration, management as an art and science, evolution and growth of scientific management- contribution of F.W Taylor. **2.2** Basic functions of management: planning, organizing, staffing, directing, controlling. Other functions: forecasting, coordinating and decision- making. **2.3** Functions in Industry: Basics of Procuring, store- keeping, material handling, production, packing and forwarding, marketing and sales, supervision, research and development. **2.4**Supervisory skills required in industry		16	9	CO1 CO2 CO3
3.BASICS OF FINANCE **3.1** Sources of finance **3.2** Cost Concepts: Necessity of costing, elements of cost: material, Labour and expense; prime cost, overhead cost, total cost, And break-even analysis. **3.3** Materials management: Inventory control-standard order, reserve stock, reorder point, lead time. Economic order quantity, ABC Analysis. Introduction to Just in time (JIT) system **3.4** Depreciation: Definition and causes. Methods of calculating depreciation charges: Straight Line Method, Diminishing Balance Method, Sinking Fund method .(Simple Numericals) **3.5** Obsolescence- definitions and reasons. **3.6** Introduction to GST.		18	13	CO1 CO2 CO3 CO4
4.HUMAN RESOURCE MANAGEMENT **4.1** Functions of Personnel Department**:** Human resource planning, selection and recruitment, training, promotion and transfer, welfare of employees. **4.2** Industrial Relations**:** Employer-employee relations, trade union, settlement of disputes of employees, collective bargaining, conciliation, arbitration, grievance handling mechanism. **4.3** Wages and Incentives**:** Factors influencing wages, types of wage plans – time rate and piece rate, Incentive – objectives and types, individual and group incentive plan, characteristics of a good wage or incentive plan, difference between incentive and wage. **4.4** Industrial Acts: Introduction to the following Industrial Acts: Industrial Disputes Act 1947/1956;		21	14	CO1 CO2 CO3 CO4

The Indian Factories Act 1948 The Workmen's Compensation Act 1923			
5.PROJECT MANAGEMENT **5.1** Introduction to Project Management **5.2** Network Analysis (Introduction to basic concepts with simple Numericals) CPM- Critical Path Method: Definition, network diagrams, critical path, advantages PERT- Programme Evaluation and Review Technique: Definition, network diagrams, advantages. Comparison of PERT and CPM.	10	6	CO1 CO2 CO3 CO4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Business Organization	6	10
2	Business Management	9	16
3	Basics of Finance	13	18
4	Human Resource Management	14	21
5	Project Management	6	10
	Total	48	75

8. LEARNING RESOURCESText

Books

S.No	Author	Title of Book	Publisher
1	O.P. Khanna	Industrial Engineering and Management	DhanpatRai Publications
2	T.R.Banga ,S.C. Sharma	Industrial Organisation and Engineering Economics	Khanna Publishers
3	Awate,Chunawala, Patel,Bhandarkar, Sriniwasan	Industrial Organisation and Management	Vrinda Publication
4	Martand Telsang	Industrial Engineering and Production Management	S.Chand& Company Ltd

SEMESTER VI

Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
SIXTH	CM601	Network Management	3	–	2	5	75	25	25	–	125
	CM602	Software Engineering &Testing	3	–	2	5	75	25	–	–	100
	CM603	Computer Engineering Project	–	–	6	6	–	–	50	100	150
	CC602	Business Communication	–	–	2	2	–	–	25	25	50
		Elective - II	3	–	2	5	75	25	25	25	150
		Elective -III	3	–	2	5	75	25	25	25	150
	AC102	Indian Constitution	2	–	–	2	–	–	–	–	–
			14	–	16	30	300	100	150	175	725

L- Lecturers T – Tutorials P – Practicals H-Hours TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks

(CM601) NETWORK MANAGEMENT

1. **COURSE OBJECTIVES:** In this course students will learn the basic network functions, planning, designing, installing, maintaining and troubleshooting of a computer network.

2. **PRE-REQUISITES:** Students should have the knowledge of Data Communication and Computer Networks

3. **TEACHING AND EXAMINATION SCHEME**

Semester	VI				Examination Scheme				
Course code & course title		Periods/Week (in hours)		Total Hours	Theory Marks		Practical Marks		Total Marks
CM601 Network Management	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	-	25	125

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to

CM601.CO1: Explain the various concepts of Network Management.

CM601.CO2: Identify the components required to setup a simple network.

CM601.CO3: Design a simple network using the most appropriate networking architecture, hardware and software.

CM601.CO4: Manage a computer network.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM601.CO1	2	2	2	2	2	2	2
CM601.CO2	2	2	2	2	2	2	2
CM601.CO3	3	3	3	3	2	3	2
CM601.CO4	3	3	3	3	2	3	2

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CM601.CO1	3	2
CM601.CO2	3	2
CM601.CO3	3	2
CM601.CO4	3	2

6.   DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr=Teaching hours	CO = Course Outcomes			
		UNIT	**M**	**Thr**	**CO**

UNIT I	**1. NETWORK MANAGEMENT, GOALS, ORGANIZATION AND FUNCTIONS**
	1.1 Network Management
	1.2 Goals of Network management
	1.3 Challenges of Network Management
	    1.3.1 Growth of networks
	    1.3.2 Continuous operations
	    1.3.3 Automation
	    1.3.4 Multivendor networks
	1.4 Network management Functions and sub Functions
	    1.4.1 Network Provisioning-Planning, Design
	    1.4.2 Network Operations and Network Operations Center (NOC)–Fault Management/Service Restoration, Configuration Management, Performance Management, Security Management, Accounting Management
	    1.4.3 Network Maintenance-Fault Management, Trouble Ticket Administration, Network Repairs, Routine Network tests
	1.5 OSI and network management model
	    1.5.1 Organizational model
	    1.5.2 Information model
	    1.5.3 Communication model
	    1.5.4 Functional model
		15	10	CO1, CO2, CO3, CO4

UNIT II	**2. NETWORK PLANNING**
	2.1 Factors to be considered while planning a Network
	    2.1.1 Identifying the applications that you intend to use on a Network
	    2.1.2 Traffic Requirements
	    2.1.3 Scalability Requirements
	    2.1.4 Geographical consideration
	    2.1.5 Availability
	    2.1.6 Security and Accessibility
	    2.1.7 Cost consideration
	2.2 Designing Network-Network design life cycle
	    2.2.1 Analysis
	    2.2.2 Design
	    2.2.3 Simulation/prototyping
	    2.2.4 Implementation monitoring, Management
	2.3 Network configuration
	    2.3.1 Peer-to-Peer Network
	    2.3.2 Server based Network.
	2.4 Meeting Network Needs
	    2.4.1 Choosing Network Type- LAN, MAN, WAN
		15	10	CO1, CO2, CO3, CO4

	2.4.2 Choosing Network Topology 2.4.3 Choosing Network components: Passive components- connectors- fiber optic connectors, RJ 45 connectors cables, patch panel, Information outlets(IO box). Active components- NIC, Servers, workstations, Switches, Routers and its functions, media converter, wireless access points 2.4.4 Network Interface card functions and features- Selecting a NIC, Installing NIC 2.4.5 Choosing Servers: Hardware server types- tower, rack and blade servers. Software Servers types- File, Print, Mail, Web and Database servers 2.5 Cabling a Network 2.5.1 Cable properties, Cabling standards 2.5.2 Choosing cable types-Co-axial cables Twisted pair cable, Fiber optic cable 2.5.3 Structured cabling 2.5.4 Cable installation- Horizontal wiring and backbone wiring. 2.5.5 Types of LAN cables - crossover cable & Straight through, Concept of color codes 2.5.6 Tools required for preparing LAN cable– Crimping Tool, cable stripper/cutter, punch down tool.			

UNIT III	**3. NETWORK IMPLEMENTATION, CONFIGURATION AND ADMINISTRATION**
	3.1 Network operating systems (NOS)
	    3.1.1 Functions of Network Operating Systems
	    3.1.2 Important features of different NOS (LINUX, WINDOWS & NOVEL NETWARE)
	3.2 Installation steps of Windows Server
	3.3 Steps to setup domain controller functionality
	3.4 Configuring the windows server and client machine: Adding client to domain
	3.5 Working with User Accounts
	    3.5.1 Creating and deleting Users
	3.6 Working with Groups
	    3.6.1 Creating a Group and adding members
	3.7 Working with Shares
	    3.7.1 Creating Share folder
	    3.7.2 Mapping Drives
	3.8 Network Printing
	    3.8.1 Printer connections: Server connections, Workstations/Client connections, Direct network connections
	    3.8.2 Steps to share a printer on a network
	3.9 Locating applications and data on a network
		15	10	CO1, CO2, CO3, CO4

	3.9.1 Server based operating systems and Server based applications
	3.10 Network administration
	    3.10.1 Need of network administration
	    3.10.2 Task of a network Administrator			

UNIT IV	**4. NETWORK TROUBLESHOOTING AND MAINTENANCE**
	  4.1 Troubleshooting a computer network
	    4.1.1 Basic Steps-Understanding the Problem, Segmenting the problem, isolating the cause, Setting priorities, planning the repair, confirming the results, documenting the outcome
	  4.2 Network faults(Common Network Problems)
	    4.2.1 Loss of connectivity
	    4.2.2 Duplicate IP address
	    4.2.3 Intermittent problems
	    4.2.4 Network configuration issues
	    4.2.5 Performance problems
	  4.3 Network Troubleshooting Tools
	    4.3.1 Hardware, Software and Monitoring tools
	      4.3.1.1 Hardware tools: Cable tester, Network traffic Analyzer, time domain reflectometer (TDR)/ optical time-domain reflectometer (OTDR)
	      4.3.1.2 Software Tools:
	        4.3.1.2.1 Windows OS Utilities: NET, NETDIAG
	        4.3.1.2.2 TCP/IP utilities: ping, tracert/traceroute, netstat, nslookup, ipconfig
	      4.3.1.3 Software applications- Packet sniffer, port scanner, protocol analyzer, bandwidth tester
	      4.3.1.4 Monitoring Tool: Network Management protocol-SNMP
	        4.3.1.4.1 SNMP architecture
	        4.3.1.4.2 SNMP commands: GET, SET, RESPONSE, TRAP, INFORM
		15	8	CO1, CO2, CO3, CO4

UNIT V	**5. BACKUP AND RECOVERY**
	  5.1 Backup Purpose
	  5.2 Backup Considerations
	  5.3 Backup Granularity
	  5.4 Backup methods
	  5.5 Backup Architecture
	  5.6 Backup and restore Operations
	  5.7 Backup Topologies
		15	10	CO1, CO2, CO3, CO4

	5.7.1 Direct attached backup topology
	5.7.2 LAN-based backup topology
	5.8 Backup hardware
	5.9 Implementation of RAID
	    5.9.1 RAID Array Components
	    5.9.2 RAID Levels (up to 3)
	    5.9.3 Hot Spares			

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. NETWORK MANAGEMENT, GOALS, ORGANISATION AND FUNCTIONS** 1.1 Network Management 1.2 Goals of Network management 1.3 Challenges of Network Management 1.4 Network management Functions and sub Functions 1.5 OSI and network management model	10	15
II	**2. NETWORK PLANNING** 2.1 Factors to be considered while planning a Network 2.2 Designing Network-Network design life cycle 2.3 Network configuration 2.4 Meeting Network Needs 2.5 Cabling a Network	10	15
III	**3. NETWORK IMPLEMENTATION, CONFIGURATION AND ADMINISTRATION** 3.1 Network operating systems (NOS) 3.2 Installation steps of Windows Server 3.3 Steps to setup domain controller functionality 3.4 Configuring the windows server and client machine- Adding client to domain 3.5 Working with User Accounts 3.6 Working with Groups 3.7 Working with Shares 3.8 Network Printing 3.9 Locating applications and data on a network 3.10 Network administration	10	15

IV	**4. NETWORK TROUBLESHOOTING AND MAINTENANCE** 4.1 Troubleshooting a computer network 4.2 Network faults(Common Network Problems) 4.3 Network Troubleshooting Tools	10	15

V	**5 BACKUP AND RECOVERY** 5.1 Backup Purpose 5.2 Backup Considerations 5.3 Backup Granularity 5.4 Backup methods 5.5 Backup Architecture 5.6 Backup and restore Operations 5.7 Backup Topologies 5.8 Backup hardware 5.9 Implementation of RAID	8	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

S. No	Practical
1	Study the design of college campus LAN (Campus wide network)
2	Study of Active and passive network components
3	Plan and Design a computer network proposal for a given case.
4	Prepare network cables - straight through and cross cables.
5	Installing and configuring Network Operating System (NOS) (eg: Windows Server-Create Domain Controller, Linux)
6	Execute Basic TCP/IP utilities and commands. (eg: ping, ipconfig, tracert, nslookup)
7	Setting up and Configuring network printer
8	Design and simulate a computer network using Network Simulation tool.
9	Case study on backup and recovery
10	Identify, Segment Network Faults and troubleshoot.
11	Design and implement small network using actual physical components with IP address scheme
12	Create new Users & assign privileges/ Permission on NOS

10.   LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Craig Zacker	The Complete Reference Networking	Tata McGraw Hill
2	Alan Sugano	The Real World Network Troubleshooting Manual	Firewall Media
3	Kornel Terplan	Web-based Systems and Network Management	Pearson
4	Mani Subramanian	Network Management	Pearson
5	G. Somasundaram Alok Shrivastava, EMC Education Services	Information Storage and Management	Wiley Publishing

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	I.T. Frisch, Manu Malek-Zavarei, Manu Malek, S.S. Panwar	Network Management and Control	Springer Science and Business Media, LLC
2	David Groth, Jim McBee, David Barnett	Cabling: The Complete Guide to Network Wiring	John Wiley & Sons; 2nd Edition (17 August 2001)

Internet and Web Resources

S. No.	Description
1	Optical fibre: https://nptel.ac.in/courses/115107095/5
2	SNMP: https://nptel.ac.in/courses/106106091/41
3	https://www.tutorialsweb.com/networking/wireless-networks/computer-networking-tutorial.htm

Videos and Multimedia Tutorials

S. No.	Description
1	Windows server Installation: https://www.youtube.com/watch?v=ScSJMfG5R1Y
2	Cross and Straight Cable: https://www.youtube.com/watch?v=Wq4fSoLXvKg

(CM602) SOFTWARE ENGINEERING AND TESTING

1. **COURSE OBJECTIVES:** In this course the students will learn the basic software engineering methods and practices, various software process models and software testing approaches.

2. **PRE-REQUISITES:** Students should have knowledge of Basic Engineering Practice and Programming skills.

3. **TEACHING AND EXAMINATION SCHEME**

Semester	VI	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
Course code & course title						Theory Marks		Practical Marks		
CM602 Software Engineering & Testing		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	-	-	100

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM602.CO1: Explain the concepts of software engineering and testing.

CM602.CO2: Identify appropriate Software development life cycle model for softwaredevelopment.

CM602.CO3: Use tools required for requirement specification, design, testing and maintenance ofsoftware projects.

CM602.CO4: Design simple software projects.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CM602.CO1	2	3	3	2	2	2	1
CM602.CO2	2	3	2	2	2	3	2
CM602.CO3	3	3	2	3	2	3	2
CM602.CO4	3	3	2	3	2	3	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM602.CO1	2	1
CM602.CO2	2	2
CM602.CO3	3	2
CM602.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT	**M**	**Thr**	**CO**
UNIT I	**1. INTRODUCTION TO SOFTWARE ENGINEERING** 1.1 Definition of a Software and types-System, Application 1.2 Characteristics of a Software 1.3 Definition of Software Engineering 1.4 Software crisis and emergence of software engineering 1.4.1 The Software Crisis 1.4.2 Demands of today's business 1.4.3 Critical problems of software development. 1.5 Computer – based System Engineering 1.6 Software Process 1.7 The Software Life Cycle 1.7.1 Waterfall Model 1.7.2 "V" Model 1.7.3 Spiral Model 1.7.4 Prototype Model 1.7.5 Iterative Model (Diagram, Advantages and Disadvantages of above models)	15	10	CO1, CO2, CO3, CO4
UNIT II	**2. SOFTWARE REQUIREMENTS** 2.1 Requirement Engineering Process 2.1.1 Types of Software requirements 2.2 Requirement Inception 2.3 Requirement Elicitation 2.3.1 Requirement elicitation through interview 2.3.2 Requirement elicitation through questionnaire 2.3.3 Record review 2.3.4 Output of requirement elicitation 2.4 Negotiation 2.5 Requirement Validation 2.6 Requirement Elaboration 2.6.1 Initial user requirements 2.6.2 Initial technical requirements 2.6.3 Final functional requirements 2.7 Structure of Software Requirement Specification (SRS) 2.8 Characteristics of RE(Requirement Engineering) Process	15	10	CO1, CO2, CO3, CO4

UNIT III	**3.SOFTWARE DESIGN**
	3.1 Different approaches to SAD
	   3.1.1 Overview of Function Oriented Approach
	   3.1.2Models and Tools
	   3.1.3Salient features of SSAD
	3.2Overview of Object Oriented Approach
	   3.2.1Object Oriented Analysis
	   3.2.2Object Oriented Design
	   3.2.3Object Oriented Testing
	   3.2.4Object Oriented Maintenance
	3.3Comparison between OOAD and SSAD
	3.4Data Flow Diagram(DFD)
	   3.4.1Rules for drawing DFD
	   3.4.2Physical and Logical DFD
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	**4.CODING, DOCUMENTATION AND MAINTENANCE**
	4.1Coding
	   4.1.1 Coding standards and guidelines
	   4.1.2Code review
	4.2Software documentation
	   4.2.1Internal documentation
	   4.2.2External documentation
	4.3Verification and validation
	4.4Software Maintenance
	   4.4.1Characteristics of software maintenance
	   4.4.2Software reverse engineering
	   4.4.3Software maintenance Process models
		15	8	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5.SOFTWARE TESTING PROCESS**
	5.1Definition of testing
	5.2The Testing process
	5.3Characteristics of Test engineer
	5.4 Levels of Testing
	   5.4.1 Unit, Module, Integration and System, Acceptance
	   5.4.2Stages of Testing, Testing process.
	5.5 Testing Approach
	   5.5.1Top-down v/s bottom-up approach
	   5.5.2Functional v/s Structural testing
	   5.5.3Mutation testing
	   5.5.4 Regression testing
	5.6Types of Testing
	   5.6.1Black-box testing
	   5.6.2White-box testing
	   5.6.3 Beta testing
	   5.6.4Performance testing
	   5.6.5Stress testing
	   5.6.6Acceptance testing
	5.7Manual testing and its limitations
		15	10	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. INTRODUCTION TO SOFTWARE ENGINEERING** 1.1 Definition of a Software and types-System, Application 1.2 Characteristics of a Software 1.3 Definition of Software Engineering 1.4 Software crisis and emergence of software engineering 1.5 Computer – based System Engineering 1.6 Software Process 1.7 The Software Life Cycle	10	15
II	**2. SOFTWARE REQUIREMENTS** 2.1 Requirement Engineering Process 2.2 Requirement Inception 2.3 Requirement Elicitation 2.4 Negotiation 2.5 Requirement Validation 2.6 Requirement Elaboration 2.7 Structure of Software Requirement Specification (SRS) 2.8 Characteristics of RE (Requirement Engineering) Process	9	15
III	**3. SOFTWARE DESIGN** 3.1 Different approaches to SAD 3.2 Overview of Object Oriented Approach 3.3 Comparison between OOAD and SSAD 3.4 Data Flow Diagram(DFD)	10	15
IV	**4. CODING, DOCUMENTATION AND MAINTENANCE** 4.1 Coding 4.2 Software documentation 4.3 Software Maintenance 4.4 Verification and validation	9	15
V	**5. SOFTWARE TESTING PROCESS** 5.1 Characteristics of Test engineer 5.2 Levels of Testing 5.3 Testing Approach 5.4 Types of Testing 5.5 Manual testing and its limitations	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Sr. No.	Practical
1	Study of basic terminology of Software Engineering.
2	Prepare problem statements for given software projects
3	Comparative study of Software Life Cycle Development Models.
4	Prepare Software Requirement Specification for a given problem.
5	Develop DFD Model of the sample problem.
6	Case study on Software documentation.
7	Case study on Software maintenance.
8	Study and usage of different types of testing tool.
9	Study of test case preparations and execution using tool.
	Mini Project
10	Phase 1: Develop small scale website using the concepts of software engineering
11	Phase 2: Test above developed website using testing tools.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Jibitesh Mishra	Software Engineering	Pearson
2	Dr. K.V.K.K. Prasad	Software Testing Tools	Dreamtech press

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Bharat BhushanAgarwal, Sumit Prakash Tayal	Software Engineering	Firewal Media
2	Rajib Mall	Fundamentals of software engineering	PHI Learning

Internet and Web Resources

S. No.	Description
1	www.tutorialspoint.com/software_engineering
2	http://www.ece.rutgers.edu/~marsic/books/SE/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=ITIyBV4ttts
2	https://www.youtube.com/watch?v=4b1D1QFEeI0

(CM603) COMPUTER ENGINEERING PROJECT

1. COURSE OBJECTIVES:

After learning various computer and allied engineering subjects, it is time to learn the application of this knowledge to real life situations by identifying, analyzing, designing, implementing and testing computer systems. This may be done individually or in group. This is known as Project work. Thus, it is a purposeful time bound student activity to accomplish higher level cognitive, psychomotor and affective domain learning.

2. PRE-REQUISITES: Students should have knowledge of Computer and allied engineering subjects.

3. TEACHING AND EXAMINATION SCHEME

Semester	VI				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)				Theory Marks		Practical Marks		
CM603	L	T	P	H		TH	TM	TW	PR/OR	
Computer Engineering Project	-	-	6	6		-	-	100	50	150

4. COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM603.CO1: Recognize ethical and professional responsibilities in engineering situations and make informed judgments.

CM603.CO2: Apply engineering design to produce solutions that meet specified needs considering social and economic factors.

CM603.CO3: Function efficiently within a team and communicate effectively with the target audiences.

CM603.CO4: Identify, formulate, and solve engineering problems by applying principles of computer and allied engineering subjects and apply new knowledge as needed.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life-long Learning
CM603.CO1	2	2	1	1	1	1	1
CM603.CO2	3	3	3	2	2	3	2
CM603.CO3	2	2	1	1	1	1	1
CM603.CO4	3	3	3	3	3	3	3

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM603.CO1	2	2
CM603.CO2	2	2
CM603.CO3	2	2
CM603.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
		UNIT	**M**	**Thr**	**CO**
I	**1.** Selection/Identification of project work by market survey/industrial survey.	-	-	CO1, CO2, CO3, CO4
II	**2.** Prepare the project proposal which should preferably contain complete details in the following form: 2.1 Title of the project. 2.2 Introduction and Objectives of the Project. 2.3 Project Category (Software oriented / Hardware oriented etc.) 2.4 Tools / Platform, Hardware and Software Requirement specifications. 2.5 Analysis (Block diagrams /DFDs/ ER Diagrams/ Class Diagrams/ Database Design, etc. as per the project requirements). 2.6 A complete structure which includes(as per the project): 2.6.1 Number of modules and their description to provide an estimation of the student's effort on the project. 2.6.2 Data Structures as per the project requirements for all the modules. 2.6.3 Process logic of each module. 2.6.4 Testing process to be used. 2.6.5 Reports generation (Mention tentative content of report).	-	-	CO1, CO2, CO3, CO4
III	**3.** Design and Implement the Project.	-	-	CO1, CO2, CO3, CO4

IV	**4.** Prepare a project report which should preferably contain following details: 4.1 Abstract 4.2 Project overview 4.3 Introduction and Motivation 4.4 Problem Statement 4.5 Requirement Analysis 4.6 Project design 4.7 Implementation Details 4.8 Technologies used 4.9 Conclusion & future work 4.10 References, and Appendix. *Every student must prepare well formatted, printed and hard bound report.	-	-	CO1, CO2, CO3, CO4

5. SUGGESTIVE AREAS OF PROJECT WORK:
• Database Management Systems
• Software Engineering and Software Development
• Web page Designing
• Digital Image Processing
• Computer Graphics and Animation
• Multimedia Systems
• Computer Networks
• Artificial Intelligence
• Robotics
• Internet and e-commerce
• Computer Security and Cryptography
• Computer hardware and embedded systems
• Improving existing systems / equipments
• Mobile applications
• Internet of things (IOT)
• Any other emerging area found worth

(CC 602) BUSINESS COMMUNICATION

1. COURSE OBJECTIVES:

The students will able to:
1. Use speaking, writing and presentation skills to communicate effectively.
2. Develop business etiquettes, manners, grooming and improve personal appearance
3. Improve non-verbal forms of communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
(CC 602) BUSINESS COMMUNICATION		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	2	2	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CC 602.CO1: Apply principles of effective communication in business

environmentCC 602.CO2: Use ICT in business communication effectively.

CC 602.CO3: Demonstrate soft skills required in business environment.

CC 602.CO4: Prepare Technical Writing for various functions of business communication.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CC 602.CO1	1	0	1	0	1	2	2	0	1
CC 602.CO2	2	2	2	1	2	2	3	1	2
CC 602.CO3	2	2	2	1	2	2	3	0	2
CC 602.CO4	1	1	1	1	2	3	3	0	3

Relationship: Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Phr = Practical hours	CO = Course Outcomes			
Unit			**M**	**Phr**	**CO**
1 COMMUNICATION SKILLS AT WORKPLACE				04	CO1
1.1 **Principles of communication in business** Importance of communication in a business organization, types of communication (formal and informal Internal and External Communication), Channels of communication: Vertical, Horizontal, Diagonal, Grapevine					CO2 CO3 CO4
1.2 **Modern Office technology for communication**: email communication and sending text (etiquettes, components, tips for writing effective emails, spellcheck), internet and use of social media for work (to communicate, search for information about suppliers, specifications, networking, quick feedback, e-commerce, video conferencing)					
2 SEMINARS				06	CO1
2.1 **Organization of seminars and workshops** Organizers role: planning, objectives, topic selection, planning the date, time, venue, creating event organization material: creating Facebook page, WhatsApp group, invitations, advertisement on pamphlet, hand-outs, signage, name badges, registration form, press note, inviting key note speaker, schedule					CO2 CO3 CO4
2.2 **Presentation** Speakers role: Gathering relevant material, organization of the material, knowing the occasion and audience, preparing handouts for distribution, time management, interaction with audience, non-verbal communication. (Checklist of significant aspects of oral presentation to be provided)					
2.3 **Role of audience** Audience's role: Listening effectively and asking relevant questions, note taking					
3 TECHNICAL WRITING				10	CO1
3.1 **Reports** **Understanding objective report writing, types of reports, parts of a formal report, illustrations** inspection reports: procedure and format, Project Report					CO2 CO3 CO4
3.2 **Business letters** Sales letters: parts of sales letter complaint letters: elements of a complaint letter adjustment letters: elements of an adjustment letter					

3.3 Tenders procedure, Preparation, Types of tenders, Single tender, limited tender, Open tenders, government e tender, structure of a tender document, tender notice, terms and conditions, payment details, specification, documents to be submitted, drafting advertisement for tender. 3.4 Generic notices, notice for meetings: purpose, format of notice for meeting, agenda, quorum and writing minutes			
4 JOB INTERVIEWS		06	CO1 CO2 CO4
4.1 **Job application and resume** draft job application and resume, draft letter of acceptance and cold contact letter			
4. 2 **Job interviews** preparing for job interview, guidelines on facing job interviews, mock interviews			
5 SOFT SKILLS **5.1 Business etiquettes** Importance of business etiquettes and manners, Tips for good business etiquettes		06	CO1 CO2 CO3 CO4

5.2 Nonverbal Communication
    grooming, personal appearance, hygiene, deportment and body language
5.3 Interpersonal skills
    Leadership skills, team work, active listening
5.4 Critical thinking
    How to improve critical thinking, tips for critical thinking			

Total		32	-

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks 50
	Practical Title	
1.	Modern office technology	03
2.	Seminar	03
3.	Technical writing	10
4.	Job interviews	04
5.	Soft skills	05
	Total	25
No	**Class room Assignments**	
1.	Email communication	
2.	Power point presentation	
3.	drafting seminar invites	

4.	Drafting hand outs for seminars	
5.	Drafting sales letter	
6.	Drafting complaint letters	
7.	Drafting adjustment letters	
8.	Drafting tender notice	
9.	Filling maintenance reports	
10.	Drafting inspection reports	
11.	Drafting abstract	
12.	Drafting notice for meetings	
13.	Drafting agenda of meetings	
14.	Drafting minutes of meeting	
15.	Drafting resume and job application	
16.	Drafting letter of acceptance	
17.	Drafting cold contact cover letter	
18.	Group discussions	
19.	Debates	
20.	Group presentations	

8. LEARNING RESOURCES

8.1 Reference books

S. No.	Author	Title of Books	Publishers
1	P.Prasad, Rajendra k. Sharma	The functional aspects of communication skills	s.k. kataria &sons
2	Pal & Rorualling	Essentials of business communication	Sultan chand & sons
3	Grount Taylor	English conversation practice	Tata MCgraw Hill
4	R.C. Sharma & Krishna Mohan	Business Correspondence & report writing	Tata MCgraw Hill

ELECTIVE I

Elective–I	
Course Code	**Course**
CM511	Data Structures
CM512	E-Commerce
CM513	FOSS (Free and Open Source Software)
CM514	Embedded System Design

(CM 511) DATA STRUCTURES

1. COURSE OBJECTIVES: In this course the students will learn the basic concepts of data structures, types of data structures, searching and sorting techniques.

2. PRE-REQUISITES: Computer Programming

3. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CM 511 Data Structures	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

4. COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM511.CO1: Select appropriate data structures as applied to specified problem definition.

CM511.CO2: Implement operations like insertion, deletion and traversing mechanism on variousdata structures.

CM511.CO3: Implement appropriate searching, sorting technique for a given problem.

CM511.CO4: Use linear and non-linear data structures like stacks, queues, linked lists, trees,

graphs.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM511.CO1	2	2	1	1	1	1	2
CM511.CO2	2	2	2	3	1	1	2
CM511.CO3	2	3	2	3	1	1	2
CM511.CO4	2	3	2	3	1	1	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM511.CO1	1	2
CM511.CO2	2	2
CM511.CO3	2	2
CM511.CO4	2	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
UNIT		**M**	**Thr**	**CO**
UNIT I	**1 INTRODUCTION TO DATA STRUCTURES** 1.1 Introduction 1.2 Definition of Data Structures 1.3 Types of Data Structures 1.4 Data Structure Operations 1.5 Algorithms 1.6 Types of Algorithms- Brute force, divide-and-conquer, Greedy Algorithms, backtracking 1.7 Space and Time complexity 1.8 Asymptotic Notation	15	10	CO1, CO2, CO3, CO4
UNIT II	**2 STACKS AND QUEUES** 2.1 Stacks 2.1.1 Introduction to Stack 2.1.2 Stack operations 2.1.3 Stack implementation 2.1.4 Application of Stacks 2.2 Queues 2.2.1 Introduction 2.2.2 Queue basics 2.2.3 Queue implementation 2.2.4 Basic Concepts of Circular queue 2.2.5 Basic Concepts of Priority queue 2.2.6 Basic Concepts of Double-ended queue	15	8	CO1, CO2, CO3, CO4
UNIT III	**3 LINKED LIST** 3.1 Introduction 3.2 Basic Concept 3.3 Implementation 3.4 Operations on a Linked List 3.4.1 Insert a node at the end of the list 3.4.2 Delete a node at the end of the list	15	8	CO1, CO2, CO3, CO4

	3.4.3 Search a node
	3.4.4 Traverse through the list
	3.5 Types of linked lists
	  3.5.1 Insert a node at the end of the list
	  3.5.2 Basic Concepts of Doubly linked lists			

UNIT IV	**4 SEARCHING AND SORTING**
	4.1 Searching Techniques
	  4.1.1 Basic concept
	  4.1.2 Linear Search
	  4.1.3 Binary Search
	4.2 Sorting Techniques
	  4.2.1 Basic Concept
	  4.2.2 Bubble Sort
	  4.2.3 Selection Sort
	  4.2.4 Insertion Sort
	  4.2.5 Quick Sort
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5 BASIC CONCEPTS OF TREES AND**
	      GRAPHS
	5.1 Trees
	  5.1.1 Basic Concept
	  5.1.2 Binary Tree
	  5.1.3 Binary Tree Representation
	  5.1.4 Binary Tree Traversal
	  5.1.5 Binary Search Tree
	5.2 Graphs
	  5.2.1 Basic Concept
	  5.2.2 Types of Graph –undirected, directed
	        graph
	  5.2.3 Graph Traversal – Depth first search,
	        Breadth first search
		15	10	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1 INTRODUCTION TO DATA STRUCTURES** 1.1 Introduction 1.2 Definition of Data Structure 1.3 Types of Data Structures 1.4 Data Structure Operations 1.5 Algorithms	10	15

	1.6 Types of Algorithms 1.7 Space and Time complexity 1.8 Asymptotic Notation		
2	**2 STACKS AND QUEUES** 2.1 Introduction 2.2 Queues	8	15
3	**3 LINKED LIST** 3.1 Introduction 3.2 Basic concept 3.3 Implementation 3.4 Operations on a Linked List 3.5 Types of linked lists	10	15
4	**4 SEARCHING AND SORTING** 4.1 Searching Techniques 4.2 Sorting Techniques	10	15
5	**5 TREES AND GRAPHS** 5.1 Trees 5.2 Graphs	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Program to implement Arrays & Strings
2.	Program to implement Structures
3.	Program to implement pointers
4.	Programs to implement file handling
5.	Program to implement stacks
6.	Program to implement Queues
7.	Program to implement Linked List
8.	Program to implement Linear Search
9.	Program to implement Binary Search
10.	Program to implement Bubble Sort
11.	Program to implement Selection Sort
12.	Program to implement Insertion Sort

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	E. Balagurusamy	Data Structures Using C	McGraw Hill Education Pvt Ltd
2	Yeshwant Kanetkar	Data Structures Through C	BPB Publications,2003
3	ISRD Group	Data Structures Using C	Tata McGraw Hill
4	R. Krishnamurthy	Data Structures Using C	Tata McGraw Hill Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	ReemaThareja	Data Structures Using C	Oxford University Press, 2014
2	A.Tennenbaum	Data Structures Using C	Pearson Education
3	Alfred V. Aho, John E. Hopcraft, J.D. Ullman	Data Structures and Algorithms	Pearson Education

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/data_structures_algorithms/dsa_queue.htm
2	https://www.geeksforgeeks.org/data-structures/
3	https://www.studytonight.com/data-structures/introduction-to-data-structures

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/playlist?list=PL2_aWCzGMAwI3W_JlcBbtYTwiQSsOTa6P
2	https://www.youtube.com/watch?v=8hly31xKli0
3	https://www.youtube.com/watch?v=YOfXMQnUlZY

(CM 512) E-COMMERCE

1. COURSE OBJECTIVES: In this course students will learn the concepts of E-Commerce, electronic payment systems and tools used to build an E-Commerce web site.

2.   PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	V	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
Course code & course title						Theory Marks		Practical Marks		
CM 512 E-commerce		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4.COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM512.CO1: Explain the different technologies in the field of e-commerce and m-commerce.CM512.CO2: Use various electronic payment systems.

CM512.CO3: Implement an e-commerce application. CM512.CO4: Manage an e-commerce enterprise

5.   MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM512.CO1	2	1	2	1	1	2	2
CM512.CO2	2	2	2	2	2	2	2
CM512.CO3	2	2	2	2	2	2	2
CM512.CO4	2	1	1	1	1	3	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM512.CO1	1	2
CM512.CO2	2	2
CM512.CO3	3	2
CM512.CO4	2	2

6.   DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO
UNIT I	**1. INTRODUCTION TO ECOMMERCE** 1.1 Defining Electronic Commerce 1.1.1 Brief History of Electronic Commerce. 1.2 Forces Fueling Electronic Commerce 1.2.1 Economic Forces 1.2.2 Marketing and Customer Interaction Forces 1.2.3 Technology and Digital Convergence 1.2.4 Implications of Various Forces 1.3 Electronic Commerce Industry Framework 1.3.1 The Information Superhighway 1.3.2 Multimedia Content and Network Publishing 1.3.3 Messaging and Information Distribution 1.3.4 Common Business Services Infrastructure 1.4 Types of Electronic Commerce 1.4.1 Inter-organizational Ecommerce 1.4.2 Intra-organizational Ecommerce 1.4.3 Consumer to Business Ecommerce 1.4.4 Intermediaries and Ecommerce		15	8	CO1, CO2, CO3, CO4
UNIT II	**2. ELECTRONIC PAYMENT SYSTEMS** 2.1 Overview of the Electronic Payment Technology 2.1.1 The Online shopping experience 2.1.2 Limitation of traditional payment 2.1.3 Problems with traditional payment methods 2.2 Electronic or Digital Cash 2.2.1 Properties of Electronic cash 2.2.2 Digital cash in action 2.2.3 Purchasing digital cash from currency servers 2.2.4 Using digital currency 2.3 Electronic Checks 2.3.1 Benefits of Electronic checks 2.3.2 Electronic check in action 2.4 Online Credit Card-Based Systems 2.4.1 Types of credit card payments 2.4.2 Payments using encrypted credit card details 2.4.3 Payments using third party verification 2.5 Other Emerging Financial Instruments		15	10	CO1, CO2, CO3, CO4

		2.5.1 Debit cards at point of sale (POS) 2.5.2 Debit Cards and Electronic Benefits Transfer 2.5.3 Smart cards			

UNIT III	**3. ELECTRONIC COMMERCE AND RETAILING**
	
	3.1 Issues in developing a business model
	3.2 Changing Retail Industry Dynamics
	    3.2.1 Overbuilding and Excess Capacity
	    3.2.2 Demographic Changes
	    3.2.3 Consumer Behavior
	    3.2.4 Technology improvements in Electronic retailing
	3.3 Mercantile Models from the Consumer's Perspective
	    3.3.1 Distinct phases of a consumer merchantile model
	    3.3.2 Types of consumers
	    3.3.3 Types of purchases
	    3.3.4 Prepurchase Preparation
	    3.3.5 Prepurchase Deliberation
	    3.3.6 Prepurchase Comparison and negotiation process
	    3.3.7 Purchase Consummation
	    3.3.8 Post purchase Interaction
	3.4 Management Challenges in Online Retailing.
	    3.4.1 Come up with retailing strategy
	    3.4.2 Manage channel conflicts
	    3.4.3 Learn to price online products/services
	    3.4.4 Deliver a satisfying shopping experience
	    3.4.5 Design the layout of an online store
	    3.4.6 Manage brands
	    3.4.7 Create the right incentives
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	**4. MARKETING STRATEGIES ON THE WEB**
	
	4.1 Rules for marketing strategy on the internet
	4.2 Web Design
	    4.2.1 The Power of internet
	    4.2.2 Content in King
	    4.2.3 Feedback and online survey
	    4.2.4 Frequently asked questions
	    4.2.5 Corporate design rules
	    4.2.6 Navigational aids
	    4.2.7 Color schema
	    4.2.8 File size
	4.3 Attracting visitors to site
	    4.3.1 Gaining market share through content
	    4.3.2 Offering free information
	    4.3.3 Personalization
	    4.3.4 Support online and offline reading
	4.4 Virtual Societies
		15	10	CO1,
				CO2,
				CO3,
				CO4

	4.4.1 Affiliate networks
	4.4.2 Internet communities
	4.4.3 Interactive user groups
	4.5 Promoting your E-Business
	    4.5.1 Choosing the right domain
	    4.5.2 Announcing the website
	4.6 Banners Ad Campaigning
	    4.6.1 Banner Advertising rules
	    4.6.2 Banner Exchange
	4.7 One-to –one marketing
	    4.7.1 Developing customer relationship
	    4.7.2 Customer centric marketing
	4.8 Direct marketing
	    4.8.1 Spam
	    4.8.2 Mailing list and Newsletters			

UNIT V	**5. SUPPLY CHAIN FUNDAMENTALS AND ONLINE SERVICES**
	
	5.1 Supply Chain Fundamentals
	    5.1.1 What is supply chain management
	    5.1.2 Pull versus Push supply chain models
	    5.1.3 Elements of supply chain: Planning systems, Execution systems, Performance measurement systems
	    5.1.4 Integrating Functions in a supply chain
	5.2 Intranets and Customer Asset Management
	    5.2.1 Challenges in Implementing Customer Asset Management
	    5.2.2 Customer Asset Management and Supply Chains
	5.3 Online Sales Force Automation
	    5.3.1 What is sales force automation
	    5.3.2 Elements of online sales automation
	    5.3.3 Intranet and sales automation
	5.4 Online Customer Service and Support
	    5.4.1 The Web and Customer Service
	    5.4.2 The Role of Technology in Customer Service.
		15	10	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO ECOMMERCE** 1.1 Defining Electronic Commerce 1.2 Forces Fuelling Electronic Commerce 1.3 Electronic Commerce Industry Framework 1.4 Types of Electronic Commerce	8	15
2	**2. ELECTRONIC PAYMENT SYSTEMS** 2.1 Overview of the Electronic Payment Technology 2.2 Electronic or Digital Cash 2.3 Electronic Checks 2.4 Online Credit Card-Based Systems 2.5 Other Emerging Financial Instruments	10	15
3	**3. ELECTRONIC COMMERCE AND RETAILING** 3. 1 Issues in developing a business model 3. 2 Changing Retail Industry Dynamics 3. 3 Mercantile Models from the Consumer's Perspective 3. 4 Management Challenges in Online Retailing.	10	15
4	**4. MARKETING STRATEGIES ON THE WEB** 4.1 Rules for marketing strategy on the internet 4.2 Web Design 4.3 Attracting visitors to site 4.4 Virtual Societies 4.5 Promoting your E-Business 4.6 Banners Ad Campaigning 4.7 One-to –one marketing 4.8 Direct marketing	10	15
5	**5. SUPPLY CHAIN FUNDAMENTALS AND ONLINE SERVICES** 5.1 Supply Chain Fundamentals 5.2 Intranets and Customer Asset Management 5.3 Online Sales Force Automation 5.4 Online Customer Service and Support	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Analysis of any E-commerce website based on following criteria a. User Interface b. Product Catalog c. Payment options d. Search options e. Security
2	Designing a Homepage for E-Commerce Site
3	Study of Electronic Payment Systems.
4	Designing Product Catalog.
5	Study of Online Promotional Strategies.
6	Study of E-commerce Enterprise(any one)
7	Case study of Payment gateway (any one)
8	Case study on an E-commerce website.

10.   LEARNING

RESOURCES Text Books

S. No.	Author	Title of Books	Publishers
1	Ravi Kalakota& Andrew B, Whinston	E-Commerce (Unit 1,2,3,5)	Pearson Education India,
2	Daniel Amor	E-Business (R) Evolution (Unit 4)	Pearson Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	KamleshAgarwala, AmitLal, DeekshaAgarwala	Business on the Net	Macmillan Publishers India Limited
2	Mukesh Chandra Trivedi	Electronic Commerce	Springer
3	Nan Si Shi	Mobile Commerce	Idea Group Publishing

Internet and Web Resources

S. No.	Description
1	https://en.wikipedia.org/wiki/E-commerce_payment_system
2	https://www.wisdomjobs.com/e-university/e-commerce-concepts-tutorial-7/retailing-in-e-commerce-11855.html
3	https://www.thebalancesmb.com/top-10-internet-marketing-strategies-2295375

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=3DyW10RWEmU
2	https://www.youtube.com/watch?v=avRkRuQsZ6M
3	https://www.youtube.com/watch?v=xKJjyn8DaAw

(CM 513) FOSS (FREE AND OPEN SOURCE SOFTWARE)

1. **COURSE OBJECTIVES:** In this course the students will be exposed to free and open source software philosophy and tools.

2. **PRE-REQUISITE:** NIL

3. **TEACHING AND EXAMINATION SCHEME**

Semester	V								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
						Theory Marks		Practical Marks		
CM 513 FOSS (Free and Open Source Software)		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM513.CO1: Explain the concepts of Free and Open Source Software.

CM513.CO2: Use the concepts of Free and Open Source Software. CM513.CO3: Examine various Free and Open Source Software.

CM513.CO4: Design Free and Open Source Software.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM513.CO1	3	2	2	1	2	1	2
CM513.CO2	3	2	2	1	2	1	2
CM513.CO3	3	2	2	2	2	2	2
CM513.CO4	3	2	3	2	2	2	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM513.CO1	2	1
CM513.CO2	2	1
CM513.CO3	2	2
CM513.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		**M**	**Thr**	**CO**
UNIT I	**1. INTRODUCTION TO FREE AND OPEN SOURCE SOFTWARE (FOSS)** 1.1 What is free/Open Source software? 1.2 Difference between Open source Software and Proprietary Software 1.3 Definition of Freeware, Free Software, Shareware 1.4 FOSS philosophy: Free Software Foundation, Open Source Initiative Philosophy 1.5 History of FOSS 1.6 Why FOSS? 1.7 Is FOSS free? 1.8 How large are the savings from FOSS? 1.9 Direct Cost Savings – An example 1.10 Benefits of FOSS: Security, Reliability/Stability, Open standards and vendor independence, Reduced reliance on imports, Developing local software capacity, (Piracy, IPR and WTO), Localization 1.11 Disadvantages of FOSS: Lack of business applications, Interoperability with proprietary systems, Documentation and Polish		15	9	CO1, CO2, CO3, CO4
UNIT II	**2. FOSS- LEGAL ASPECTS AND ECONOMY** 2.1 Introduction to intellectual property: Copyright, Trade secret, Patents and utility models, Registered trademarks and logos 2.2 Introduction to Free software licences 2.3 Types of licences: Permissive licences, Strong licences- The GNU General Public Licence 2.4 Distribution under several licences 2.5 Program documentation 2.6 Funding free software projects: Public funding, Private not-for-profit funding, Financing by		15	10	CO1, CO2, CO3, CO4

	someone requiring improvements, Financing as an internal investment 2.7 Business models based on free software: Better knowledge, Source of a free software product, Product source with limitations, Special licenses			
UNIT III	3. FREE SOFTWARE ENGINEERING AND DEVELOPMENT ENVIRONMENTS & TECHNOLOGIES 3.1 Introduction to Free software engineering 3.2 The cathedral and the bazaar 3.3 Leadership and decision-making in the bazaar 3.4 Free software processes 3.5 Criticism of "The cathedral and the bazaar" 3.6 Description of Development environments, tools and systems 3.7 Associated languages and tools 3.8 Integrated development environments 3.9 Basic collaboration mechanisms 3.10 Source management: CVS, Disadvantages of CVS 3.11 Documentation: DocBook, Wikis 3.12 Bug management and other issues 3.13 Development support sites: SourceForge	15	10	CO1, CO2, CO3, CO4
UNIT IV	4. OPEN SOURCE DEVELOPMENT 4.1 History of open source development 4.2 Evolution of the open source movement 4.3 Introduction to Community driven development 4.4 Developers' group-Software design and development: Hardware platform, Operating system, Automatic code generators, Version control 4.5 Builders' group: Software building 4.6 Testers' group: Software Testing 4.7 Release management group: Packaging 4.8 Release management group: Releasing 4.9 Installation 4.10 Issue tracking- Introduction, Life cycle of an issue	15	10	CO1, CO2, CO3, CO4
UNIT V	5. CASE STUDIES OF FOSS 5.1 Moodle - Learning Management System (LMS) 5.2 What is Moodle? 5.3 Benefits of Moodle 5.4 Basic structure of Moodle site: Front page, Inside Moodle	15	9	CO1, CO2, CO3, CO4

	5.5 OpenOffice.org: History, Organization of OpenOffice.org, Analysis of OpenOffice.org with respect to status, programming languages used
	5.6 Red Hat Linux: History, Analysis of Red Hat Linux with respect to status, programming languages used
	5.7 Mozilla: History, Analysis of Mozilla with respect to status, programming languages used
	5.8 Apache: History, Analysis of Apache with respect to status, programming languages used
	5.9 FOSS in Government - a case study: Introduction, Motivation, Implementation approach, Results
	5.10 FOSS in Education - a case study: Introduction, Motivation, Implementation approach, Results

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1.INTRODUCTION TO FREE AND OPEN SOURCE SOFTWARE (FOSS)** 1.1 What is free/Open Source software? 1.2 Difference between Open source Software and Proprietary Software 1.3 Definition of Freeware, Free Software, Shareware 1.4 FOSS philosophy 1.5 History of FOSS 1.6 Why FOSS? 1.7 Is FOSS free? 1.8 How large are the savings from FOSS? 1.9 Direct Cost Savings – An example 1.10 Benefits of FOSS 1.11 Disadvantages of FOSS	9	15

2	**2. FOSS- LEGAL ASPECTS AND ECONOMY**	10	15
	2.1 Introduction to intellectual property: Copyright, Trade secret, Patents and utility models, Registered trademarks and logos		
	2.2 Introduction to Free software licences		
	2.3 Types of licences: Permissive licences, Strong licences- The GNU General Public Licence		
	2.4 Distribution under several licences		
	2.5 Program documentation		
	2.6 Funding free software projects: Public funding, Private not-for-profit funding, Financing by someone requiring improvements, Financing as an internal investment		
	2.7 Business models based on free software: Better knowledge, Source of a free software product, Product source with limitations, Special licenses		
3	**3. FREE SOFTWARE ENGINEERING AND DEVELOPMENT ENVIRONMENTS & TECHNOLOGIES**	10	15
	3.1 Introduction to Free software engineering		
	3.2 The cathedral and the bazaar		
	3.3 Leadership and decision-making in the bazaar		
	3.4 Free software processes		
	3.5 Criticism of "The cathedral and the bazaar"		
	3.6 Description of Development environments, tools and systems		
	3.7 Associated languages and tools		
	3.8 Integrated development environments		
	3.9 Basic collaboration mechanisms		
	3.10 Source management: CVS, Disadvantages of CVS		
	3.11 Documentation: DocBook, Wikis		
	3.12 Bug management and other issues		
	3.13 Development support sites: SourceForge		
4	**4. OPEN SOURCE DEVELOPMENT**	10	15
	4.1 History of open source development		
	4.2 Evolution of the open source movement		
	4.3 Introduction to Community driven development		
	4.4 Developers' group-Software design and development: Hardware platform, Operating system, Automatic code generators, Version control		
	4.5 Builders' group: Software building		
	4.6 Testers' group: Software Testing		
	4.7 Release management group: Packaging		
	4.8 Release management group: Releasing		
	4.9 Installation		
	4.10 Issue tracking- Introduction, Life cycle of an issue		

5	**5. CASE STUDIES OF FOSS**	9	15
	5.1 Moodle - Learning Management System (LMS) 5.2 What is Moodle? 5.3 Benefits of Moodle 5.4 Basic structure of Moodle site: Front page, Inside Moodle 5.5 OpenOffice.org: History, Organization of OpenOffice.org, Analysis of OpenOffice.org with respect to status, programming languages used		
	5.6 Red Hat Linux: History, Analysis of Red Hat Linux with respect to status, programming languages used 5.7 Mozilla: History, Analysis of Mozilla with respect to status, programming languages used 5.8 Apache: History, Analysis of Apache with respect to status, programming languages used 5.9 FOSS in Government - a case study: Introduction, Motivation, Implementation approach, Results 5.10 FOSS in Education - a case study: Introduction, Motivation, Implementation approach, Results		
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of Free and Open Source Software.
2	Study of different types of licenses with respect to FOSS.
3	Study of Business models based on free software.
4	Installation, configuration and study of Integrated development environments such as Netbeans, Eclipse etc.
5	Demonstrate the use of Github - a provider of Internet hosting for software development and version control
6	Installation and use of Moodle-Open source Learning Management System.
7	Installation of Linux operating system.
8	Study of basic Linux commands.

9	Linux system administration
	  1. Becoming super user
	  2. Temporarily changing user identity with su command
	  3. Using graphical administrative tools
	  4. Administrative commands
	  5. Administrative configuration files

10	Configuring Apache Web Server on Linux operating system.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Kenneth Wong and Phet Sayo	Free/Open Source software – a general introduction (Unit 1, 5)	United Nations Development Programme (UNDP)
2	J. Gonzalez Barahona, J. Seone Pascual, G. Robles	Introduction to Free Software (Unit 2,3,5)	Free Technology Academy
3	Rachna kapur, mario briggs, tapas saha, ulisses costa, pedro carvalho, raul f. Chong, peter kohlmann	Getting started with open source development (Unit 4)	IBM corporation 2010

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Ellen Siever	Linux in a Nutshell	O'Reilly
2	Allen Tucker, Ralph Morelli, Chamindra de Silva	Software Development An Open Source Approach	CRC Press
3	Andy Oram and Zaheda Bhorat	Open Source in the Enterprise	O"Reilly

Internet and Web Resources

S. No.	Description
1	Philosophy of GNU URL: http://www.gnu.org/philosophy/
2	Version control system URL: http://git-scm.com/
3	https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_open_source_software.htm

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=Qyb5KZC7d6s
2	https://www.youtube.com/watch?v=yzeVMecydCE
3	https://www.youtube.com/watch?v=loCLu8Iq1dQ

(CM514) EMBEDDED SYSTEMS DESIGN

1. COURSE OBJECTIVES: In this course students will learn the following Fundamentals of Microcontrollers and Embedded Systems and its design.

2. PRE-REQUISITES: Knowledge of Digital Electronics and Microprocessors.

3.   TEACHING AND EXAMINATION SCHEME:

Semester	V	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
CM514 Embedded Systems Design		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4. COURSE OUTCOMES: On successful completion of the course, the students will be able to:

CM514.CO1: Explain the basic concepts of Embedded Systems and its design. CM514.CO2.

Identify the components of an Embedded system

CM514.CO3. Develop firmware for an embedded

system. CM514.CO4. Design and develop a simple

embedded system.

5.   MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM514.CO1	3	2	1	1	1	1	2
CM514.CO2	3	2	1	1	1	1	2
CM514.CO3	3	2	3	2	2	2	2
CM514.CO4	3	2	3	2	2	2	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM514.CO1	2	2
CM514.CO2	2	2
CM514.CO3	3	2
CM514.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO
UNIT I	**1. INTRODUCTION TO 8051 MICROCONTROLLERS** 1.1 Difference between microcontrollers and microprocessors 1.2 Types of microcontrollers (4-bit,8-bit,16-bit &32-bit microcontrollers), 1.3 Processor architecture- Harvard and Princeton 1.4 Criteria for choosing a microcontroller for an embedded system. 1.5 Architecture of 8051 Microcontroller: 1.5.1 Introduction 1.5.2 8051 microcontroller hardware: Detailed block diagram, 8051 programming model, The Oscillator and Clock, 8051 Pin diagram 1.5.3 8051 Registers: Program Counter, Data Pointer, A and B CPU registers, Register Banks, Flag and Program Status word(PSW) 1.5.4 8051 Memory: Internal Memory, Internal RAM Organization, Stack and Stack Pointer, Special Function Registers (SFRs), Internal ROM, Basics of External Memory 1.5.5 Input/Output Pins and Ports (no circuits): Functions of Port 0, Functions of Port 1, Functions of Port 2, Functions of Port 3 1.5.6 Counters and Timers 1.5.7 Basics of interrupts.		15	10	CO1, CO2, CO3, CO4

UNIT II	2. INSTRUCTION SET OF 8051 WITH ASSEMBLY LANGUAGE PROGRAMMING	15	10	CO1, CO2, CO3, CO4
	2.1 Addressing modes (only immediate, register and direct)			
	2.2 Assembly language programming: instruction set (bit and byte level)			
	2.3 Data transfer instructions, push and pop instructions, data exchanges.			
	2.4 Arithmetic instructions, Incrementing and decrementing, addition, and subtraction, multiplication, and division. (Also includes basic assembly language programming based on above instructions)			
	2.5 Logical instructions: AND, OR, EX-OR, NOT operations, clear and set.			
	2.6 Branching instructions: unconditional jumps, calls and subroutines. (No programming on above instructions)			
	2.7 Interfacing input devices: Matrix Keyboard.			
	2.8 Interfacing output devices: LED, LCD and seven-segment display			
UNIT III	3. INTRODUCTION TO EMBEDDED SYSTEM	15	9	CO1, CO2, CO3, CO4
	3.1 Definition of Embedded System			
	3.2 Embedded systems vs General Computing Systems			
	3.3 Classification of Embedded Systems			
	3.3.1 Classification based on Generations			
	3.3.2 Classification based on Complexity and Performance			
	3.4 Major Application Areas			
	3.5 Purpose of Embedded Systems			
	3.5.1 Data Collection/Storage /Representation			
	3.5.2 Data Communication			
	3.5.3 Data (Signal) Processing			
	3.5.4 Monitoring			
	3.5.5 Control			
	3.5.6 Application-Specific User Interface			
	3.6 Characteristics and Quality Attributes of Embedded Systems			
	3.6.1 Characteristics of an Embedded Systems: Application and Domain Specific, Reactive and Real Time, Operates in Harsh Environment, Distributed, Small size and Weight, Power Concerns			
	3.6.2 Quality Attributes of Embedded Systems: Operational Quality Attributes, Non-Operational			

	Quality Attributes 3.7 Examples of Application Specific Embedded system 3.7.1 Washing Machine 3.7.2 Automated Meter reading system			

UNIT IV	**4. TYPICAL EMBEDDED SYSTEM**
	
	4.1 Core of the Embedded System
	    4.1.1 General Purpose and Domain Specific Processors: Microprocessors, Microcontrollers, Digital Signal Processors
	    4.1.2 Application Specific Integrated Circuits (ASICs)
	    4.1.3 Programmable Logic Devices (PLDs)
	    4.1.4 Commercial off-the-shelf Components (COTS)
	4.2 Memory
	    4.2.1 ROM: MROM, PROM/OTP, EPROM, EEPROM, FLASH, NVRAM
	    4.2.2 RAM: Comparison of SRAM and DRAM
	    4.2.3 Memory Shadowing
	    4.2.4 Memory Selection for Embedded Systems
	    4.2.5 Basic concepts of Sensors and Actuators: LED, 7-segment LED Display, Optocoupler, Stepper Motor, Piezo Buzzer, Push Button Switch, Keyboard
	4.3 Communication Interface
	    4.3.1 Onboard Communication Interfaces: Inter Integrated Circuit (I2C) Bus, Serial Peripheral Interface (SPI) Bus, UART, Parallel Interface
	    4.3.2 External Communication Interfaces: RS-232 C, USB, Infrared, Wi-Fi, ZigBee
		15	10	CO1, CO2, CO3, CO4

UNIT V	**5. EMBEDDED FIRMWARE**
	
	5.1 Embedded Firmware Design Approaches
	    5.1.1 Super Loop based approach
	    5.1.2 Embedded Operating System based approach
	5.2 Embedded firmware Design Approaches and Development Languages
	    5.2.1 Assembly Language based Development
	        5.2.1.1 Basic steps in Source File to Object File translation
	        5.2.1.2 Advantages of Assembly Language based Development
	        5.2.1.3 Drawbacks of Assembly Language based Development
	    5.2.2 High Level Language based development
	        5.2.2.1 Advantages of High-Level Language based development
	        5.2.2.2 Limitations of High-Level Language
		15	9	CO1, CO2, CO3, CO4

	based development
	5.3 Other components of Embedded System
	     5.3.1 Reset Circuit
	     5.3.2 Brown-out Protection Circuit
	     5.3.3 Oscillator Unit
	     5.3.4 Real Time Clock
	     5.3.5 Watchdog Timer			

	Total	75	48	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks

I	**1. INTRODUCTION TO 8051 MICROCONTROLLER**
	    1.1 Difference between microcontrollers and microprocessors
	    1.2 Types of microcontrollers (4-bit,8-bit,16-bit &32-bit microcontrollers),
	    1.3 Processor architecture- Harvard and Princeton
	    1.4 Criteria for choosing a microcontroller for an embedded system.
	    1.5 Architecture of 8051 Microcontroller:
		10	15

II	**2. INSTRUCTION SET OF 8051 WITH ASSEMBLY LANGUAGE PROGRAMMING**
	    2.1 Addressing modes (only immediate, register and direct)
	    2.2 Assembly language programming: instruction set (bit and byte level)
	    2.3 Data transfer instructions, push and pop instructions, data exchanges.
	    2.4 Arithmetic instructions, Incrementing and decrementing, addition, and subtraction, multiplication, and division. (Also includes basic assembly language programming based on above instructions)
	    2.5 Logical instructions: AND, OR, EX-OR, NOT operations, clear and set.
	    2.6 Branching instructions: unconditional jumps, calls and subroutines. (No programming on above instructions)
	    2.7 Interfacing input devices: Matrix Keyboard.
	    2.8 Interfacing output devices: LED, LCD and seven-segment display
		10	15

III	**3. INTRODUCTION TO EMBEDDED SYSTEM**
	   3.1 Definition of Embedded System
	   3.2 Embedded systems vs General Computing Systems
	   3.3 Classification of Embedded Systems
	   3.4 Major Application Areas
	   3.5 Purpose of Embedded Systems
	   3.6 Characteristics & Quality Attributes of Embedded Systems
	   3.7 Examples of Application Specific Embedded system
		9	15

IV	**4. TYPICAL EMBEDDED SYSTEM**
	   4.1 Core of the Embedded System
	   4.2 Memory
	   4.3 Communication Interface
		10	15

V	**5. EMBEDDED FIRMWARE**
	   5.1 Embedded Firmware Design Approaches
	   5.2 Embedded firmware Design Approaches and Development Languages
	   5.3 Other components of Embedded System
		9	15

	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Sr. No	Practical
1	Study of 8051 Microcontroller
2	Study of Keil compiler tool
3	Assembly language programs based on Data transfer instructions
4	Assembly language programs based on Arithmetic Instructions (Addition, Subtraction, Multiplication, Division)
5	Develop Assembly Language Programs based on Logical Instructions (And, Or etc.)
6	Develop Assembly Language Program to interface LED with 8051
7	Develop Assembly Language Programs to interface 7 segment Display with 8051
8	Study of Embedded systems terminology.
9	Study and classification of Embedded Systems on the basis of application areas.
10	Study of use of Sensors and Actuators in Embedded System.
11	Case study of Temperature sensor system and Traffic Light Controller System.
12	Mini project: Design a simple embedded system using 8051 microcontrollers

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Kenneth J. Ayala	The 8051 Microcontroller, Architecture, Programming & applications-second edition	Penram International
2	Mohammad Ali Mazidi.	The 8051 Microcontroller and Embedded Systems	Pearson Education India
3	Shibu K. V.	Introduction to Embedded Systems	McGraw-Hill
4	Raj Kamal	Embedded Systems	TMH

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Frank Vahid, Tony Givargis, John Wiley	Embedded System Design	John Wiley and sons Inc.
2	Michael Predko	Programming and customizing the 8051 Microcontroller	McGraw Hill
3	Lyla	Embedded Systems	Pearson,2013
4	Davide. Simon	An Embedded Software Primer	Pearson Education

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/8051-microcontroller
2	https://openlabpro.com/learn/8051-microcontroller-tutorials/
3	https://www.tutorialspoint.com/embedded_systems/embedded_systems_tutorial.pdf
4	https://nptel.ac.in/downloads/108105057/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=iXSXIJn_Xwc&list=PLm_MSClsnwm9hEIDpFfDnOEu-6kVnF4ug
2	https://www.youtube.com/watch?v=RdjtRpFlAnc&list=PLiQ6yyBxf5MoSZKMOqFredyH24e6sdZL4
3	https://www.youtube.com/watch?v=tj3GmD2cXHw
4	https://www.youtube.com/watch?v=ECEvUEkSSLg

AUDIT COURSE

(AC101) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

1. COURSE OBJECTIVES:

This course aims at imparting basic principles of thought process, reasoning and inferencing by human being. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogis, science and wisdom capsules in Sanskrit literature are also importantin modern society with rapid technological advancements and societal disruptions. The course thus focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world- view, basic principles of Yoga and holistic health care system.

2. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title	**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(AC101) Essence of Indian Knowledge and Tradition	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
	2	-	-	2	-	-	-	-	-

Course Content:

Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उनवेद (आयुवेद, धनुवेद, गन्धवेद, स्थानत्य आदद) (iii) वेदांग (शिक्षा, कल्न, ननरुत, व्याकरण, ज्योनतष छांद), (iv) उनाइग (धर्मे सि, रीरांसा, नुराण, तकमिास)

ϓ Modern Science and Indian Knowledge System
ϓ Yoga and Holistic Health care
ϓ Case Studies.

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India- Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am

| 6. | Science of Consciousness Psychotherapy and Yoga Practices | RN Jha | Vidyanidhi Prakasham, Delhi, 2016 |

ELECTIVE II

Elective–II	
Course Code	**Course**
CM611	Computer Graphics
CM612	Cyber Law and Computer Forensics
CM613	Internet of Things
CM614	E-Governance

(CM611) COMPUTER GRAPHICS

1. **COURSE OBJECTIVES:** In this course the students will gain the fundamental knowledgeof computer graphics and learn computer graphics algorithms.

2. **PRE-REQUISITES:** NIL

3. **TEACHING AND EXAMINATION SCHEME**

Semester	VI					Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
CM611 Computer Graphics		3	-	2	5	75	25	25	25	150

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM611.CO1: Explain concepts of computer graphics.

CM611.CO2: Implement various computer graphics algorithms.

CM611.CO3: Compare different computer graphics algorithms and color

models. CM611.CO4: Develop simple computer graphic images and

animation.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM611.CO1	2	2	2	3	0	0	1
CM611.CO2	3	3	1	3	2	1	1
CM611.CO3	0	2	1	3	0	0	1
CM611.CO4	3	3	2	3	0	2	1

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM611.CO1	2	1
CM611.CO2	2	1
CM611.CO3	2	1
CM611.CO4	2	1

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT	M	Thr	CO

UNIT I	**1. INTRODUCTION TO COMPUTER GRAPHICS SYSTEMS AND APPLICATIONS**
	1.1 Overview of Graphics Systems
	    1.1.1 Video display devices
	        1.1.1.1 Refresh cathode ray tubes
	        1.1.1.2 Raster scan displays
	            1.1.1.2.1 Video controller
	            1.1.1.2.2 Raster scan display processor
	        1.1.1.3 Random scan displays
	        1.1.1.4 Color CRT monitors
	        1.1.1.5 Flat panel displays
	        1.1.1.6 Liquid crystal displays
	1.2 Computer Graphics Applications
	    1.2.1 Computer-aided design
	    1.2.2 Presentation graphics
	    1.2.3 Computer art
	    1.2.4 Entertainment
	    1.2.5 Education and training
	    1.2.6 Visualization
	    1.2.7 Image Processing
	    1.2.8 Graphical user interfaces
		15	9	CO3, CO5

UNIT II	**2. OUTPUT PRIMITIVES AND THEIR ATTRIBUTES**
	2.1 Output Primitives
	    2.1.1 Points and Lines
	    2.1.2 Line Drawing Algorithms
	        2.1.2.1 DDA Algorithm
	    2.1.3 Circle Generating Algorithms
	        2.1.3.1 Properties of Circles
	        2.1.3.2 Midpoint Circle Algorithm
	    2.1.4 Ellipse Generating Algorithms
	        2.1.4.1 Properties of Ellipses
	        2.1.4.2 Midpoint Ellipse Algorithm
	2.2 Attributes of Output Primitives
		15	10	CO2, CO4

	2.2.1 Line attributes
	    2.2.1.1 Line Type
	    2.2.1.2 Line Width
	    2.2.1.3 Pen and Brush Options
	    2.2.1.4 Line Color
	2.2.2 Color and Grayscale Levels
	    2.2.2.1 Color Tables
	    2.2.2.2 Grayscale
	2.2.3 Area Fill Attributes
	    2.2.3.1 Fill Styles
	    2.2.3.2 Pattern Fill
	2.2.4 Character Attributes
	2.2.5 Text Attributes			

UNIT III	**3. FILLED AREA PRIMITIVES AND TWO DIMENSIONAL GEOMETRIC TRANSFORMATIONS**
	3.1 Filled Area Primitives
	    3.1.1 Scan Line Polygon Fill Algorithm
	    3.1.2 Inside Outside Tests
	    3.1.3 Boundary Fill Algorithm
	    3.1.4 Flood Fill Algorithm
	3.2 Two-Dimensional Geometric Transformations
	    3.2.1 Basic Transformations
	        3.2.1.1 Translation
	        3.2.1.2 Rotation
	        3.2.1.3 Scaling
	    3.2.2 Other Transformations
	        3.2.2.1 Reflection
	        3.2.2.2 Shear
		15	10	CO2,
				
				CO4

UNIT IV	**4. TWO-DIMENSIONAL VIEWING AND THREE DIMENSIONAL CONCEPTS**
	4.1 Two Dimensional Viewing
	    4.1.1 The Viewing Pipeline
	    4.1.2 Clipping Operations
	        4.1.2.1 Point Clipping
	        4.1.2.2 Cohen-Sutherland Line Clipping
	        4.1.2.3 Sutherland Hodgeman Polygon Clipping
	        4.1.2.4 Curve Clipping
	        4.1.2.5 Text Clipping
	4.2 Three Dimensional Concepts
		15	10	CO2,
				
				CO4

	4.2.1 Three Dimensional Display Methods
	    4.2.1.1 Parallel Projection
	    4.2.1.2 Perspective Projection
	    4.2.1.3 Depth Cueing
	    4.2.1.4 Visible Line and Surface
	          Identification			

UNIT V	5. COLOR MODELS AND COMPUTER
	   ANIMATION
	5.1 Color Models
	    5.1.1Properties of Light
	    5.1.2 Standard Primaries and the Chromaticity
	         diagram
	    5.1.3 Intuitive Color Concepts
	    5.1.4RGB Color Model
	    5.1.5YIQ Color Model
	    5.1.6CMY Color Model
	    5.1.7HSV Color Model
	5.2 Computer Animation
	    5.2.1 Design of Animation Sequences
	        5.2.1.1 Storyboard Layout
	        5.2.1.2 Object Definitions
	        5.2.1.3 Key-frame specifications
	        5.2.1.4 Generation of in-between frames
	     5.2.2 Brief description of Computer Animation
	           Languages
	        5.2.2.1 Key - frame Systems
	        5.2.2.2 Parameterized Systems
	        5.2.2.3 Scripting Systems
		15	9	CO1

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks

I	**1.INTRODUCTION TO COMPUTER GRAPHICS SYSTEMS AND APPLICATIONS** 1.1 Overview of Graphics Systems 1.2 Computer Graphics Applications	9	15

II	**2.OUTPUT PRIMITIVES AND THEIR ATTRIBUTES**
	    2.1 Output Primitives
	    2.2 Attributes of Output Primitives
		10	15

III	**3.FILLED AREA PRIMITIVES AND TWO**
	    DIMENSIONAL GEOMETRIC TRANSFORMATIONS
	    3.1 Filled Area Primitive
	    3.2 Two-Dimensional Geometric Transformations
		10	15

IV	**4.TWO DIMENSIONAL VIEWING AND THREE**
	    DIMENSIONAL CONCEPTS
	    4.1 Two Dimensional Viewing
	    4.2 Three Dimensional Concepts
		10	15

V	**5.COLOR MODELS AND COMPUTER ANIMATION**
	    5.1 Color Model
	    5.2 Computer Animation
		9	15

	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of Video Display Devices
2.	Implementation of DDA Line Drawing Algorithm.
3.	Implementation of Midpoint Circle Algorithm.
4.	Implementation of Midpoint Ellipse Algorithm.
5.	Implementation of Flood Fill Algorithm.
6.	Implementation of Basic 2D transformation: Translation
7.	Implementation of Basic 2D transformation: Rotation
8.	Implementation of Basic 2D transformation: Scaling
9.	Implementation of Point Clipping Algorithm.
10.	Implementation of Line Clipping Algorithm.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Donald Hearn and M. P. Baker	Computer Graphics	PHI
2	James D. Foley	Computer Graphics: Principals and Practice	Pearson Education
3	N. Krishnamurthy	Introduction to Computer Graphics	McGraw Hill

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Steven Harrington	Computer Graphics	McGraw Hill
2	Samit Bhattacharya	Computer Graphics	Oxford Publication

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/computer_graphics/
2	http://www.darshan.ac.in/Upload/DIET/Documents/2160703_CG_Study_Material_01022019_011300PM.pdf

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.nptelvideos.com/computer_graphics/

(CM612) CYBER LAW & COMPUTER FORENSICS

1. COURSE OBJECTIVES: In this course the student will learn various aspects of IT Act 2000, Computer forensics fundamentals and perform investigation at cybercrime site.

2. PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	VI					Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
CM612 Cyber law & computer Forensics		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4.COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM612.CO1: Describe the various aspects of IT Act, Cybercrimes and Forensic process.

CM612.CO2: Identify various provisions of the IT Act in the context of Cybercrimes. CM612.CO3: Use various provisions of IT act for protecting cyber consumers.

CM612.CO4: Examine a simple forensic lab for investigations and evidence collection.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM612.CO1	2	2	1	2	2	2	3
CM612.CO2	2	2	1	2	2	2	2
CM612.CO3	2	2	1	2	2	2	2
CM612.CO4	2	2	1	2	2	2	3

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM612.CO1	1	2
CM612.CO2	1	2
CM612.CO3	1	2
CM612.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO
UNIT I	**1. INTRODUCTION TO IT ACT 2000** 1.1 Power of arrest without warrant under the IT Act, 2000: A Critique 1.1.1 Crimes of this millennium 1.1.2 Section 80 of the IT Act, 2000-A Weapon or a Farce? 1.1.3 Necessity of Arrest without warrant from any place, public or otherwise 1.1.4 Arrest, but no punishment 1.2 Cyber Crime & Criminal justice: Penalties, Adjudication & Appeals under the IT act, 2000 1.2.1 Concept of Cyber Crime & IT Act 2000 1.2.2 Hacking (Concept and Section) 1.2.3 Teenage Web vandals 1.2.4 Cyber Fraud and Cyber Cheating 1.2.5 Virus on the Internet 1.2.6 Defamation, Harassment and Email Abuse 1.3 Jurisdiction in the Cyber World 1.3.1 Civil law of jurisdiction in India 1.3.2 Cause of Action 1.3.3 Jurisdiction and the Information Technology Act, 2000		15	10	CO1, CO2, CO3, CO4
UNIT II	**2. COPYRIGHT PROTECTON IN CYBER WORLD AND THE INDIAN EVIDENCE ACT V. IT ACT 2000** 2.1 Copyright Protection in the Cyber world 2.1.1 Works in which Copyright subsists and meaning of Copyrights 2.1.2 Copyright Ownership and Assignments 2.1.3 License of Copyrights 2.1.4 Copyright protection of content on Internet: Copyright notice, Disclaimer and Acknowledgement		15	9	CO1, CO2, CO3, CO4

	2.1.5 Computer Software Piracy			
	2.2 Protection of Cyber Consumers in India			
	2.2.1 Introduction			
	2.2.2 Are Cyber Consumers covered under the Consumer protection Act?			
	2.2.3 Goods and Services			
	2.2.4 Consumer Complaints			
	2.2.5 Defects in goods and Deficiency in Services			
	2.2.6 Restrictive and Unfair trade practices			
	2.2.7 Instances of Unfair trade Activities			
	2.2.8 Reliefs under CPA			
	2.2.9 Beware Consumers			

UNIT III	**3. INTRODUCTION TO COMPUTER FORENSIC**
	3.1 The Forensic Process
	  3.1.1 Types of Investigations
	  3.1.2 The Role of Investigator
	  3.1.3 Elements of Good Process
	  3.1.4 Defining a Process
	  3.1.5 After the investigation
	3.2 Forensic Lab Environment Preparation
	  3.2.1 The Ultimate Computer Forensics Lab: What Is a Computer Forensic Laboratory, Forensic Lab Security, Protecting Forensic Lab
	  3.2.2 Forensic Hardware and Software Tools: Using Hardware Tools, Using Software Tools
	  3.2.3 The FLYAWAY kit
	  3.2.4 Case Management: Poor Case Management, Misplacing Evidence, Improper Evidence destruction
		15	10	CO1, CO2, CO3, CO4

UNIT IV	**4. INTRODUCTION TO EVIDENCE COLLECTION AND CONSUMER FRAUD**
	4.1 Forensically Sound Evidence Collection
	  4.1.1 Collecting Evidence from a single system: Power down the suspect system, Remove the Drive(s) from the suspected system, check for other media, Record BIOS information, forensically image the drive, Record Cryptography Hashes, Bag and Tag
	4.2 Documenting the Investigation
	  4.2.1 Internal report
	  4.2.2 Declaration
	  4.2.3 Affidavit
		15	10	CO1, CO2, CO3, CO4

	4.2.4 Expert report
	4.3 Consumer Fraud
	    4.3.1 What is Consumer Fraud?
	    4.3.2 Types of Consumer Fraud: Identity Theft,
	         Detecting Spam Attacks, Phishing Websites,
	         Identity Theft Malware, Theft of Personal
	         Records by an Insider, Investment Fraud			

UNIT V	**5. ETHICAL HACKING**
	5.1 Concept of Ethical Hacking
	    5.1.1 Hacking
	    5.1.2 Hacker
	    5.1.3 Hacker v/s Cracker
	    5.1.4 Types of Hackers: Coders, Admins, Script
	         Kiddies, White Hat Hacker, Black Hat Hacker,
	         Grey Hat Hacker
	    5.1.5 Ethical Hacking
	    5.1.6 Hacktivists
	    5.1.7 Cyber Terrorist
	    5.1.8 Why Hackers Hack?
	    5.1.9 Prevention from Hackers
	    5.1.10 Steps Performed by Hackers: Reconnaissance,
	         Scanning, Gaining Access, Maintaining
	         Access, Clearing Tracks
	    5.1.11 Working of Ethical Hacker: Obeying the
	         Ethical Hacking Commandments, working
	         ethically, Respecting privacy, Not crashing
	         your systems, Executing the plan
	5.2 Concepts of Email Hacking
	    5.2.1 Email Security
	    5.2.2 Email Spoofing
	    5.2.3 Methods to send fake emails: Open Relay
	         Server, Web Scripts
	    5.2.4 Consequences of fake email
	    5.2.5 Proving a fake email
	    5.2.6 Email Bombing
	    5.2.7 Email Spamming
	    5.2.8 Email password hacking
		15	9	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO IT ACT 2000** 1.1 Power of arrest without warrant under the IT Act, 2000: A Critique 1.2 Cyber Crime & Criminal justice: Penalties, Adjudication & Appeals under the IT act, 2000 1.3 Jurisdiction in the Cyber World	10	15
2	**2. COPYRIGHT PROTECTON IN CYBER WORLD AND THE INDIAN EVIDENCE ACT V. IT ACT 2000** 2.1 Copyright Protection in the Cyber world 2.2 Protection of Cyber Consumers in India	9	15
3	**3. INTRODUCTION TO COMPUTER FORENSIC** 3.1 The Forensic Process 3.2 Forensic Lab Environment Preparation	10	15
4	**4. INTRODUCTION TO EVIDENCE COLLECTION AND CONSUMER FRAUD** 4.1 Forensically Sound Evidence Collection 4.2 Documenting the Investigation 4.3 Consumer Fraud	10	15
5	**5. ETHICAL HACKING** 5.1 Concept of Ethical Hacking 5.2 Concepts of Email Hacking	9	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Study and analysis of Cyber Laws in India and its effectiveness
2.	Study of Email fraud and Internet Virus
3.	Case Study on Copyright issues in Cyberspace
4.	Case study on Online Sale of Goods and Consumer Protection
5.	Study and analysis of Computer frauds and Abuse
6.	Study on Software piracy
7.	Study of Forensic Hardware and software Tools
8.	Tracing E–mail – Finding senders IP Address of received e – mail, tracing route of e – mail received using tools available on internet e.g. Visual Trace Route.

9.	Study of Encase forensic Software
10.	Study of Tools for Ethical Hacking
11.	Study of email hacking, wireless hacking and mobile hacking
12.	Study of various reporting techniques after the investigation.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Vivek Sood	Cyber Law Simplified	Tata McGraw-Hill
2	Chris Davis,David Cowen & Aaron Philipp	Hacking Exposed^{TM} Computer Forensics Secrets & Solutions	Tata McGraw-Hill
3	Manthan Desai	Basics of Ethical Hacking	Manthan Desai

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Jonathan Rosenoer	CyberLaw: The Law of the Internet	Springer
2	Marie-Helen Maras	Computer Forensics	Jones & Bartlett
3	Ankit Fadia	An Unofficial Guide to Ethical Hacking	Macmillan

Internet and Web Resources

S. No.	Description
1	http://www.cyberlawsindia.net/
2	https://www.tutorialspoint.com/information_security_cyber_law/
3	https://www.hackingarticles.in/best-of-computer-forensics-tutorials
4	https://www.tutorialspoint.com/ethical_hacking

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=TAz-E06SdBk
2	https://www.youtube.com/watch?v=2gcX9EzTBJc
3	https://www.youtube.com/watch?v=i8oPtGFPtBU
4	https://www.youtube.com/watch?v=2VSNn7UIXn8

(CM613) INTERNET OF THINGS

1. **COURSE OBJECTIVES:** In this course the students will learn the uses and applications of IoTand implement simple IoT models.

2. **PRE-REQUISITES:** Knowledge of Digital Electronics, Microprocessor and assembly language programming

3. **TEACHING AND EXAMINATION SCHEME**

Semester	VI								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				**Total Marks**
						Theory Marks		**Practical Marks**		
CM613		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Internet of Things		3	-	2	5	75	25	25	25	150

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM613.CO1 Explain the basics of IoT.

CM613.CO2 Apply the concept of IoT to different domains.CM613.CO3 Examine IoT enabled solutions.

CM613.CO4 Develop simple IoT systems using Arduino and Raspberry Pi.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM613.CO1	2	2	2	2	2	2	3
CM613.CO2	3	3	3	3	2	2	3
CM613.CO3	2	3	3	3	2	2	3
CM613.CO4	3	3	3	3	2	2	3

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM613.CO1	2	2
CM613.CO2	3	2
CM613.CO3	3	2
CM613.CO4	3	2

7.DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO
UNIT I	**1 INTRODUCTION TO INTERNET OF THINGS** 1.1 Introduction 1.2 Characteristics of IoT: Interconnectivity, Things related services, Heterogeneity, Dynamic changes, Enormous scale, Safety, Connectivity, Naming and Addressing 1.3 Applications of IoT: Smart Home, Wearables, Smart Cars, Smart Industry, Smart Cities, Smart Agriculture, Smart Retail, Energy Management, Smart Healthcare, Smart Poultry and Farming, Smart Dust 1.4 IoT Categories: Industrial IoT, Consumer IoT 1.5 Challenges for IoT: Security, Privacy, Scalability, Bandwidth Management, Interoperability, Data Storage, Data Analytics, Standards, Regulation 1.6 IoT Protocols: 802.3 Ethernet, 802.11-WiFi, 2G/3G/4G-Mobile Communication, CoAP, MQTT, XMPP 1.7 IoT Functional Blocks: Device, Communication, Services, Management, Security, Application 1.8 IoT Communication Models: Request-Response, Publish-Subscribe, Push-Pull, Exclusive Pair	15	10	CO1, CO2, CO3, CO4
UNIT II	**2　INTERNET OF THINGS AND M2M** 2.1　Introduction to M2M 2.2　M2M Ecosystem 2.3 M2M Service Platform: M2M Device Platform, M2M User Platform, M2M Application Platform, M2M Access Platform 2.4 M2M Applications: Manufacturing, Home Appliances, Healthcare Device Management, Smart Utility Management, Traffic Control 2.5 IoT Ecosystem	15	9	CO1, CO2, CO3, CO4

	2.6 Enabling Technologies in IoT: Sensors, Edge Devices, Embedded Systems, Communications, Wireless Sensor Networks, Cloud Computing 2.7 Difference between IoT and M2M: Communication Protocols, Machines in M2M and Things in IoT, Hardware vs Software emphasis, Data Collection & Analysis, Applications 2.8 IoT Levels: IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6			

UNIT III	**3. SENSORS, ACTUATORS AND WIRELESS SENSOR NETWORKS**
	3.1 Introduction to Sensors
	   3.1.1 Workflow of a sensor in a typical system
	   3.1.2 Classification of sensors: Analog Sensors, Digital Sensors
	   3.1.3 Pros and Cons of Analog Sensors
	   3.1.4 Pros and Cons of Digital Sensors
	   3.1.5 Types of sensors: Thermal Sensors, Mechanical Sensors, Electrical Sensors, Chemical Sensors, Optical Light Sensors, Acoustic Sensors, Motion Sensors, Biological Sensors
	3.2 Introduction to Actuators
	   3.2.1 Workflow of an actuator in a system
	   3.2.2 Classification of actuators: Thermal Actuators, Electric Actuators, Mechanical Actuators
	3.3 Introduction to Wireless Sensor Networks (WSN)
	   3.3.1 Architecture of WSN: Application Layer, Transport Layer, Network Layer, Data Link Layer, Physical Layer
	   3.3.2 Network topologies in WSN: Peer-to-Peer networks, Star networks, Tree networks, Mesh networks
	   3.3.3 Issues and challenges in WSN: Fault Tolerance, Life Time, Scalability, Data Aggregation, Cost, Environment, Heterogeneity Support, Autonomous Operations
	   3.3.4 Security in WSN: Confidentiality, Integrity, Availability
		15	10	CO1, CO2, CO3, CO4

UNIT IV	**4. DEVELOPING INTERNET OF THINGS**	15	10	CO1,
	4.1 IoT Connectivity technologies			CO2,
	4.1.1 IEEE 802.15.4			CO3,
	4.1.2 ZigBee			CO4
	4.1.3 RFID			
	4.1.4 NFC			
	4.2 IoT Design Methodology			
	4.2.1 Purpose and Requirements Specification			
	4.2.2 Process Specification			
	4.2.3 Domain Model Specification			
	4.2.4 Information Model Specification			
	4.2.5 Service Specifications			
	4.2.6 IoT Level Specification			
	4.2.7 Functional View Specification			
	4.2.8 Operational View Specification			
	4.2.9 Device & Component Integration			
	4.2.10 Application Development			
	4.3 IoT Implementation with Raspberry Pi			
	4.3.1 Raspberry Pi Architecture			
	4.3.2 Raspberry Pi PIN Configuration			
	4.3.3 Case Study: Blinking LED using Raspberry Pi, DHT Sensor with Raspberry Pi			
	4.4 IoT Implementation with Arduino			
	4.4.1 Features of Arduino			
	4.4.2 Components of Arduino Board			
	4.4.3 Arduino IDE			
	4.4.4 Case Study: Traffic Control System using Arduino, DHT Sensor with Arduino			
UNIT V	**5. DOMAIN SPECIFIC IoTs**	15	9	CO1,
	5.1 Smart Homes			CO2,
	5.1.1 Examples of Smart Home Technologies			CO3,
	5.1.2 Introduction to Home Area Networks (HANs): HAN Elements, HAN Standards – Universal Plug and Play, Konnex, HAN Architectures - DomoNet, Jini, HAN Initiatives			CO4
	5.1.3 Smart Home Benefits and Issues			
	5.2 Smart Grids			
	5.2.1 Characteristics of Smart Grid			
	5.2.2 Benefits of Smart Grid			
	5.2.3 Smart Grid Architecture			
	5.3 Smart Cities			
	5.3.1 Characteristics of Smart Cities			

	5.3.2 Smart City Frameworks: Technology Framework, Human Framework, Institutional Framework, Energy Framework
	5.4 Industrial IoT (IIoT)
	  5.4.1 IIoT Requirements
	  5.4.2 Applications of IIoT
	  5.4.3 Benefits of IIoT			

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. INTRODUCTION TO INTERNET OF THINGS** 1.1 Introduction 1.2 Characteristics of IoT 1.3 Applications of IoT 1.4 IoT Categories: Industrial IoT, Consumer IoT 1.5 Challenges for IoT 1.6 IoT Protocols 1.7 IoT Functional Blocks 1.8 IoT Communication Models	10	15
II	**2. INTERNET OF THINGS AND M2M** 2.1 Introduction to M2M 2.2 M2M Ecosystem 2.3 M2M Service Platform 2.4 M2M Applications 2.5 Difference between IoT and M2M 2.6 IoT Levels	10	15
III	**3. SENSORS, ACTUATORS AND WIRELESS SENSOR NETWORKS** 3.1 Introduction to Sensors 3.2 Introduction to Actuators 3.3 Introduction to Wireless Sensor Networks (WSN)	10	15
IV	**4. DEVELOPING INTERNET OF THINGS** 4.1 IoT Connectivity technologies 4.2 IoT Design Methodology 4.3 IoT Implementation with Raspberry 4.4 IoT Implementation with Arduino UNO	10	15

V	**5. DOMAIN SPECIFIC IoTs** 5.1 Smart Homes 5.2 Smart Grids 5.3 Smart Cities 5.4 Industrial IoT	8	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Familiarization with Arduino and perform necessary software installation.
2.	Familiarization with Raspberry Pi and perform necessary software installation.
3.	To interface LED with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds.
4.	To interface LED with Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
5.	To interface DHT11 sensor with Arduino and write a program to print temperature and humidity readings.
6.	To interface DHT11 sensor with Raspberry Pi and write a program to print temperature and humidity readings.
7.	To interface Servo Motor with Arduino
8.	To interface Servo Motor with Raspberry Pi
9.	Remote Data Logging using Arduino
10.	Remote Data Logging using Raspberry Pi

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	ArshdeepBahga and Vijay Madisetti	Internet of Things	Universities Press (India)
2	Jeeva Jose	Internet of Things	Khanna Publishing House
3	Srinivasa K.G., Siddesh G.M., Hanumantha Raju R.	Internet of Things	Cengage Learning

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Adrian McEwen, Hakim Cassimally	Designing the Internet of Things	Wiley Publications
2	Imad Saleh, Mehdi Ammi, Samuel Szoniecky	Challenges of the Internet of Things: Technique, Use, Ethics	Wiley Publications

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/internet_of_things/
2	https://pythonprogramming.net/introduction-raspberry-pi-tutorials/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=Q3ur8wzzhBU (IOT)
2	https://www.youtube.com/watch?v=QSIPNhOiMoE (IOT)
3	https://www.youtube.com/watch?v=3DH_SryMwzs (Python and Raspberry Pi)

(CM614) E-GOVERNANCE

1.COURSE OBJECTIVE: In this course the students will learn the concepts of e-Governance and understand how technologies and business models shape the contours of government for improvingcitizen services and bringing in transparency.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
CM614		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
E-Governance		**3**	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3.COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM614.CO1: Familiarize with the concepts of e-governance.

CM614.CO2: Examine e-governance models and infrastructure developments.CM614.CO3: Prepare e-government proposals, plans and strategies.

CM614.CO4: Evaluate Government e-services.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM614.CO1	2	2	1	1	3	2	2
CM614.CO2	2	2	1	1	3	2	2
CM614.CO3	2	2	3	2	3	2	2
CM614.CO4	2	2	3	2	3	2	2

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
CM614.CO1	2	2
CM614.CO2	2	2
CM614.CO3	3	2
CM614.CO4	3	2

5.   DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr=Teaching hours	CO = Course Outcomes			
UNIT			M	Thr	CO

UNIT I	1. INTRODUCTION TO E-GOVERNANCE	15	10	CO1, CO2, CO3, CO4

	1.1 Meaning of Governance
	1.2 Definition of E-governance
	1.3 E-Governance and E-Government
	1.4 Objectives of E-governance
	    1.4.1 To Build an Informed Society
	    1.4.2 To Increase Interaction between Government and Citizens
	    1.4.3 To Encourage Citizen Participation
	    1.4.4 To Bring Transparency in the Governing Process
	    1.4.5 To Make the Government Accountable
	    1.4.6 To Reduce the Cost of Governance
	    1.4.7 To Reduce the Reaction Time of the Government
	1.5 SMART Government: Simple, Moral, Accountable, Responsive and Transparent
	1.6 Benefits /Advantages of E-governance
	1.7 Disadvantages of E-governance
	1.8 Stakeholders/Models of E-governance
	    1.8.1 G2G (Government to Government)
	    1.8.2 G2C (Government to Citizen)
	    1.8.3 G2B (Government to Business)
	    1.8.4 G2E (Government to Employees)
	1.9 Stages of development of E-Government (E-Governance Maturity Model/Gartner E-Governance Maturity Model)
	    1.9.1 Information
	    1.9.2 Interaction
	    1.9.3 Transaction
	    1.9.4 Integration / Transformation
	1.10 Rise of E-Governance			

	1.11 Status of E-Governance Around the World			

UNIT II	**2. E-GOVERNANCE IN INDIA**
	2.1 E-Governance Development in India / Evolution of e-Governance in India
	2.2 Structure of E-Governance in India
	2.3 National E-Governance Plan Framework
	   2.3.1 Initiatives
	      2.3.1.1 National E-Governance Plan (NEGP): Introduction, Emergence, Vision, Key stakeholders
	      2.3.1.2 Implementation Strategy, Approach and Methodology of NeGP
	   2.3.2 National E-Governance Division
	   2.3.3 Services
	   2.3.4 Projects
	      2.3.4.1 Mission Mode Projects
	   2.3.5 Capacity-Building Scheme
	   2.3.6 Awareness and Communication
	   2.3.7 Standards, Policies and Frameworks
	   2.3.8 Impact and Outcomes
	2.4 E-Governance Infrastructure
	   2.4.1 NeGP Infrastructure Plan
	   2.4.2 Other Initiatives under NeGP
	   2.4.3 E-Governance under Digital India
		15	10	CO1, CO2, CO3, CO4

UNIT III	**3. E-GOVERNANCE INITIATIVES IN STATES AND M-GOVERNANCE**
	3.1 Introduction
	   3.1.1 Agriculture
	   3.1.2 Commerce and Industry
	   3.1.3 Tourism
	   3.1.4 Consumer Affairs, Food and Public Distribution
	   3.1.5 Railways
	   3.1.6 Labor
	   3.1.7 Health and Family Welfare
	
	3.2 E-Governance Initiatives in Goa
	   3.2.1 Goa online project: Introduction, vision, objectives
	   3.2.2 G2C, G2G and G2E services offered in Goa (Objectives and features)
	   3.2.3 G2C services - Case Studies: Land records (Dharani), Municipal services, Infogram software for village panchayats, RTO (Vahan, sarathi & RTO services)
	   3.2.4 G2G services - Case Studies: Computerizing the Finance Department and Directorate of Accounts (DOA) (Accounts online)
		15	10	CO1, CO2, CO3, CO4

	3.2.5 G2E services- Case Studies: General Provident Fund, Employee advances
	3.2.6 Initiatives towards integrated services: Goanet to Goa Broadband Network, MahithiGhars and Citizen Service Centres, State data centre
	
	3.3 M-governance
	   3.3.1 Need of M-governance
	   3.3.2 Mobile Services Delivery Gateway (MSDG)
	   3.3.3 Government initiatives for M-governance
	   3.3.4 Mobile Seva
	   3.3.5 Advantages of M-governance
	   3.3.6 Disadvantages of M-governance			

UNIT IV	**4. GOVERNMENT PROCESS RE-ENGINEERING (GPR) & E-GOVERNANCE PROJECT DEVELOPMENT LIFECYCLE**
	  4.1 Government Process Re-engineering (GPR)
	    4.1.1 E-Governance and Traditional Approach to e-Governance
	    4.1.2 Re-engineering defined
	    4.1.3 Steps involved in GPR (6: Steps)
	
	  4.2 Challenges in current environment (e-Governance Projects)
	    4.2.1 Key factors contributing to current environment
	    4.2.2 Need for a more robust approach for e-Governance
	    4.2.3 Essential elements of E-Governance project
	  4.3 e-Governance Project Lifecycle
	    4.3.1 Phase 1: E-Governance Strategy Development
	    4.3.2 Phase 2: Current State Assessment
	    4.3.3 Phase 3: Define Future State (To-be definition)
	    4.3.4 Phase 4: Implementation approach and sourcing
	    4.3.5 Phase 5: Develop and Implement IT System
	    4.3.6 Phase 6: Operate and Sustain Key Activities
	  4.4 eGLC vs Software Development Lifecycle (SDLC)
		15	8	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5. CHANGING TECHNOLOGICAL TRENDS FOR E-GOVERNANCE**
	
	  5.1 E-Governance Technology Trends
	    5.1.1 Ubiquitous Computing
	    5.1.2 Free and Open Source Software (FOSS)
	    5.1.3 Lean Six Sigma
	    5.1.4 Integrated Single-Window System
	    5.1.5 Blockchain Technology
	  5.2 E-Governance Plan for near Future
	    5.2.1 From Assisted Services to Mobile and Digitally Assisted Services
		15	10	CO1,
				CO2,
				CO3,
				CO4

	5.2.2 From Solutions for Departments/Ministries to Solutions for Citizens/Businesses			
	5.2.3 From Management-Driven Policy to Inclusive Decision Making			
	5.2.4 From Large and Stand-Alone Systems to Smart and Integrated Systems			
	5.2.5 From Individual Initiatives to Institutional Initiatives			
	5.2.6 From Multiple Download of Information to Need Fulfillment of G2C Services Online			
	5.2.7 Outsourcing and Deferred Payment to Shared Services and PPP			
	5.3 Pillars of Digital India Leading to E-Governance vision			
	5.3.1 Vision			
	5.3.2 Nine Pillars of Digital India			
	5.3.3 Some of the initiatives: Direct Benefit Transfer (DBT), JAM Trinity, Smart Cities, National Optical Fibre Network (NOFN), Wi-Fi Hotspots, Skill India Initiative, E-Hospital, E-Sign Framework, Digital Chip Maker, E-Kranti, Cloud Computing, Service Enablement Support for 2G, 3G and 4G, Machine to Machine (M2M), Social Media			
	5.4 Security Concerns			
	5.4.1 Challenges of e-government security			
	5.4.2 Sources of threat to e-government: Internal sources, external sources			
	5.4.3 Types of threats			
	5.4.4 Security management model: User Environment, Transport Environment, ICT Assets Environment			
	5.4.5 Security management tools for User management Passwords, Digital identity tokens, Access control Lists (ACL), PKI, Biometrics, e-government gateway			
	5.4.6 Security Management tools for Transport environment: Government secure intranet, Virtual private networks, Government Secure Internet (GSI), Encryption			
	5.4.7 Security Management tools for ICT assets environment: Firewalls, Intrusion detection systems, anti-virus systems, disaster recovery site			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7.   SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. INTRODUCTION TO E-GOVERNANCE** 1.1 Meaning of Governance 1.2 Definition of E-governance 1.3 E-Governance and E-Government 1.4 Objectives of E-governance 1.5 SMART Government: Simple, Moral, Accountable, Responsive and Transparent 1.6 Benefits /Advantages of E-governance 1.7 Disadvantages of E-governance 1.8 Stakeholders/Models of E-governance 1.9 Stages of development of E-Government (E-Governance Maturity Model/Gartner E-Governance Maturity Model) 1.10 Rise of E-Governance 1.11 Status of E-Governance Around the World	10	15
II	**2.E-GOVERNANCE IN INDIA** 2.1 E-Governance Development in India / Evolution of E-Governance in India 2.2 Structure of E-Governance in India 2.3 National E-Governance Plan Framework 2.4 E-Governance Infrastructure	10	15
III	**3. E-GOVERNANCE INITIATIVES IN STATES AND M-GOVERNANCE** 3.1 Introduction 3.2 E-Governance Initiatives in Goa 3.3 M-governance	10	15
IV	**4. GOVERNMENT PROCESS RE-ENGINEERING (GPR) & E-GOVERNANCE PROJECT DEVELOPMENT LIFECYCLE** 4.1 Government Process Re-engineering (GPR) 4.2 Challenges in current environment (e-Governance Projects) 4.3 e-Governance Project Lifecycle 4.4 eGLC vs Software Development Lifecycle (SDLC)	08	15
V	**5. CHANGING TECHNOLOGICAL TRENDS FOR E-GOVERNANCE** 5.1 E-Governance Technology Trends 5.2 E-Governance Plan for near Future 5.3 Pillars of Digital India Leading to E-Governance vision 5.4 Security Concerns	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

S. No	Practical
1	Identify and study the G2G, G2B, G2E and G2C E-governance application.
2	Study of On-line Water bill payment system of PWD, Goa state.
3	Study of E-Learning applications. (Online experiments in a virtual laboratory of a college, Online tutorials for physics)
4	Create a bid document - Tender schedule or Request for Proposal (RFP)
5	Visit to a (eSeva) citizen service centre and find out the E-services available. Note down the shortcomings and limitations of eSeva.
6	Smart Government - towards a paperless office. Design a proposal for a paperless office for: administration of your college or a clinic / hospital/ doctor etc.
7	E-procurement system- a case study.
8	Identify a service that can be converted into an E-governance service and prepare a detailed report.
9	Study of security management tools.
10	Study of M- Governance initiatives.

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Sunil K. Muttoo, Rajan Gupta, Saibal K. Pal	E-Governance in India: The Progress Status (Unit 1, 2, 5)	Palgrave Macmillan
2	J Satyanarayana	e-Government -The Science of the Possible (Unit 1, 5)	Prentice Hall, India
3	http://www.nisg.org/	e-Governance Project Lifecycle Reading Supplement Handbook (Unit 4)	National Institute for Smart Government

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	J Satyanarayana	Managing Transformation – Objectives to Outcomes	Prentice Hall India

Internet and Web Resources

S. No.	Description
1	https://informatics.nic.in/uploads/pdfs/c6f44b83_Goa.pdf (Unit 3)
2	https://egov.eletsonline.com/2007/02/e-governance-a-rising-wave-in-goa/ (Unit 3)
3	http://www.csi-sigegov.org/publications.php
4	https://negd.gov.in
5	https://www.nisg.org/case-studies-on-e-governance-in-india

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=tQ0aZzATFsM
2	https://www.youtube.com/watch?v=LNYQQuUsvEE
3	https://www.youtube.com/watch?v=LNrLmKtl3QY
4	https://www.youtube.com/watch?v=u7iqhAItBBw

ELECTIVE III

Elective–III	
CM615	Mobile Application development
CM616	Principles of Multimedia
CM617	Data Science
CM618	Python Programming

(CM615) MOBILE APPLICATION DEVELOPMENT

1. COURSE OBJECTIVES: In this course the students will learn various mobile devices, platforms, mobile operating systems, mobile application development tools and technologies.

2. PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	VI					Examination Scheme				
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Theory Marks**		**Practical Marks**		**Total Marks**
		L	T	P	H	TH	TM	TW	PR/OR	
CM615 Mobile App. Dev.		3	-	2	5	75	25	25	25	150

4. COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM615.CO1: Use mobile application development technologies.

CM615.CO2: Compare mobile devices with respect to operating system and architecture.CM615.CO3: Design simple responsive webpages for mobile device.

CM615.CO4: Develop simple android based native Application.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CM615.CO1	2	2	1	1	1	2	2
CM615.CO2	2	3	2	2	2	2	2
CM615.CO3	3	3	2	3	2	2	2
CM615.CO4	3	3	2	3	2	3	3

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM615.CO1	1	2
CM615.CO2	2	2
CM615.CO3	3	2
CM615.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
UNIT			**M**	**Thr**	**CO**
UNIT I	**1. THE MOBILE ECOSYSTEM** 1.1 What is a Mobile Device 1.1.1 Portable 1.1.2 Personal 1.1.3 Companion 1.1.4 Easy Usage 1.1.5 Connected device 1.2 Mobile Device Categories 1.2.1 Mobile Phones 1.2.2 Low-end mobile devices 1.2.3 Mid-end mobile devices 1.2.4 High-end mobile devices 1.2.5 Smart phones 1.2.6 Tablets, net books and Notebooks 1.3 Mobile Knowledge 1.3.1 Display 1.3.2 Resolution 1.3.3 Physical Dimension 1.3.4 Aspect ratio 1.3.5 Input Methods 1.3.6 Other features 1.4 Mobile Operating Systems 1.4.1 Operating Systems (no diagrams) 1.4.1.1 Android OS 1.4.1.2 Windows OS 1.4.1.3 iOS 1.4.1.4 Blackberry OS 1.4.1.5 Symbian OS 1.4.1.6 Tizen OS 1.4.1.7 Comparison of Mobile Operating Systems	15	9	CO1, CO2, CO3, CO4

UNIT II	**2. MOBILE BROWSING ARCHITECTURE AND DESIGN**	15	9	CO1, CO2, CO3, CO4
	2.1 Mobile Browsing			
	2.1.1 What Is the Mobile Web?			
	2.1.2 Differences between Mobile Web and desktop web			
	2.1.3 Brief of WAP 1-Wireless Application Protocol			
	2.1.4 Browsing types			
	2.1.4.1 Focus navigation			
	2.1.4.2 Cursor navigation			
	2.1.4.3 Touch navigation			
	2.1.4.4 Multi touch navigation			
	2.1.5 Zoom Experience			
	2.1.2.1 Basic Zoom			
	2.1.2.2 Smart zoom			
	2.1.6 Reflow Engine			
	2.1.7 Direct Versus Cloud-Based Browsers			
	2.1.8 Multipage experience			
	2.2 Architecture & Design			
	2.2.1 Website Architecture			
	2.2.1.1 Navigation			
	2.2.1.2 Context			
	2.2.1.3 Progressive enhancement			
	2.2.1.4 Different version approach			
	2.2.1.5 Design and usability			
	2.2.1.6 Touch Design patterns			
	2.2.1.6.1 Panorama UI			
	2.3 Brief of Official UI Guidelines			
UNIT III	**3. MOBILE APPLICATION DEVELOPMENT TECHNOLOGIES**	15	12	CO1, CO2, CO3, CO4
	3.1 Setting up your Environment			
	3.1.1 Working with Code			
	3.1.2 Emulators and Simulators			
	3.1.3 Brief description of Android Emulator			
	3.1.4 Brief description of I phone Simulator			
	3.2 Building Android Apps with HTML, CSS and JavaScript			
	3.2.1 Web Apps Versus Native Apps			
	3.2.1.1 What is a Web App			
	3.2.1.2 What is a Native App			
	3.2.1.3 Pros and Cons			
	3.2.1.4 Choice of Web or Native Approach			

	3.3 Web Programming for Mobile Application Development(A Quick Recap)
	 3.3.1 HTML, CSS and JavaScript
	   3.3.1.1 What is HTML, CSS and Javascript
	   3.3.1.2 Why use HTML, CSS and Javascript
	   3.3.1.3 How to insert CSS and Javascript in a webpage
	3.4 Introduction to jQuery
	 3.4.1 What is jQuery
	 3.4.2 Why jQuery
	 3.4.3 Adding a jQuery to a webpage
	 3.4.4 jQuery basic syntax
	3.5 Introduction to jQuery Mobile
	 3.5.1 What is jQuery Mobile
	 3.5.2 Why use jQuery Mobile
	 3.5.3 Adding jQuery Mobile to a webpage
	 3.5.4 jQuery Mobile Pages
	3.6 Introduction to Bootstrap
	 3.6.1 What is Bootstrap
	 3.6.2 Why use Bootstrap
	 3.6.3 Where to get Bootstraps
	 3.6.4 What Bootstrap package contains
	3.7 Cross platform Mobile Application Development tools
	 3.7.1 Appcelerator Titanium
	   3.7.1.1 Overview
	   3.7.1.2 Benefits of Appcelerator Titanium
	 3.7.2 PhoneGap
	   3.7.2.1 Overview
	   3.7.2.2 Benefits of PhoneGap
	 3.7.3 Xamarin
	   3.7.3.1 Overview
	   3.7.3.2 Benefits of Xamarin
	3.8 Brief of Introduction to MIT App Inventor			

UNIT IV	**4. INTRODUCTION TO ANDROID** 4.1 Getting Started with Android Programming 4.1.1 What is Android 4.1.2 Android Versions 4.1.3 Features of Android 4.1.4 Architecture of Android (with Diagram) 4.1.5 Android Devices in the Market 4.2 Why Develop for Android? 4.2.1 Market share 4.2.2 Time to market 4.2.3 Open Platform 4.2.4 Cross- Compatibility	15	8	CO1, CO2, CO3, CO4

	4.2.5 Mash up Capability
	4.3 Android Programming Basics
	    4.3.1 Java: Your Android programming language
	    4.3.2 Activities
	    4.3.3 Intents
	    4.3.4 Cursorless Controls
	    4.3.5 Views and widgets
	    4.3.6 Asynchronous calls
	    4.3.7 Background Services
	    4.3.8 Hardware Tools
	        4.3.8.1 Touch Screen
	        4.3.8.2 GPS
	        4.3.8.3 Accelerometer
	        4.3.8.4 SD card
	    4.3.9 Software Tools
	        4.3.9.1 Internet
	        4.3.9.2 Audio and Video Support
	        4.3.9.3 Contacts
	        4.3.9.4 Security
	        4.3.9.5 Google API's			

UNIT V	**5. ANDROID APPLICATION DEVELOPMENT**
	
	  5.1 Android Application Development Tools
	     5.1.1 Android Studio
	         5.1.1.1 Installation Process
	     5.1.2 Android SDK
	     5.1.3 Creating Android Virtual Device
	         5.1.3.1 Steps to create Android Virtual
	             Device (AVD)
	  5.2 Creating an Example Android Application in
	     Android Studio
	     5.2.1 Creating a new Android Project
	     5.2.2 Defining the project and SDK settings
	     5.2.3 Creating an Activity
	     5.2.4 Modifying the Example Application
	     5.2.5 Reviewing the Layout and Resources Files
	     5.2.6 Previewing the Layout
	  5.3 Activities and Intents
	     5.3.1 Life Cycle of an Activity
	         5.3.1.1 Understanding Activities
	         5.3.1.2 Life Cycle of an Activity (with
	            Life Cycle diagram)
	           5.3.1.2.1 onCreate( ) method
	           5.3.1.2.2 onStart( ) method
	           5.3.1.2.3 onResume( )method
	           5.3.1.2.4 onPause( )method
	           5.3.1.2.5 onStop( )method
		15	10	CO1,
				CO2,
				CO3,
				CO4

	5.3.1.2.6 onRestart( )method
	5.3.1.2.7 onDestroy( )method
	5.3.2 Intents
	    5.3.2.1 Linking Activities using Intents
	    5.3.2.2 Returning results from Intent			

	Total	75	48	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. THE MOBILE ECOSYSTEM** 1.1 What is a Mobile Device 1.2 Mobile Device Categories 1.3 Mobile Knowledge 1.4 Mobile Operating Systems	9	15
II	**2. MOBILE BROWSING ARCHITECTURE AND DESIGN** 2.1 Mobile Browsing 2.2 Architecture & Design 2.3 Brief of Official UI Guidelines	9	15
III	**3. MOBILE APPLICATION DEVELOPMENT TECHNOLOGIES** 3.1 Setting up your Environment 3.2 Building Android Apps with HTML, CSS and JavaScript 3.3 Web Programming for Mobile Application Development(A Quick Recap) 3.4 Introduction to jQuery 3.5 Introduction to jQuery Mobile 3.6 Introduction to Bootstrap 3.7 Cross platform Mobile Application Development tools 3.8 Brief of Introduction to MIT App Inventor	12	15
IV	**4. INTRODUCTION TO ANDROID** 4.1 Getting Started with Android Programming 4.2 Why Develop for Android? 4.3 Android Programming Basics	8	15
V	**5. ANDROID APPLICATION DEVELOPMEN** 5.1 Android Application Development Tools 5.2 Creating an Example Android Application in Android Studio 5.3 Activities and Intents	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of history of Mobile Devices
2.	Study of Resolution, Physical Dimensions and Aspect Ratio for Mobile Devices.
3.	Study of various Mobile Brands in the Market.
4.	Study of Panorama User Interface for Mobiles.
5.	Study of Android Emulators and IPhone Simulator.
6.	Implementation of HTML, CSS and JavaScript for Mobile Application Development
7.	Implementation of jQuery Mobile Pages.
8.	Implementing Simple web page using Bootstrap.
9.	Study of PhoneGap, Appcelerator Titanium and Xamarine tools.
10.	Study of Latest versions of Android Operating System.
11.	Study of Android Studio in details.
12.	Create a Hello Android Application using Android Studio.
13.	Implementation of Activities and Intents in Android using Android Studio
14.	Case Study of MIT App Inventor
15.	Study of Google API.

10. LEARNING RESOURCES

Text Books

Sr. No.	Author	Title of Books	Publishers
1	Donn Felker	Android Application Development for Dummies	John Wiley & Sons,
2	Ed Burnette	Hello Android, Introducing Google's Mobile Development Platform, 3rd Edition	Pragmatic Bookshelf
3	Maximiliano Firtman [O'Reilly].	Programming the Mobile Web	O'Reilly Media, Inc
4.	Neil Smyth (Unit 5)	Android studio development essentials-Second Edition	eBookFrenzy
5.	Jonathan Stark with Brian Jespon [O'Reilly].(Unit 3)	Building Android Apps with HTML, CSS and JavaScript-Second Edition	O'Reilly Media, Inc
6.	J.K. DiMarzio (Unit 4 and 5)	Beginning Android Programming with Android Studio	John Wiley & Sons

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Joseph Annuzzi, Jr. Lauren Darcey, Shane Conder	Introduction to Mobile Application Development	Pearson
2	Budi Kurniawan, Daniel Perry	Introduction to Android Application Development	Brainy Software Inc

Internet and Web Resources

S. No.	Description
1	www.w3schools.com
2	http://www.diva-portal.org/smash/get/diva2:626531/fulltext01.pdf
3	http://scienceeq.org/uploaded/editorial/1475902795.pdf

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=ujgL44AEUzs
2	https://www.youtube.com/watch?v=EOfCEhWq8sg

(CM616) PRINCIPLES OF MULTIMEDIA

1.COURSE OBJECTIVES: In this course students will learn the fundamental elements of Multimedia,its technologies and develop small multimedia applications.

2. PRE-REQUISITES: Computer Graphics

3. TEACHING AND EXAMINATION SCHEME

Semester	VI	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
Course code & course title						Theory Marks		Practical Marks		
CM616 Principles of multimedia		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4.COURSE OUTCOMES

CM616.CO1: Discuss multimedia elements and technologies. CM616.CO2: Use audio and video processing software.

CM616.CO3: Implement different animation techniques. CM616.CO4: Create simple multimedia applications.

5.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM616.CO1	1	2	1	1	3	1	2
CM616.CO2	1	2	1	3	3	3	2
CM616.CO3	3	2	1	3	3	3	2
CM616.CO4	3	3	3	3	3	3	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM616.CO1	1	2
CM616.CO2	2	2
CM616.CO3	3	2
CM616.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT	M	Thr	CO
UNIT I	**1.MULTIMEDIA: AN OVERVIEW** 1.1 Introduction 1.2 Multimedia Presentation and production 1.3 Characteristics of Multimedia, Multiple media, non-linearity, interactivity, integrity, digital representation. 1.4 Utilities of Multisensory perception 1.5 Hardware and software requirements, Multimedia playback, Multimedia production 1.6 Uses of Multimedia, Home entertainment, Educational purpose, Industrial training, Info. Kiosks, corporate presentations, business, electronic shopping, communication & networks, medicine, engineering applications – etc 1.7 Promotion of Multimedia based contents, Demand, compression technique, processing power, standards, bandwidth, distribution mechanisms 1.8 Steps for creating a multimedia presentation (8 steps in brief)	15	8	CO1, CO2, CO3, CO4
UNIT II	**2. TEXT AND IMAGE** 2.1 Text 2.1.1 Introduction 2.1.2 Types of text 2.1.3 Architecture of HyperText document 2.1.4 Unicode standards, UCS-4, UTF-32, UTF-16 2.1.5 Font Appearance, size and style 2.1.6 Insertion of Text Using keyboard, copy-paste, using OCR software 2.1.7 Text Compression: Huffman coding, LZ coding 2.1.8 Text File Formats: Text, doc, rtf, pdf, post-script 2.2 Image 2.2.1 Introduction 2.2.2 Types of Image: Hard Copy, Soft-copy, Continuous Tone, Half-tone, Bitone	15	10	CO1, CO2, CO3, CO4

	2.2.3 Seeing Color			
	2.2.4 Color Models: RGB, CMYK, device dependency and Gamut			
	2.2.5 Basic steps for Image Processing			
	2.2.6 Specification of Digital Images, Pixel dimension, Image resolution, file size, color depth			
	2.2.7 Image processing software, Selection tool, Painting and drawing tool, color selection tool, gradient tool, clone tool, transformation tool, retouching tool, text tool, changing image chars, filters, layers, color channel, mask			
	2.2.8 Image – File formats: Bmp, jpeg, gif, tiff, png, pict, tga, psd.			

UNIT III	**3. AUDIO AND VIDEO**
	  3.1 Audio
	    3.1.1 Introduction
	    3.1.2 Acoustics
	    3.1.3 Nature of Sound waves
	    3.1.4 Fundamental Characteristics of sound: Amplitude, Frequency, Waveform, Speed
	    3.1.5 Elements of audio system
	    3.1.6 Audio – File formats: WAV, AIFF, MID, DLS, XMF, MOD, AU, MP3,WMA
	    3.1.7 Audio Processing Software: Playing a file, Playing selected Portions of a file, Accurately Positioning the Playback head, Copying and Pasting Portions of a file, Saving a file, Using Cut, Trim and Undo functions, Magnifying and zooming, Mixing Sounds, Crossfading sounds
	  3.2 Video
	    3.2.1 Introduction
	    3.2.2 Motion video
	    3.2.3 Video recording and storage formats: Betamax, Betacam, Video Cassette Recorder, Camcoder, Video 8, DV, MiniDV, DVCAM
	    3.2.4 Video file formats: AVI, MOV, MPG, RM, WMV, FLV, 3GPP, 3GPP2, MP4
	    3.2.5 Video editing concepts: Online Editing and Offline Edition, SMPTE Time, Code, Non drop Mode, Drop Mode Timebase.
	    3.2.6 Video Processing Software: Timeline Structure, Trimming, Splitting, Transitions, Audio Content, Speed and Opacity, Filters, Superimposing Content.
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	**4. ANIMATION**	15	10	CO1, CO2, CO3, CO4
	4.1 Introduction			
	4.2 Uses of Animation			
	4.3 Traditional Animation: Keyframes and tweening, cel animation, Rotoscoping, stop-motion, flip-book, motion cycling.			
	4.4 Principles of Animation: Squash and Stretch, Anticipation, Staging, Follow through and Overlapping, Slow-in Slow-Out, Arcs, Secondary Action, Timing, Exaggeration, and Appeal.			
	4.5 Computer-based animation, Frame-based Animation, Path-based Animation, Transformations			
	4.6 Animation on the web, Shockwave Format, Client-Pull Animation, Server-Push Animation			
	4.7 Steps involved in creation of 3D Animation			
	4.8 Animation software			
	4.8.1 2D Animation: Shape Tweening, Motion Tweening, Path Animation, Masking, Changing color, and Transparency, Onion Skinning and Buttons.			
	4.8.2 3D Animation: Key Frame based Animation, Path Animation, Particle Systems and Space Wraps.			
UNIT V	**5. MULTIMEDIA DATABASE**	15	10	CO1, CO2, CO3, CO4
	5.1 Introduction			
	5.2 What is multimedia database			
	5.3 Content-based storage and retrieval (CBSR)			
	5.4 Designing a basic multimedia database			
	5.5 Image color features			
	5.6 Image texture features			
	5.7 Image-shape features			
	5.8 Classification of data			

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. MULTIMEDIA: AN OVERVIEW** 1.1 Introduction 1.2 Characteristics of Multimedia 1.3 Uses of Multimedia 1.4 Promotion of Multimedia based contents 1.5 Steps for creating a multimedia presentation	8	15
2	**2. TEXT AND IMAGES** 2.1 Introduction 2.2 Images	10	15
3	**3. AUDIO AND VIDEO** 3.1 Audio 3.2 Video	10	15
4	**4. ANIMATION** 4.1 Introduction 4.2 Uses of Animation 4.3 Traditional Animation 4.4 Principles of Animation 4.5 2D Animation 4.6 3D Animation 4.7 Animation software	10	15
5	**5. MULTIMEDIA DATABASE** 5.1 Introduction 5.2 Content-based storage and retrieval (CBSR) 5.3 Designing a basic multimedia database 5.4 Image color features 5.5 Image texture features 5.6 Image-shape features 5.7 Classification of data	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	To study Flash fundamentals.
2	To study and use Drawing and Painting tools available in Flash.
3	To study handling Images in Flash.
4	To export Audio in flash.
5	To add Video to flash.

6	To learn adding Effects in flash.
7	To develop Animation in flash.
8	A mini-project to create and manage interactive multimedia web applications using Flash technology.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Ranjan Parekh.	Principles of Multimedia	Tata McGraw-Hill
2	Ranjan Parekh (Edition 2)	Principles of Multimedia	Tata McGraw-Hill

Reference Books for further study

Sr. No.	Author	Title of Books	Publishers
1	Prabhat K. Andleigh and KiranThakrar	Multimedia Systems Design	PHI publication
2	John F. Koegal	Multimedia systems	Buford-Pearson Education.
3	Ze-Nian Li and MS Drew	Fundamentals of multimedia	PHI EEE edition
4.	Adobe	ADOBE® FLASH® PROFESSIONAL Help and tutorials (for Practicals)	Adobe

Internet and Web Resources

S. No.	Description
1	https://en.wikibooks.org/wiki/Introduction_to_Computer_Information_Systems/Multimedia
2	https://en.wikipedia.org/wiki/Video_editing

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=uDqjIdI4bF4

(CM617) DATA SCIENCE

1. COURSE OBJECTIVES: In this course students will learn the basics of Data Science, Big Data and its tools.

6. PRE-REQUISITES: Knowledge of Database Management Systems

3. TEACHING AND EXAMINATION SCHEME

Semester	VI	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
Course code & course title						Theory Marks		Practical Marks		
CM617 Data Science		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4. COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM617.CO1: Explain the concepts of Data Science, Data Warehousing, Data Mining, Big Data.

CM617.CO2: Use the concepts of Data Science, Data Warehousing, Data Mining, Big Data.

CM617.CO3: Compare various data management methods and technologies. CM617.CO4: Develop solutions to real life problems using data science.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life-long Learning
CM617.CO1	2	2	3	2	3	3	3
CM617.CO2	2	3	3	2	3	3	3
CM617.CO3	2	2	3	3	3	3	3
CM617.CO4	2	2	3	3	3	3	3

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM617.CO1	2	2
CM617.CO2	3	2
CM617.CO3	3	2
CM617.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT		**M**	**Thr**	**CO**
UNIT I	**1. INTRODUCTION TO DATA SCIENCE** 1.1 What is Data science? 1.2 Why Data Science? 1.3 Types of Data Science Jobs: Data Analyst, Machine Learning Expert, Data Engineer, Data Scientist 1.4 Data Science components: Statistics, Visualization, Machine Learning, Deep Learning. 1.5 Data Science Lifecycle: Discovery, Data preparation, Model Planning, Model-building, Operationalize, Communicate results 1.6 Tools for data science: Data Analysis tools, Data Warehousing, Data Visualization tools, Machine learning tools 1.7 Applications of data science 1.8 Challenges of Data science Technology	15	8	CO1, CO2, CO3, CO4
UNIT II	**2. DATA WAREHOUSING** 2.1 Introduction 2.2 What is Data Warehouse? 2.3 Definition: Subject-Oriented, Non-volatile, Time varying, Integrated 2.4 Multidimensional data model 2.4.1 Data Cube 2.4.2 Dimension Modelling 2.5 OLAP operations: Slicing, Dicing, Drilling, Drill-up, Drill-down, Drill-within, Drill-across, Pivot(rotate) 2.6 Warehouse Schema: Star Schema, Snowflake Schema 2.7 Data warehousing architecture 2.8 Warehouse server: Enterprise warehouse, Data Marts 2.9 OLAP Engine 2.10 Data warehousing backend processes: Data extraction, Data cleaning, Data transformation	15	10	CO1, CO2, CO3, CO4

UNIT III	**3. DATA MINING** 　3.1　Introduction 　3.2　What is Data mining? 　3.3　Why data mining? 　3.4　Knowledge Discovery in Database (KDD) Vs. Data Mining 　3.5　Stages of KDD: Selection, Preprocessing, transformation, Data mining, Interpretation and evaluation, Data Visualization 　3.6　Database Management System (DBMS) Vs. Data Mining 　3.7　DM Techniques: Classification, Association, Clustering, Regression, Prediction 　3.8　Issues and challenges in Data Mining 　3.9　 DM application area: 　　　3.9.1　 Business and e-commerce data 　　　3.9.2　 Scientific, Engineering and Health care data 　3.10 DM application- Case studies: 　　　3.10.1　Crime detection 　　　3.10.2　Store-level fruits purchasing prediction	15	10	CO1, CO2, CO3, CO4
UNIT IV	**4. INTRODUCTION TO BIG DATA** 　4.1　Classification of Digital Data: 　　　4.1.1　 Structured Data : Sources, Ease of Working 　　　4.1.2　 Semi-Structured Data: Sources 　　　4.1.3　 Unstructured Data: Sources, Issues, How to deal with Unstructured data 　4.2　Characteristics of Data 　4.3　 Evolution of Big Data 　4.4　 Definition of Big Data 　4.5　 Challenges of Big Data 　4.6　 Characteristics of Big Data: Volume, Velocity, Variety 　4.7　 Other characteristics: Veracity and validity, Volatility, Variability 　4.8　 Why Big Data? 　4.9　 Traditional Business Intelligence (BI) vs Big Data 　4.10 Typical Data Warehouse Environment 　4.11 Typical Hadoop Environment 　4.12 Coexistence of Big data and Data warehouse 　4.13 What is changing in realms of Big Data?	15	10	CO1, CO2, CO3, CO4
UNIT V	**5. BIG DATA TECHNOLOGIES** 　5.1 Hadoop 　　　5.1.1 Introduction 　　　5.1.2 Features and key advantages of Hadoop	15	10	CO1, CO2,

	5.1.3 Overview of Hadoop ecosystems 5.1.4 Hadoop vs SQL 5.2 NoSQL 5.2.1 What is NoSQL? 5.2.2 Where is NoSQL Used? 5.2.3 Why NoSQL? 5.2.4 Types of NoSQL databases 5.2.5 Advantages of NoSQL 5.2.6 Use of NoSQL in Industry, 5.2.7 SQL vs. NoSQL vs. NewSQL 5.3 MongoDB 5.3.1 What is MongoDB? 5.3.2 Why MongoDB? 5.3.3 MongoDB's Core Server tools 5.3.4 Data Types in MongoDB's: String, Integer, Boolean, Double, Arrays, Object, Date 5.3.5 MongoDB Query Language: Insert, Save, Update, Remove, Find 5.4 MapReduce: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching Sorting, Compression			CO3, CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO DATA SCIENCE** 1.1 What is Data science? 1.2 Why Data Science? 1.3 Types of Data Science Jobs: Data Analyst, Machine Learning Expert, Data Engineer, Data Scientist 1.4 Data Science components: Statistics, Visualization, Machine Learning, Deep Learning. 1.5 Data Science Lifecycle: Discovery, Data preparation, Model Planning, Model-building, Operationalize, Communicate results 1.6 Tools for data science: Data Analysis tools, Data Warehousing, Data Visualization tools, Machine learning tools 1.7 Applications of data science 1.8 Challenges of Data science Technology	10	15
2	**2. DATA WAREHOUSING** 2.1 Introduction 2.2 What is Data Warehouse? 2.3 Definition: Subject-Oriented, Non-volatile, Time varying, Integrated 2.4 Multidimensional data model 2.5 OLAP operations: Slicing, Dicing, Drilling, Drill-up, Drill-down, Drill-within, Drill-across, Pivot(rotate) 2.6 Warehouse Schema: Star Schema, Snowflake Schema 2.7 Data warehousing architecture 2.8 Warehouse server: Enterprise warehouse, Data Marts 2.9 OLAP Engine 2.10 Data warehousing backend processes: Data extraction, Data cleaning, Data transformation	9	15

	3.DATA MINING		10	15
	3.1 Introduction			
	3.2 What is Data mining?			
	3.3 Why data mining?			
	3.4 Knowledge Discovery in Database (KDD) Vs. Data Mining			
	3.5 Stages of KDD: Selection, Preprocessing, transformation, Data mining, Interpretation and evaluation, Data Visualization			
	3.6 Database Management System (DBMS) Vs. Data Mining			
	3.7 DM Techniques: Classification, Association, Clustering, Regression, Prediction			
	3.8 Issues and challenges in Data Mining			
	3.9 DM application area			
	3.10 DM application- Case studies			
4	**4. INTRODUCTION TO BIG DATA**		10	15
	4.1 Classification of Digital Data:			
	4.2 Characteristics of Data			
	4.3 Evolution of Big Data			
	4.4 Definition of Big Data			
	4.5 Challenges of Big Data			
	4.6 Characteristics of Big Data: Volume, Velocity, Variety			
	4.7 Other characteristics: Veracity and validity, Volatility, Variability			
	4.8 Why Big Data?			
	4.9 Traditional Business Intelligence (BI) vs Big Data			
	4.10 Typical Data Warehouse Environment			
	4.11 Typical Hadoop Environment			
	4.12 Coexistence of Big data and Data warehouse			
	4.13 What is changing in realms of Big Data?			
5	**5. BIG DATA TECHNOLOGIES**		9	15
	5.1 Hadoop			
	5.2 NoSQL			
	5.3 MongoDB			
	5.4 MapReduce			
		Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Creating a simple data warehouse
2	OLAP operations: Roll Up, Drill Down, Slice, Dice through SQL- Server
3	Install and Configure WEKA Tool

4	Demonstration of Weka Explorer, Mining techniques and Attribute Relation File Format (ARFF).
5	Create an Employee Table with the help of Data Mining Tool WEKA.
6	Create a Weather Table with the help of Data Mining Tool WEKA.
7	Apply Pre-Processing techniques (Add, Remove, Normalization) to the training data set of Weather Table
8	Apply Pre-Processing techniques to the training data set of Employee Table
9	Normalize Weather Table data using Knowledge Flow.
10	Finding Association Rules for Banking data.
11	Study of Hadoop ecosystem
12	Programming exercises on Hadoop e.g. Word count program

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Arun K Pujari	Data Mining Techniques (Unit 2 and 3)	Orient Longman Publishers
2	Seema Acharya, Subhashini Chellappan	Big Data and Analytics (Unit 4 and 5)	Wiley

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Elmasri Ramez, Navathe Shamkant Kamber and Han	Fundamentals of Database System	Pearson

Internet and Web Resources

S. No.	Description
1	https://www.javatpoint.com/data-science (Unit 1)
2	https://www.tutorialspoint.com/mongodb/index.htm (Unit 4)
3	http://www.tutorialspoint.com/data_mining/ (Unit 3)

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=-ETQ97mXXF0 (Data Science)
2	https://www.youtube.com/watch?v=J326LIUrZM8 (Data Warehousing)
3	https://www.youtube.com/watch?v=zez2Tv-bcXY (Big Data)
4	https://www.youtube.com/watch?v=rzRJsNeS0KI (Data Mining)

(CM618) PYTHON PROGRAMMING

1. COURSE OBJECTIVES: In this course students will learn how to work with a scripting language.

2.PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	VI					Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
CM618 Python Programming		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4.COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM618.CO1: Explain the various constructs of Python programming.

CM618.CO2: Experiment with various constructs of Python Programming

CM618.CO3: Select the appropriate features of Python programming for solving real worldproblems.

CM618.CO4: Develop simple Python programs.

5.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM618.CO1	2	2	3	3	2	3	2
CM618.CO2	3	3	3	3	2	3	2
CM618.CO3	3	3	3	3	2	3	2
CM618.CO4	3	3	3	3	2	3	3

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM618.CO1	2	2
CM618.CO2	3	2
CM618.CO3	3	2
CM618.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO

UNIT I	**1. INTRODUCTION TO PYTHON, DATA TYPES AND OPERATORS**
	1.1 Introduction
	1.2 Features of Python
	1.3 How to run Python
	1.4 Identifiers
	1.5 Reserved Words
	1.6 Variables
	1.7 Comments in Python
	1.8 Indentation in Python
	1.9 Multiline Statements
	1.10 Multiple statement group
	1.11 Quotes in Python
	1.12 Input, Output and import functions
	1.13 Operators
	 1.13.1 Arithmetic operators
	 1.13.2 Comparison operators
	 1.13.3 Assignment operators
	 1.13.4 Bitwise operators
	 1.13.5 Logical operators
	 1.13.6 Membership operators
	 1.13.7 Identity operators
	1.14 Data Types
	 1.14.1 Numbers
	  1.14.1.1 Mathematical Functions [abs(), sqrt(), ceil(), floor(), pow(), exp(), max(), min()]
	  1.14.1.2 Trigonometric Functions ([sin(), cos(), tan(), degrees(), radians()]
	  1.14.1.3 Random Number Functions [choice(), shuffle(), random(), randrange(), seed(), uniform()]
	 1.14.2 Strings
	  1.14.2.1 Escape characters
	  1.14.2.2 String Formatting operator
			15	10	CO1, CO2, CO3, CO4

	1.14.2.3 String formatting Functions [len(), lower(), upper(), swapcase(), capitalize(), replace
	1.14.3 Lists
	    1.14.3.1 Built in List functions [len (), max(), min(), list(),
	    1.14.3.2 Built in list methods [append(), count(), remove(), reverse(), sort()
	    1.14.3.3 Using List as a Stack
	    1.14.3.4 Using List as a Queue
	1.14.4 Tuple
	1.14.5 Dictionary			

UNIT II	**2. FLOW CONTROL**
	2.1 Decision Making
	    2.1.1 *if* statements
	    2.1.2 *if ... else* statements
	    2.1.3 *if .. elif.. else* statements
	    2.1.4 nested *if* statement
	2.2 Loops
	    2.2.1 *for* loop
	    2.2.2 range() function
	    2.2.3 enumerate() function
	    2.2.4 *for* loop with *else* statement
	    2.2.5 *while* loop
	    2.2.6 *while* loop with *else* statement
	    2.2.7 nested loops
	2.3 Control Statements
	    2.3.1 break
	    2.3.2 continue
	    2.3.3 pass statement
	2.4 Types of loops
	2.5 List comprehensions
	    2.5.1 Nested Lists
	2.6 Dictionary comprehensions
	2.7 Programming using flow control statements
		15	9	CO1, CO2, CO3, CO4

UNIT III	**3. FUNCTIONS, MODULES AND PACKAGES**
	3.1 Functions
	    3.1.1 Function Definition
	    3.1.2 Function calling
	    3.1.3 Function arguments: required arguments, keyword arguments, default arguments and variable-length arguments
	    3.1.4 Anonymous functions (Lambda functions): Filter () and reduce () function
	    3.1.5 Recursive functions
		15	10	CO1, CO2, CO3, CO4

	3.1.6 Functions with more than one return values			
	3.2 Modules			
	3.2.1 Creating modules			
	3.2.2 *Import* statements: *import* with renaming, *from..import* statements, *import* all names			
	3.2.3 Locating modules: PHYTHONPATH variable			
	3.2.4 Namespaces and scope			
	3.2.5 The *dir( )* function			
	3.2.6 The *reload* () function			
	3.3 Packages			
	3.3.1 Importing modules from a package			
	3.3.2 Date and Time modules: The *time* module, The *calender* module, The *datetime* module			

UNIT IV	**4. FILE HANDLING AND DATABASE PROGRAMMING**
	
	4.1 File Handling
	    4.1.1 Opening a File: Modes for Opening a File, Attributes of File object
	    4.1.2 Closing a File
	    4.1.3 Writing to a File: with Statement
	    4.1.4 Reading from a File
	    4.1.5 Deleting a File
	    4.1.6 Directories in Python: mkdir() method, chdir() method, getcwd() method, rmdir() method
	4.2 Database Programming
	    4.2.1 Connecting to a database
	    4.2.2 Creating tables
	    4.2.3 INSERT operation
	    4.2.4 UPDATE operation
	    4.2.5 DELETE operation
	    4.2.6 READ operation
	    4.2.7 Transaction control: COMMIT operation, ROLLBACK operation
	    4.2.8 Disconnecting from a database
		15	10	CO1, CO2, CO3, CO4

UNIT V	**5. GUI PROGRAMMING AND FRAMEWORKS** 5.1 GUI Programming: 5.1.1 Tkinter widgets: Label, message widget, entry widget, text widget, tk message box, button widget, radio button, checkbutton, listbox, frames, top level	15	9	CO1, CO2, CO3, CO4

	widgets, menubutton widgets, scrollbar, scale widget (slider widget), canvas.
	5.1.2 Layout managers: pack , place, grid
	5.2 Frameworks:
	    5.2.1 Introduction to Frameworks in Python.
	    5.2.2 Advantages of Frameworks.
	    5.2.3 Library vs Framework
	    5.2.4 Frameworks in Python
	        5.2.4.1 Django: Brief Introduction, Features
	        5.2.4.2 Web2Py: Brief Introduction, Features
	        5.2.4.3 CherryPy: Brief Introduction, Features			

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks

1	**1. INTRODUCTION TO PYTHON, DATA TYPES AND OPERATORS**
	    1.1 Introduction
	    1.2 Features of Python
	    1.3 How to run Python
	    1.4 Identifiers
	    1.5 Reserved Words
	    1.6 Variables
	    1.7 Comments in Python
	    1.8 Indentation in Python
	    1.9 Multiline Statements
	    1.10 Multiple statement group
	    1.11 Quotes in Python
	    1.12 Input, Output and import functions
	    1.13 Operators
	    1.14 Data Types
		10	15

2	**2.FLOW CONTROL**
	    2.1 Decision Making
	    2.2 Loops
	    2.3 Control Statements
	    2.4 Types of loops
	    2.5 List comprehensions
	    2.6 Dictionary comprehensions
		9	15

	2.7 Programming using flow control statements		

3	**3.FUNCTIONS, MODULES AND PACKAGES**
	    3.1 Functions
	    3.2 Modules
	    3.3 Packages
		10	15

4	**4.FILE HANDLING AND DATABASE PROGRAMMING**
	    4.1 File Handling
	    4.2 Database Programming
		10	15

5	**5. GUI PROGRAMMING AND FRAMEWORKS**
	    5.1 GUI Programming
	    5.2 Frameworks
		9	15

	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study how to run Python program.
2	Python program to implement various data types like numbers, Strings, Lists, Tuple and Dictionary.
3	Python program to implement Decision making statements.
4	Python program to Implement Looping statements.
5	Python program to implement Control statements.
6	Python program to implement Functions, modules and Packages.
7	Python program to implement File Handling.
8	Python program to perform Database programming.
9	Python program to implement Tkinter Widgets in GUI programming.
10	Case study of frameworks in python.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Jeeva Jose	Taming Python by Programming	Khanna Publishing
2	Tony Gaddis	Starting Out with Python	Pearson

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Wesley J. Chun	Core Python Programming,	Prentice Hall
2	Reema Thareja	Python Programming: Using Problem Solving Approach	Oxford University
3	Paul Gries	Practical Programming: An Introduction to Computer Science using Python 3	The Pragmatic Bookshelf

Internet and Web Resources

S. No.	Description
1	https://www.learnpython.org/
2	https://www.programiz.com/python-programming
3	https://www.codecademy.com/learn/learn-python

Videos and Multimedia Tutorials

S. No.	Description
1	Python Tutorial - Python for Beginners [Full Course] https://www.youtube.com/watch?v=_uQrJ0TkZlc
2	Python Tutorial | Python Programming Tutorial for Beginners | Course Introduction https://www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3
3	Python Full Course - Learn Python in 12 Hours | Python Tutorial For Beginners | Edureka https://www.youtube.com/watch?v=WGJJIrtnfpk

AUDIT COURSE

(AC102) INDIAN CONSTITUTION

1. COURSE OBJECTIVES:

As a proud citizen of this country every student must be aware about the Indian Constitution to appreciate the provisions available for the people of this biggest democracy in Indian Constitution so that the youth of this country plays active role in development of the country by participating in the formation of sensitive and proactive Government at national and state level. This course intends to make students aware about various constituents of the Indian Constitution.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
(AC102) INDIAN CONSTITUTION		L	T	P	H	TH	TM	TW	PR/OR	
		2	-	-	2	-	-	-	-	-

3. Course Content

Unit 1 – The Constitution - Introduction   • The History of the Making of the Indian Constitution   • Preamble and the Basic Structure, and its interpretation   • Fundamental Rights and Duties and their interpretation   • State Policy Principles
Unit 2 – Union Government   • Structure of the Indian Union   • President – Role and Power   • Prime Minister and Council of Ministers   • Lok Sabha and Rajya Sabha
Unit 3 – State Government   • Governor – Role and Power   • Chief Minister and Council of Ministers   • State Secretariat
Unit 4 – Local Administration   • District Administration   • Municipal Corporation   • Zila Panchayat

Unit 5 – Election Commission
• Role and Functioning
• Chief Election Commissioner
• State Election Commission

4. Suggested Learning Resources:

Title of Book Author Publication
1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi,2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition

5. Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-ofindia/