BACHELOR OF SCIENCE (ELECTRONICS AND COMMUNICATION)

VISION

To nurture the potential of students by designing and delivering learning inputs based on current trends to achieve excellence in academics and to create employable and socially responsible citizens.

MISSION

- To design and delivering fundamentally strong learning inputs by providing equal importance for academics and individual development.
- To create employable graduates by continuous motivation, teaching, and training that bridge the gap between rural inputs and industrial benchmarks.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To inculcate the ability for adapting the changes in the new environment with skills as well as competencies.

PEO 2: To incorporate the advancements in existing and emerging technologies which lead to holistic and pragmatic view of the present scenario.

PEO 3: To create thrust in the development of innovative products by applying practical approach.

PROGRAMME OUTCOMES (PO)

After completion of the programme, the graduates will be able to

PO 1: Recall and state fundamental laws, theorems and basic concepts of electronics.

PO 2: Understand and adopt the professional and ethical responsibilities of analog and digital communication systems.

PO 3: Apply the fundamentals to the development and modernization of the industries.

PO 4: Analyze the experimental trails by comparing them to the International standards.

PO 5: Design hardware, software and networking solutions for emerging smart devices and technologies.

PROGRAMME SPECIFIC OUTCOMES (PSO)

After completion of the programme, the graduates will be able to

PSO1: Comprehend the fundamental theoretical concepts and solve small numeric problems.

PSO2: Describe the theoretical concepts and communicate ideas effectively in a team during the development of analog as well as digital electronic products.

PSO3: Analyze the working principles and protocols of emerging smart devices.

PSO4: Provide efficient circuit design solutions which serve for industrial and social needs.

PSO5: Design and develop affordable hardware solutions for the existing complex instruments and devices.

REGULATIONS

ELIGIBILITY

Candidates seeking admission to the first year of the Bachelor of Science in Electronics and Communication should have passed with Mathematics or Physics or EMR/EMS/EE (Vocational Stream) as one of the subjects in the Higher Secondary Examination conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the syndicate, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the B.Sc., Electronics and Communication Degree of this university after a course of study of Three Academic Years.

DURATION OF THE PROGRAMME

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME

The maximum duration for completion of the UG Programme shall not exceed 12 semesters.

SCHEME OF EXAMINATION

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
First Semester							
Part - I							
18UTALA101/ 18UHILA101/ 18UFRLA101	Tamil-I / Hindi-I/ French-I/	5	3	25	75	100	3
Part - II							
18UENLA101	Foundation English-I	5	3	25	75	100	3
Part - III							
18UECM101	Core I: Physics of Semiconductor Devices	4	3	25	75	100	4
18UECM102	Core II: Digital Electronics	4	3	25	75	100	4
18UMAECA101	Allied I: Algebra and Calculus	5	3	25	75	100	4
18UECMP101	Core Practical –I: Semiconductor Devices Lab	3	3	40	60	100	2
18UECMP102	Core Practical –II: Digital Electronics Lab	2	3	40	60	100	2
Part - IV							
18UVE101	Value Education I: Yoga	2	3	25	75	100	2
	TOTAL	**30**				**800**	**24**
Second Semester							
Part - I							
18UTALA201/ 18UHILA201/ 18UFRLA201	Tamil-II/ Hindi-II/ French-II	5	3	25	75	100	3
Part - II							
18UENLA201	Foundation English-II	5	3	25	75	100	3
Part - III							
18UECM201	Core III: Electronic Circuits	4	3	25	75	100	4
18UECM202	Core IV: Principles of Communication Systems	4	3	25	75	100	4
18UMAECA201	Allied II : Numerical Methods	5	3	25	75	100	4
18UECMP201	Core Practical-III: Electronic Circuits Lab	3	3	40	60	100	2

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
18UECMP202	Core Practical IV: Communication Lab	2	3	40	60	100	2
Part – IV							
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
	TOTAL	**30**				**800**	**24**
Third Semester							
Part – I							
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil-III / Hindi-III/ French-III	5	3	25	75	100	3
Part – II							
18UENLA301	Foundation English-III	5	3	25	75	100	3
Part – III							
18UECM301	Core V: Microprocessor and Interfacing	4	3	25	75	100	4
18UCSECA301	Allied III: Programming in C	4	3	25	75	100	2
18UECMP301	Core Practical –IV: Microprocessor and Interfacing Lab	3	3	40	60	100	2
18UCSECAP301	Allied Practical -I: Programming in C	2	3	40	60	100	2
Part – IV							
18UECSBC301	SBC I: PCB Design and Circuit Simulation Lab	2	3	40	60	100	2
	NMEC –I	2	3	25	75	100	2
18ULS301	Career Competency Skills I	1	-	-	-	-	-
	Add on Course - I	2	3	-	100	100	-
	TOTAL	**30**				**800**	**20**
Fourth Semester							
Part – I							
18UTALA401/ 18UHILA401/	Tamil-IV / Hindi-IV/	5	3	25	75	100	3

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
18UFRLA401	French-IV						
Part – II							
18UENLA401	Foundation English-IV	5	3	25	75	100	3
Part – III							
18UECM401	Core VI: ICs and Applications	4	3	25	75	100	4
18UCSECA401	Allied IV : Programming in JAVA	4	3	25	75	100	2
18UECMP401	Core Practical –VI: ICs and Applications Lab	3	3	40	60	100	2
18UCSECAP401	Allied Practical -II: Programming in JAVA	2	3	40	60	100	2
Part – IV							
18UECSBC401	SBC II: Consumer Electronics (100% Internal Evaluation)	2	3	100	-	100	2
	NMEC –II	2	3	25	75	100	2
18ULS401	Career Competency Skills II	1	-	-	-	-	-
	Add on Course - II	2	3	-	-	-	-
	Advanced Learners Course	-	3	-	-	-	2*
	TOTAL	**30**				**800**	**20**
FIFTH SEMESTER							
PART-III							
18UECM501	Core VII: Computer Networks	5	3	25	75	100	5
18UECM502	Core VIII: Embedded Systems	5	3	25	75	100	5
18UECM503	Core IX: Arduino and Internet of Things	5	3	25	75	100	4
	Elective	5	3	25	75	100	4
18UECMP501	Core Practical VII: Embedded Systems Lab	3	3	40	60	100	2
18UECMP502	Core Practical – VIII: Internet of Things Lab	3	3	40	60	100	2
PART-IV							

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
18UECSB501	SBC III: Electronic Media	3	3	25	75	100	2
18ULS501	Career Competency Skills III	1	-	-	-	-	-
	Advanced Learners Course	-	3	-	-	-	2*
PART-V							
18UE501	Extension Activity	-	-	-	-	-	2
	TOTAL	**30**				**700**	**26**
SIXTH SEMESTER							
PART-III							
18UECM601	Core X: Mobile and Cellular Communication	5	3	25	75	100	5
18UECM602	Core XI: VLSI Design and VHDL	5	3	25	75	100	5
18UECM603	Core XII: Biomedical Instrumentation	5	3	25	75	100	4
	Elective	5	3	25	75	100	4
18UECMP601	Core Practical –IX: VHDL Programming & Simulation Lab	3	3	40	60	100	2
18UECMP602	Project Viva voce	3	-	40	60	100	4
PART-IV							
18UECSB601	SBC –IV: PLC and SCADA	3	3	25	75	100	2
18ULS601	Career Competency Skills IV	1	-	-	-	-	-
	TOTAL	**30**				**700**	**26**
					Grand Total	**4600**	**140**

Advanced Learners Course

*The department offers the following two subjects as **Advanced Learners Course** in fifth semester. Extra two credits will be given if student complete any one of the subjects.

Subject	Subject Code	Subject Name
Advanced Learners Course	18UECAL501	Energy Auditing
	18UECAL502	Electronic Applications in Agriculture
	Massive Open Online Courses (MOOC) from Swayam/ NPTEL/CEC.	

Elective Courses

The department offers the following Elective courses. Student shall select any one of the two subjects as Elective in the respective semester

Subject	Subject Code	Subject Name
Elective	18UECEL501	Elective I: Sensors and Transducers
	18UECEL502	Elective II: Microwave and Fiber Optic Communication
	18UECEL601	Elective III: Intelligent Instrumentation
	18UECEL602	Elective IV: Robotics

FOR COURSE COMPLETION

Students shall complete:

- Language subjects (Tamil/ Hindi/French and English) in I, II, III and IV Semesters.
- Value Education Yoga and Environmental Studies in I and II Semesters respectively.
- Allied subjects in I, II, III and IV semesters.
- Two Add on Courses during Semester III and Semester IV.
- Non Major Elective Courses (NMEC I & NMEC II) during Semester III and Semester IV.
- Skill Based Courses (SBC) from Semester III to Semester VI.
- Extension Activity in V semester.
- Career Competency skills(CCS) from Semester III to Semester VI.
- An individual Project & Viva-Voce at the end of VI semester, but they have to carry out their Project work from V Semester onwards.

TOTAL CREDIT DISTRIBUTION

PART	Credits	Marks
PART- I		
Tamil/Hindi /French (4 X 3 Credits)	12	400 (4X100 Marks)
PART-II		
English (4 X 3 Credits)	12	400 (4X100 Marks)
PART-III		
Core Subjects (16 Papers) (4 X 5 Credits) (10 X 4 Credits)		 400 (4X100 Marks) 1000 (10X100 Marks)
Core Practical (9 Practicals) (9 X 2 Credits)	82	 900 (9X100 Marks)
Core Project (1 X 4 Credits)		 100 (1X100 Marks)
Allied (4 Papers +2 Practicals) (2 X 4 Credits) (2 X 2 Credits) (2 X 2 Credits)	 16	 200 (2X100 Marks) 200 (2X100 Marks) 200 (2X100 Marks)
PART-IV		
Value Education (2 X 2 Credits) NMEC (2 X 2 Credits) SBC (4 X 2 Credits)	 16	200 (2X100 Marks) 200 (2X100 Marks) 400 (4X100 Marks)
PART-V		
Extension Activity (1 X 2 Credits)	2	-
Total	**140**	**4600**

18UTALA101	**TAMIL – I: கவிதைகளும் கதைகளும்**	**பருவம் - I**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

1.தற்காலத்தமிழ் இலக்கியவகைகளைமாணவர்களுக்குக் கற்பித்தல்.

2.காலந்தோறும் தமிழ்க் கவிதைவளர்ச்சிநிலைகளைஅறிமுகப்படுத்துதல்.

3.அடிப்படைத் தமிழ் இலக்கணத்தைக் கற்பித்துஅரசுப்போட்டித் தேர்வுகளுக்கு ஆயத்தப்படுத்துதல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**மரபுக் கவிதைகள்** அ.பாரதியார் - பாரததேசம் ஆ.பாரதிதாசன் - தமிழின் இனிமை இ. நாமக்கல் கவிஞர் - கவிதைஎன்றால் என்ன? ஈ. முடியரசன் - நல்லஉலகமடா!	10	**CO1**
II	**புதுக்கவிதைகள்** அ.வைரமுத்து - ரத்ததானம் - தண்ணீர் பிச்சை ஆ.வெ.இறையன்பு - பூபாளத்திற்கொருபுல்லாங்குழல் - பனித்துளியில் பாற்கடல் இ. தீபா - மழைக்குஒருமடல் - பாரதியார்,வறுமை ஈ. சிற்பி - ஒருகிராமத்துநதி–ஒருகிராமத்துநதி	10	**CO2**
III	**சிறுகதைகள்** அ.அறிஞர் அண்ணா - செவ்வாழை ஆ. கிருத்திகா - உழவுமாடுகள் இ.வள்ளி.வ. - தணல் துண்டாய்...சிலதருணங்கள் ஈ.தி.ஜானகிராமன் - முள்முடி	10	**CO3**
IV	**இலக்கியவரலாறு** அ. மரபுக்கவிதையின் தோற்றமும் வளர்ச்சியும் ஆ. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் இ. சிறுகதையின் தோற்றமும் வளர்ச்சியும் ஈ. நாடகத்தின் தோற்றமும் வளர்ச்சியும்	10	**CO4**
V	**அடிப்படை இலக்கணம்** அ.முதலெழுத்துகள் மற்றும் சார்பெழுத்துகள் (நன்னூல் விதிப்படிவிளக்கம்) ஆ.வல்லினம் மிகும் மிகா இடங்கள். இ. மரபுப் பெயர்கள் - இளமைப் பெயர்கள்	10	**CO5**

Text Book:	
1	தமிழ்த்துறைவெளியீடு, கே.எஸ்.ரங்கசாமிகலைஅறிவியல் கல்லூரி(தன்னாட்சி), திருச்செங்கோடு.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO1	மரபுக்கவிதைகளின் வடிவங்களைஅறிதல்.
CO2	புதுக்கவிதைகளின் வடிவங்கள் மற்றும் பாடுபொருள் தன்மையைஅறிதல்.
CO3	சிறுகதைகளின் உருவம்,உள்ளடக்கங்களைஅறிதல்
CO4	காலந்தோறும் மாறும் இலக்கியவளர்ச்சியைஅறிதல்
CO5	எழுத்துகளின் வகைகளைஅறிதல்.

18UENLA101	FOUNDATION ENGLISH – I	SEMESTER – I

COURSE OBJECTIVES:

The course aims:

- To enable the students to develop their comprehensive skill.
- To introduce the students to know about English poetry.
- To introduce the students to know about English short stories.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I & II	**POETRY** William Wordsworth - The Solitary Reaper Margaret Atwood - This Is a Photograph of Me **SHORT STORY** A. J. Cronin - Two Gentlemen of Verona **GRAMMAR** Parts Of Speech Articles **COMPOSITION** Letter Writing – Formal **COMMUNICATION SKILLS** Greeting and Introducing Inviting a Person	20	CO1 & CO2
III & IV	**POETRY** Robert Frost - The Road Not Taken **SHORT STORIES** Pearl S. Buck - The Refugees C. Rajagopalachary – Tree Speaks **GRAMMAR** Kinds of Sentences	20	CO3 & CO4

	COMPOSITION Dialogue Writing **COMMUNICATION SKILLS** Seeking Permission Offering a Suggestion and Giving an Advice		
V	**SHORT STORY** R. K. Narayan - The Axe **GRAMMAR** Question Tag **COMPOSITION** Reading Comprehension **COMMUNICATION SKILLS** Persuading	**10**	**CO5**

Text Books:

1.	*G.Damodar, D.Venkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli.* 2009. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad.
2.	*M.M.Lukose*. 2010. **Images, A hand book of Stories.** Macmillan Publishers Indian Limited. Chennai.
3.	*Dr.A.Shanmugakani,* M.A., Ph.d, **Prose for Communication**. Manimekala Publishing House, Madurai.
4.	*SasiKumar V and Syamala V*. 2006. **Form and Function A Communicative Grammar for Colleges.** Emerald Publishers. Chennai.
5.	*T.M.Farhathullah.* 2006. **Communication Skills For Undergraduates**. Publishers-RBA Publications. Chennai.

Reference Book:

1.	*Thomas, A.J and Martinet, A.V.* 1994. **A Practical English Grammar.** Oxford University Press. Delhi.

COURSE OUTCOMES (CO)

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

CO1	Know the different parts of genres in English
CO2	Trace the famous authors of English
CO3	Enrich grammar knowledge
CO4	Stimulate their writing skills
CO5	Deserve appreciation for their communication

18UECM101	**CORE I: PHYSICS OF SEMICONDUCTOR DEVICES**	**SEMESTER – I**

Course Objectives:

The Course aims

- To study the basic information about the electricity and laws.
- To enable students to gain basic knowledge about the fundamentals of semiconductor.
- To understand the operating principles of diode, transistor and FET.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Electricity and Laws**: Resistance in opposition to current – Direct current and Alternating current – Sources of Electricity – Ohm's law- Electrical power – Kirchhoff's laws. Resistors-Types of Resistors – Resistor Color Coding – Capacitors- Inductors-Series and Parallel Combination: Resistors – Capacitance – Inductance.	10	CO1
II	**Structure of Solids:** Structure of Solids–Crystalline Structures – Structure of Atom – Atomic number- Valence electrons - Energy level diagram – Bonding in solids: Ionic bond-Covalent bond-Metallic bond.	10	CO2
III	**Semiconductor:** Introduction of Semiconductor, Intrinsic and Extrinsic semiconductors – Donors and Acceptors – Majority and Minority Charge carriers of N and P type Semiconductors – Mobile and Immobile charges – Hall effect – Energy band diagrams for Conductors, Insulators and Semiconductors – Depletion layer.	10	CO3
IV	**Semiconductor Diodes:** Junction diode- Construction,	10	CO4

	Characteristics, Static resistance, Dynamic resistance, Average ac resistance, Diode applications – Zener diode – Construction –Characteristics – LED- LCD- Tunnel diode- PIN diode- Varactor diode- Varistor- Introduction to Solar Cell.		
V	**Configuration and Characteristics:** Bipolar Junction Transistor (BJT)-Field Effect Transistor (FET)-Metal Oxide Semiconductor Field Effect Transistor (MOSFET)-Silicon Controlled Rectifier (SCR)-TRIAC- Unijunction Transistor (UJT).	**10**	**CO5**
Text Book:			
1.	*Sedha, R.S.* 2013. **A Text Book of Applied Electronics.** [Second Edition]. S.Chand, New Delhi.		
Reference Books			
1.	*Theraja, B.L.* 2008. **Basic Electronics.** [Second Edition]. S.Chand, New Delhi.		
2.	*Metha, V.K. and Shalu Metha.* 2005. **Principles of Electronics.** [Eighth Edition] S.Chand, New Delhi.		
3.	*Bakshi, U.A and Godse, A.P.* 2009. **Electronic Devices.** [First Edition]. Technical Publications, Pune.		

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	L	L
CO2	M	M	M	L	L
CO3	L	M	L	L	M
CO4	L	M	M	M	M
CO5	L	M	M	M	H

H-High; M-Medium; L-Low

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to:

CO1	understand the concepts of current, voltage, stored energy, and power in circuits using Kirchhoff's law and Ohms law.
CO2	acquire the basic concept of atomic theory and relates it to the materials.
CO3	distinguish between semiconductor materials and their properties.
CO4	analyze the construction, basic operation and characteristics of semiconductor diodes in practical applications.
CO5	compare the basic structure, operation and characteristics of BJT and power devices.

18UECM102	**CORE II: DIGITAL ELECTRONICS**	**SEMESTER – I**

Course Objectives:

The Course aims

- To understand the digital logic levels, number systems and operation of logic

gates and their applications.

- To utilize the skills for the design of combinational and sequential logic circuits.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Number Systems**: Binary signals – Binary Number System – Decimal Number System –Octal Number System – Hexadecimal Number System – BCD – Gray code – Excess-3 Code – Parity codes – ASCII code –Number Conversions.	**10**	**CO1**
II	**Boolean algebra and Logic Gates**: Logic Gates – Logic gates using discrete components -Universal gates. Fundamental concepts of Boolean algebra – Basic Laws of Boolean algebra – Demorgan's theorem – Fundamental Products – Sum of Products – Product of Sums- Karnaugh's Map Method-Quine Mccluskey Method.	**10**	**CO2**
III	**Digital Combinational Circuits**: Binary Addition and Subtraction – Signed and Unsigned Binary Number's – Addition in 1's and 2's Complement – Addition in 9's and 10's Complement – Half Adder and Full Adder – Parallel Adder – Half and Full Subtractor – Multiplexer – Demultiplexer – Encoder - Decoder.	**10**	**CO3**
IV	**Flip Flop and Sequential Logic Circuits:** RS, D, JK, T and JK Master -Slave flip flops – Shift register – Serial in Serial out, Serial in Parallel out, Parallel in Serial out- Parallel in	**10**	**CO4**

	Parallel out – Counters: Binary Counter– BCD Counter – Ring counter– UP/DOWN counter.		
V	**D/A and A/D Conversions**: D/A converters-Variable Resister network – Binary Ladder – D/A Accuracy and Resolution. A/D converters – Simultaneous Conversion – Counter type A/D Converter- Successive Approximation Converter – Dual slope A/D converter – A/D Accuracy and Resolution.	**10**	**CO5**
Text Book:			
1.	*Virendra Kumar.* 2009. **Digital Technology Principles and Practice.** [First Edition]. New Age International Publications, New Delhi.		
Reference Books:			
1.	*Donald,P.Leach, Albert Paul Malvino and Goutam Saha.* 2008. **Digital Principles and Applications.** [Sixth Edition]. Tata Mc Graw Hill, New Delhi.		
2.	*Basavaraj,.B.* 1998. **Digital Fundamentals.** [First Edition]. Vikas Publications House Private Limited, New Delhi.		
3.	*Thomas, L.Floyd.* 2006. **Digital Fundamentals.** [Nineth Edition]. Pearson Education, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the logic levels, number systems and codes and convert the numbers from one system to another.
CO2	solve Boolean expressions comprehend the functions of the logic gates
CO3	compute binary values and apply Boolean algebra for the design of combinational logic.
CO4	design sequential circuits for various storage, shifting and counting applications.

CO5	analyze the logic levels and apply them for the design of analog to digital conversion and vice versa.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	L
CO2	M	H	M	L	L
CO3	L	H	M	M	L
CO4	L	M	H	H	M
CO5	L	L	M	H	H

H-High; M-Medium; L-Low

18UMAECA101	ALLIED I: ALGEBRA AND CALCULUS	SEMESTER – I

*Note: Proof of the theorem and proof of examples are excluded.

COURSE OBJECTIVES:

The Course aims

- To get knowledge about matrices and various method of solving algebraic equations.
- To learn basic concepts of differentiation and integration.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Matrices:** Matrix operations – Characteristics equation of a matrix – Eigen values and Eigen vectors – Cayley - Hamilton Theorem (Statement only) and its problems – Rank of a matrix – Problems.	10	CO1
II	**Theory of Equation:** Relation between roots and coefficients (Problems based on A.P., G.P. and H.P.) – Imaginary and Irrational roots.	10	CO2
III	**Differentiation:** Differential coefficient of a sum or difference – Product rule – Quotient rule – Function of function rule. **Successive Differentiation:** The nth derivative - Leibnitz formula for nth derivative – problems.	10	CO3
IV	**Partial differentiation:** Partial derivative - Partial derivatives of higher orders – Homogeneous functions (Euler theorem on homogeneous functions) – Problems.	10	CO4
V	**Methods of integration:** Integral of functions involving $\sqrt{a^2 + x^2}$ - Integration by parts – Bernoulli's formula.	10	CO5

Text Book	
1.	*Vittal, P.R.* 2002. **Allied Mathematics.** [Third Edition]. Margham Publications, Chennai.
Reference Books	
1.	*Manicavachagam Pillay, T.K. and Narayanan, S.* 2004. **Algebra – Vol II.** Vijay Nicole Imprints Private Limited, Chennai.
2.	*Singaravelu. A.*2002. **Allied Mathematics.** Meenakshi Publishers, Chennai.

Course Outcomes (CO)

After the completion of the course, the student will be able to:

CO1	calculate Eigen values and Rank of a matrix.
CO2	solve algebraic equations.
CO3	understand the variations in variables.
CO4	understand the difference between partial and total differentiation.
CO5	evaluate simple integrations.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	L	L	L	L
CO 2	H	M	L	L	L
CO 3	H	M	M	L	M
CO 4	H	H	L	M	M
CO 5	H	H	M	M	M

H-High; M-Medium; L-Low

18UECMP101	**CORE PRACTICAL I: SEMICONDUCTOR DEVICES LAB**	**SEMESTER – I**

Course Objectives:

The Course aims

- To explore the fundamental concepts of Electronic Devices.
- To understand the characteristics of various electronic components**.**

Credits: 2 **Total Hours: 30**

S.No	**EXPERIMENTS**	**Hrs**	**CO**
1.	Series and Parallel Combination (Resistor, Capacitor).	**3**	**CO1**
2.	Ohm's law and Kirchoff's Laws.	**3**	**CO1**
3.	V-I Characteristics of Junction Diode.	**3**	**CO2**
4.	V-I Characteristics of Zener Diode.	**3**	**CO2**
5.	Automatic Street Light Using LDR.	**3**	**CO5**
6.	Solar Cell Characteristics.	**3**	**CO4**
7.	Transistor Characteristics (CE Configuration).	**3**	**CO3**
8.	FET Characteristics.	**3**	**CO2**
9.	SCR Characteristics.	**3**	**CO2**
10.	TRIAC Characteristics.	**3**	**CO2**

Reference Books:

1.	*Poorna Chandar, S and Sasikala,B.* 2006. **Electronics Laboratory Primer, A Design approach.** S.Chand, New Delhi.
2.	*Sedha,R.S.* 2013. **A Text book of Applied Electronics.** [Fourth Edition] S.Chand, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	prove the laws and theorems of electricity.
CO2	understand the characteristics of diodes
CO3	construct circuits based on energy conversion.
CO4	understand the function of transistor.
CO5	acquire the characteristics of the power devices.

18UECMP102	**CORE PRACTICAL II: DIGITAL ELECTRONICS LAB**	**SEMESTER – I**

Course Objectives:

The Course aims

- To acquire the knowledge in the field of Simplification of circuits, Fundamental functions of ICs, Combinational and Sequential circuit implementations.
- To explore the circuit designing skills, Arithmetic and logical functions, Registers, Counters and Conversion of Digital signal to Analog signal.

Credits:2 **Total Hours: 30**

S.No	**EXPERIMENT**	**Hrs**	**CO**
1.	Verification of Logic gates using ICs	**2**	**CO1**
2.	Verification of logic gates using NAND/NOR.	**2**	**CO3**
3.	Half and Full Adder.	**2**	**CO2**
4.	Half and Full Subtractor.	**2**	**CO2**
5.	Multiplexer and Demultiplexer.	**2**	**CO3**
6.	Encoder and Decoder.	**2**	**CO3**
7.	Flip Flops – RS and D	**2**	**CO3**
8.	Shift Register (Serial in Parallel Out)/Ring Counter.	**2**	**CO4**
9.	Binary Counter.	**2**	**CO4**
10.	Digital to Analog Converter.	**2**	**CO5**

Reference Books:

1.	*Poorna Chandar,S and Sasikala,B. 2006*. **Electronics Laboratory Primer A Design Approach.** S.Chand, New Delhi.
2.	*Donald P.Leach.,Albert Paul Malvino and Goutam Saha. 2008*. **Digital Principles**

	and Applications. [Sixth Edition]. Tata Mc Graw Hill, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	perform the basic logic gate functions.
CO2	implement the functions of combinational circuits in various applications
CO3	design various sequential logic circuits for real time applications.
CO4	develop flip flop and counter based circuits for timer applications
CO5	design interfacing circuits using digital to analog conversion.

18UVE101	VALUE EDUCATION I: YOGA	SEMESTER - I

Course Objectives:

The course aims

- To understand physical body and Health concepts
- To have the basic Knowledge on Simplified Physical Exercises and Asanas and Meditation
- To Introspect and improve the behaviors
- To inculcate cultural behavioral patterns

Credits: 2 **Total Hours: 30**

UNIT	CONTENTS	Hrs	CO
I	**Yoga and Physical Health:** Health - Meaning and Definition - Physical Structure - Three bodies - Five limitations - Simplified Physical Exercises - Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana 1, 2 , Massage, Acu pressure, Relaxation exercises - Yogasanas – Surya namaskar - Padmasana - Vajrasana - Ardha katti Chakrasana - Viruchasana - Yogamudra - Patchimothasana - Ustrasana - Vakkarasana – Salabasana	6	CO1
II	**Greatness of Life Force and Mind :** Maintaining youthfulness - Postponing the ageing process - Sex and spirituality - Significance of sexual vital fluid - Married life - Chastity - Development of mind in stages - Mental Frequencies - Methods for Concentration - Meditation and its Benefits	6	CO2
III	**Personality Development – Sublimation :** Purpose and Philosophy of Life - Introspection - Analysis of Thought - Moralization of Desire - Analysis and practice -	6	CO3

	Neutralization of Anger - Strengthening of will-power		
IV	**Human Resources Development:** Eradication of Worries - Analysis and Eradication practice - Benefits of Blessings – Effect of good vibrations - Greatness of Friendship - Guidance for good Friendship – Individual Peace and world peace - Good cultural behavioral patterns	**6**	**CO4**
V	**Law of Nature:** Unified force - Cause and effect system - Purity of thought deed and Genetic Centre – Love and Compassion - Gratitude - Cultural Education - Fivefold culture.	**6**	**CO5**
Text Book:			
1.	Value Education - World Community Service centre, Vethathiri Publicatic Erode.		
Reference Book:			
1.	*Vethathiri Maharishi*, 2011, Journey of Consciousness, Erode, Vethathiri Publications.		
2.	*Vethathiri Maharishi*, 2014, Simplified Physical Exercises, Erode, Vethathiri Publications.		
3.	*Vethathiri Maharishi*, 2004, Unified force, Erode, Vethathiri Publications		
4.	Yoga for Modern age - Thathuvagnani Vethathiri Maharishi		
5.	Sound Health through yoga – Dr. K. Chandrasekaran, November 1999 Prem Kalyan Publications, Madurai		
6.	Light on yoga - BKS.Iyenger		
7.	Thathuvagnani Vethathiri Maharishi – Kayakalpa yoga – First Edition 2009 –Vethathiri Publications, Erode.		
8.	Environmental Studies - Bharathidasan University Publication Division		

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO1	Understand the physical structure and simplified physical exercises.
CO2	Nurture the life force and mind
CO3	Introspect and improve the moral values
CO4	Realize the importance of human resources development
CO5	Enhance purity of thought and deed

18UTALA201	**Tamil – II: சமய இலக்கியங்கள்**	**பருவம் - II**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

1. சமய இலக்கியங்களைஅறிமுகம் செய்தல்
2. சமயச் சான்றோர் நிலைப்பாட்டைஉணர்த்துதல்
3. சமயங்கள் வளர்த்ததமிழைஅறியச் செய்தல்

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**சைவ,வைணவ இலக்கியங்கள்** அ. சம்பந்தர் தேவாரம் - திருக்கொடிமாடச்செங்குன்றூர்- **(முதல் ஐந்துபாடல்கள்)** ஆ. மாணிக்கவாசகர் - திருவம்மானை - **(முதல் ஐந்துபாடல்கள்)** இ. பெரியாழ்வார் - திருப்பல்லாண்டு **(முதல் ஐந்துபாடல்கள்)** ஈ. ஆண்டாள் - திருமணக் கனவு **(முதல் ஐந்துபாடல்கள்)**	10	CO1
II	**கிறித்துவ, இசுலாமிய இலக்கியங்கள்** அ. இரட்சணியயாத்திரிகம் - சிலுவைப்பாடு**(முதல் பத்துப்பாடல்கள்)** ஆ. நாயகம் ஒருகாவியம்–பாம்பின் நேசமும் தோழரின் பாசமும் **(முதல் பத்துப்பாடல்கள்)**	10	CO2
III	**சமயச் சான்றோர் வரலாறு** அ. **சைவசமயச் சான்றோர்கள்** 1. திருஞானசம்பந்தர், 2. திருநாவுக்கரசர், 3. சுந்தரர், 4. மாணிக்கவாசகர் 5. சேக்கிழார் ஆ. **வைணவசமயச் சான்றோர்கள்** 1. முதலாழ்வார்கள் 2. திருமங்கையாழ்வார் 3.ஆண்டாள் 4. நாதமுனிகள்	12	CO3
IV	**சமய இலக்கியவரலாறு** அ.பன்னிருதிருமுறைகள் ஆ. பதினெண்சித்தர்கள் இ. நாலாயிரதிவ்யபிரபந்தம் ஈ. சைவசித்தாந்தசாத்திரங்கள்	08	CO4
V	**இலக்கணமும் மொழித்திறனும்**	10	CO5

	அ. ஆகுபெயர் ஆ. தொகைச்சொற்கள் இ. மயங்கொலிச்சொற்கள் (ர,ற வேறுபாடுகள்) ஈ. நேர்காணல்		
Text Book:			
1.	தமிழ்த்துறை. வெளியீடு : கே.எஸ்.ரங்கசாமிகலைஅறிவியல் கல்லூரி(தன்னாட்சி),திருச்செங்கோடு– 637 215.		

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO1	தேவார,திவ்யபிரபந்தச் சிறப்பினைஉணர்தல்.
CO2	கிறித்துவ, இசுலாமிய காவியங்களின் சிறப்பினை உணர்தல்.
CO3	சைவசமய, வைணவசமயச் சான்றோர் சிறப்புக்களை உணர்தல்.
CO4	சமயவளர்ச்சி, இலக்கியவளர்ச்சி ஆகியவற்றை உணர்தல்
CO5	ஆகுபெயர் வகைகளை உணர்தல், மொழித்திறன் பெறுதல்.

18UENLA201	FOUNDATION ENGLISH – II	SEMESTER – II

Course Objectives:

The course aims:

- To enable the students to develop their comprehensive skill.
- To introduce the students to know about English poetry and short stories.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I & II	**POETRY** Langston Hughes - I, Too **SHORT STORIES** Vsevolod M. Garshin - The Signal W. Somerset Maugham - The Man with the Scar **GRAMMAR** Tenses (Present, Past & Future) **COMPOSITION** E-mail SMS **COMMUNICATION SKILLS** Asking Questions	20	CO1 & CO2
III & IV	**POETRY** Chinua Achebe - Refugee Mother and Child Nissim Ezekiel - Goodbye Party for Miss Pushpa T. S **SHORT STORY** H. G. Wells - The Stolen Bacillus **GRAMMAR**	20	CO3 & CO4

	Voices (Active and Passive) **COMPOSITION** Note Making, Note Taking **COMMUNICATION SKILLS** Praising and Complimenting Complaining and Apologizing		
V	**POETRY** Tripuraneni Srinivas - I Will Embrace only the Sun **SHORT STORY** O. Henry - One Thousand Dollars **COMPOSITION** Discourse Pattern **COMMUNICATION SKILLS** Expressing Sympathy Phoning	**10**	**CO5**
Text Books:			
1.	*G.Damodar, DVenkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli.* 2009. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad –500 029.		
2.	*M.M.Lukose*. 2010. **Images, A hand book of Stories.** Macmillan Publishers Indian Limited. Chennai–600 041.		
3.	*SasiKumarV and SyamalaV*. 2006. **Form and Function A Communicative Grammar for Colleges.** Emerald Publishers. Chennai–600 008.		
4.	*T.M.Farhathullah.* 2006. **Communication Skills For Undergraduates**. Publishers-RBA Publications. Chennai–600 015.		
Reference Books:			
1.	*Thomas, A.J and Martinet, A.V.* 1994. **A Practical English Grammar.** Oxford University Press. Delhi.		
2.	*Martin Hewings.* 1999. **Advanced English Grammar.** Cambridge University		

	Press. New Delhi.

COURSE OUTCOMES (CO)

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

CO1	Know the different parts of genres in English
CO2	Identify the famous authors of English
CO3	Enrich their grammar knowledge
CO4	Stimulate their writing skills
CO5	Deserve appreciation for their communication

18UECM201	**CORE III: ELECTRONIC CIRCUITS**	**SEMESTER - II**

Course Objectives:

The Course aims

- To understand the fundamentals of the alternating current.
- To apply the basic tools and test equipments used to construct, troubleshoot, and design standard electronic circuits.
- To analyze and describe the applied electronics principles used to develop circuits and systems.

Credits:4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**AC Fundamentals**: Cycle- Time Period– Frequency – Amplitude- Peak to Peak Value– Instantaneous Value- RMS Value-Average Value- Phase. **Networks theorems**: Thevenin's theorem – Norton's theorem – Super position theorem – Maximum power transfer theorem.	10	CO1
II	**Rectifiers:** Half Wave Rectifier- Full Wave – Bridge Rectifier –Average and RMS Values- Ripple Factor and Efficiency – Filters- Voltage Stabilization by Zener Diode – IC Voltage Regulator – Current Limit and Overload Protection.	10	CO2
III	**Transistor Biasing:** Operating point, DC and AC load line in CE amplifier – Graphical analysis- Thermal Stability - Thermal Runaway- Transistor Biasing circuits – Base bias, Base bias with Emitter feedback, Base bias with Collector feedback – Voltage Divider bias-Stability.	10	CO3
IV	**Amplifiers:** Two port network – h parameters- CE amplifier design – Common Source FET amplifier design – DC amplifier – RC coupled amplifier and frequency response-	10	CO4

	Class A Transformer coupled power amplifier – Class B push pull amplifier – Complimentary Symmetry amplifier - Emitter follower.		
V	**Oscillators:** Positive and Negative feedback– Current and Voltage feedback – Barkhausen's conditions for stabilized oscillation- Hartley oscillator- Colpitt's oscillator – Phase Shift, Wien bridge and Crystal oscillator – UJT relaxation oscillator - Clipping and clamping circuits. Multivibrators: Astable- Monostable -Bistable.	**10**	**CO5**
Text Book			
1.	*Sedha.R.S. 2004.* **A Text book of Applied Electronics**. [Fourth Edition]. S.Chand, New Delhi.		
Reference Books			
1.	*Bernard Grob*. **Basic Electronics.** [8th Edition].Tata Mc Graw Hill, New Delhi.		
2.	*Mehta. V.K, Rohit Mehta. 2013,* **Principles of Electronics.** [Revised Edition]. S.Chand, NewDelhi.		
3.	*Salivahanan. 2007.* **Electronic devices and circuits** [3rd Edition] Tata Mc Graw Hill, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the basics of electrical energy and practical implementation of electrical fundamentals.
CO2	solve design problems on rectifiers, filters and power supply circuits.
CO3	identify difference between small signal and large signal amplifiers.
CO4	design different types of oscillators for various computing as well as communication hardware's.
CO5	acquire the knowledge about Multivibrators and Wave shaping circuits.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	L	L
CO2	H	M	L	H	M
CO3	L	M	L	H	L
CO4	L	H	M	M	H
CO5	L	H	M	L	M

H-High; M-Medium; L-Low

18UECM202	**CORE IV: PRINCIPLES OF COMMUNICATION SYSTEMS**	**SEMESTER – II**

Course Objectives:

The Course aims

- To understand the fundamentals of Electronic communication, Modulation schemes, transmitters and receivers.
- To get familiarize with recent technologies in communication field.

Credits:4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction to Electronic Communication:** Communication Systems- Types of Electronic Communication -Modulation and Multiplexing: Baseband Transmission –Broad band Transmission- Multiplexing- The Electromagnetic Spectrum-The Optical Spectrum-Bandwidth- A Survey of Communication Applications- Jobs and Careers in the Communication Industry.	**10**	**CO1**
II	**Amplitude Modulation Fundamentals**: AM Concepts-Modulation Index and Percentage of Modulation- Over modulation and Distortion- Percentage of Modulation-Sidebands and the Frequency Domain-AM Power.	**10**	**CO2**
III	**Single-Sideband Modulation**: DSB Signals- SSB Signals-Disadvantages of DSB and SSB-Signal Power Considerations. Modulators and Demodulators: Diode AM Modulators- Diode AM Detectors- Generating SSB using Filter Method – DSB and SSB Demodulation.	**10**	**CO3**
IV	**Fundamentals of Frequency Modulation**: Basic Principles of Frequency Modulation- Principles of Phase Modulation-Modulation Index and Sidebands -FM Signal Bandwidth – Varactor FM Modulator- Varactor PM Modulator- Slope Detector.	**10**	**CO4**
V	**Communication Receivers:** Communication Receivers- The Simplest Receiver Configuration- Superheterodyne Receivers-	**10**	**CO5**

	Direct Conversion Receivers- Software-Defined Radio.		
Text Book			
1.	*Louis, E. Frenzel.Jr*. 2007. **Principles of Electronic communication systems.** [Fourth Edition]. McGraw Hill, United States.		
Reference Books			
1.	*George Kennedy and Bernard Davis.* 2008. **Electronic Communication Systems. [**Fourth Edition]. Tata McGraw Hill, New Delhi		
2.	*Robert, J. Schoenbeck.* 1992. **Electronic Communications.** [Second Edition]. Universal Book Stall, New Delhi.		
3.	*Dennis Roddy and Jhon Coolen.* 2011. **Electronic Communications. [**Fourth Edition]. Pearson, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	acquire the basic concepts of electronic communication including electromagnetic spectrum and modulation.
CO2	comprehend the working principles of amplitude modulation fundamentals, sidebands and power consumption.
CO3	identify the constrains in implementing the single-sideband modulation, signals, power considerations and modulators and demodulators.
CO4	understand the fundamentals of FM and PM.
CO5	evaluate the detailed operation of communication Receivers such as superheterodyne Receivers, direct Conversion Receivers and software-defined radio.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	M	M
CO2	L	L	L	M	M
CO3	L	M	L	L	L
CO4	H	M	M	M	L
CO5	L	M	M	M	H

H-High; M-Medium; L-Low

18UMAECA201	**ALLIED II: NUMERICAL METHODS**	**SEMESTER II**

Course Objectives:

The Course aims

- To provide a basic knowledge in Numerical Solution for Algebraic and Transcendental Equations.
- To introduce the methods for Interpolation.
- To solve integration using Numerical methods.

Credits: 4		**Total Hours: 50**	
UNIT	**CONTENTS**	**Hrs**	**CO**
I	**The solution of Numerical Algebraic and Transcendental Equations**: Bisection Method –Iteration Method – Regula-Falsi Method – Newton-Raphson Method. **(Chapter – 3 Sections: 3.1 – 3.4)**	**10**	**CO1**
II	**Solution of Simultaneous Linear Algebraic Equations**: Introduction - Gauss Elimination Methods - Gauss Jordan method – Inversion of a matrix using Gauss Elimination method – Iterative method – Gauss-Jacobi - Gauss Seidal method of iteration. **(Chapter – 4 Sections: 4.1 – 4.3, 4.7 - 4.9)**	**10**	**CO2**
III	**Finite Differences**: Forward Difference – Backward Diffference. **Interpolation (for Equal Intervals):** Newton forward interpolation formula and backward interpolation. **(Chapter – 5 Sections: 5.1 – 5.2) (Chapter – 6 Sections: 6.1 – 6.6)**	**10**	**CO3**
IV	**Central Difference Interpolation Formulae (for Equal Intervals):** Central Differences and Central Differences Table – Central Difference Interpolation formula – Gauss forward interpolation formula – Gauss backward interpolation formula – Stirling's formula. **(Chapter – 7 Sections: 7.1 – 7.5)**	**10**	**CO4**
V	**Numerical Integration:** Trapezoidal rule – Simpson's one-third	**10**	**CO5**

	rule – Simpson's three-eighth rule. **Numerical Solution of Ordinary Differential Equations:** Euler's method – Improved Euler Method – Modified Euler method – Runge-Kutta method - Second order Runge-Kutta method (for first order ODE). **(Chapter – 9 Sections: 9.9, 9.13, 9.14, Chapter – 11 Sections: 11.9 – 11.13)**		
Text Book			
1.	*Kandasamy, P., Thilagavathy, K., Gunavathi, K.* 2008. **Numerical Methods.** [First Edition]. S. Chand & Company Ltd, New Delhi.		
Reference Books			
1.	*Dr. M.K. Venkataraman,* 2007. **Numerical Methods in Science and Engineering** [Fifth Edition]. The National Publishing Company, Chennai.		
2.	*Dr. V.N. Vedamurthy, D.N. Ch. and S.N. Iyengar,* 2011. **Numerical Methods.** Vikas Publishing House Private Limited, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	Find solution of algebraic and transcendental equations
CO2	Solve system of linear equations
CO3	Interpolate unknown values from known values
CO4	Know numerical methods of solving differential equations
CO5	Find the solution of the integral equations

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	M	L	L	L
CO 2	H	M	M	L	M
CO 3	H	M	M	L	M
CO 4	H	H	M	M	H
CO 5	H	H	M	M	H

H-High; M-Medium; L-Low

18UECMP201	**CORE PRACTICAL III: ELECTRONIC CIRCUITS LAB**	**SEMESTER - II**

Course Objectives:

The Course aims

- To provide exposure to the process of various types of amplifiers and oscillators.
- To implement the rectifier circuits using diodes.

Credits:2 **Total Hours: 30**

S.No	**EXPERIMENTS**	**Hrs**	**CO**
1.	Verification of Thevenin's theorem.	**3**	**CO1**
2.	Verification of Norton's theorem.	**3**	**CO1**
3.	Verification of Maximum power transfer theorem.	**3**	**CO1**
4.	Half wave and Full wave rectifier.	**3**	**CO2**
5.	Regulated power supply using Zener diode.	**3**	**CO2**
6	Regulated power supply using IC.	**3**	**CO3**
7	RC coupled amplifier.	**3**	**CO3**
8	Colpitt's oscillator.	**3**	**CO4**
9	Clipping and Clamping Circuits.	**3**	**CO5**
10.	Monostable Multivibrator	**3**	**CO5**

Reference Books

1. *Poorna Chandar,S and Sasikala,B. 2006*. **Electronics Laboratory Primer A Design Approach.** S.Chand, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	implement the concepts of network theorems using their equivalent circuits.
CO2	design and construct Half wave and Full wave rectifier.
CO3	construct a regulated power supply using integrated circuit.
CO4	understand the design process of amplifiers and oscillators.
CO5	generate required time delay for timers using a monostable multivibrator.

18UECMP202	**CORE PRACTICAL IV: COMMUNICATION LAB**	**SEMESTER - II**

Course Objectives:

The Course aims

- To develop skills in designing simple communication circuits
- To simulate various communication circuits using software.

Credits:2 **Total Hours: 20**

S.No.	**EXPERIMENTS**	**Hrs**	**CO**
1.	Study of AFO and CRO.	**3**	**CO1**
2.	AM Modulator.	**3**	**CO1**
3.	AM Demodulator.	**3**	**CO1**
4.	FM Modulator.	**3**	**CO2**
5.	Study of AM Radio Receiver	**3**	**CO2**
6	Study of FM Radio Receiver	**3**	**CO3**
7	AM Transmitter (Simulation)	**3**	**CO3**
8	FM Transmitter (Simulation)	**3**	**CO4**
9	AM Receiver (Simulation)	**3**	**CO5**
10.	FM Receiver (Simulation)	**3**	**CO5**

Reference Books

1. *Poorna Chandar,S and Sasikala,B. 2006*. **Electronics Laboratory Primer A Design Approach.** S.Chand, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	perform basic operations such as generate various waveforms and measurements using CRO.
CO2	understand the AM Modulator circuit and measure modulation index.
CO3	identify the various stages and track signals in AM Radio Receiver.
CO4	design AM & FM Transmitter through Simulation.
CO5	implement a superheterodyne AM & FM Receiver using Simulation.

18UVE201	VALUE EDUCATION II: ENVIRONMENTAL STUDIES	SEMESTER – II

Course Objectives:

The course aims

- To enable the students acquire knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.
- To implicate awareness among young minds for safeguarding environment from manmade disasters.

Credits: 2 **Total Hours: 30**

UNIT	CONTENTS	Hrs	CO
I	Environment– Definition– Scope– Structure and function of ecosystems- producers, consumers and decomposers- Energy flow in the ecosystem- Ecological succession– food chain, food webs and ecological pyramids– Concept of sustainabledevelopment.	06	CO1
II	Natural resources: Renewable- air, water, soil, land and wildlife resources. Non–renewable – Mineral coal, oil and gas. Environmental problems related to the extraction and use of natural resources.	06	CO2
III	Biodiversity– Definition– Values– Consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of bio diversity– conservation of bio- diversity: in– situ Ex– situ. Bio– wealth - National and Global level.	06	CO3
IV	Environmental Pollution :Definition– causes, effects and mitigation measures– Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution– Nuclear hazards – Solid wastes acid rain–Climate change and global	06	CO4

	warming environmental laws and regulations in India– Earth summit		
V	Population and environment – Population explosion – Environment and human health – HIV/AIDS – Women and Child welfare – Disaster Management - Resettlement and Rehabilitation of people, Role of information technology in environmental health – Environmental awareness.	**06**	**CO5**
Text Book:			
1.	Department of Biochemistry. Environmental Studies (Study Material). Published by K.S.Rangasamy College of Arts & Science (Autonomous). Tiruchengode.		
Reference Book:			
1.	*Erach Bharucha*. 2005. **Textbook of Environmental studies**. Universities press. PVT. Ltd.		

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO1	Describe the types of ecosystem and concepts in sustainable development.
CO2	Explain the importance of natural resources and environmental problems
CO3	Recite about the biodiversity, hot spots of biodiversity and its conservation
CO4	Be conscious on the effects of pollution and population explosion
CO5	Implement the preventive measures for environmental issues

18UTALA301	TAMIL – III: காப்பியம் - சிற்றிலக்கியம்	பருவம் - 3

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

1. தமிழ்க் காப்பியங்கள் தோற்றத்தையும்,காப்பிய இலக்கணத்தையும் காப்பியவகைகளையும் அறிமுகம் செய்தல்.
2. சிற்றிலக்கியங்கள் தோற்றம்,வளர்ச்சிநிலைகளையும்,சிற்றிலக்கியங்களையும் அறிமுகம் செய்தல்.
3. பகுபதஉறுப்புக்களைக் கற்பித்தல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	காப்பியங்கள் - சிலப்பதிகாரம் - வழக்குரைகாதை மணிமேகலை - மலர்வனம் புக்ககாதை.	10	CO1
II	பிறகாப்பியங்கள் - கம்பராமாயணம் - குகப் படலம் பெரியபுராணம் - இளையான்குடிமாறநாயனார் புராணம்.	10	CO2
III	சிற்றிலக்கியங்கள் - குற்றாலக் குறவஞ்சி– வசந்தவல்லியின் காதல் **(1-10 பாடல்)** கலிங்கத்துப் பரணி - பேய்களைப் பாடியது.	10	CO3
IV	இலக்கியவரலாறு - காப்பியங்கள் - ஐம்பெருங்காப்பியங்கள் - ஐஞ்சிறுகாப்பியங்கள் -புராணங்கள் - சிற்றிலக்கியங்கள்.	10	CO4
V	இலக்கணமும் மொழிப்பயிற்சியும் - பகுபதஉறுப்பிலக்கணம் - சீர் வகைகள் - வழூஉச் சொற்கள் - கடிதம் எழுதுதல்.	10	CO5

Text Book:

1.	தமிழ்த்துறைவெளியீடு,கே.எஸ்.ரங்கசாமி கலை அறிவியல் கல்லூரி(தன்னாட்சி), திருச்செங்கோடு-637 215.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO1	இரட்டைக் காப்பியங்களின் மேன்மைநிலையை உணர்தல்.
CO2	காப்பியக்காலகுடிகளின் நிலையை,உரிமையைஉணர்தல்.
CO3	சிற்றிலக்கியங்களின் சிறப்பை உணர்தல்.
CO4	காப்பிய,சிற்றிலக்கியங்களின் வரலாறு குறித்த செய்திகளைஅறிதல்.
CO5	இலக்கணம் மற்றும் மொழிப்பயிற்சியின் அமைப்பை உணர்தல்.

18UENLA301	FOUNDATION ENGLISH – III	SEMESTER – III

Course Objectives:

The course aims:

- To enable the students to develop their comprehensive skill.
- To promote language skills through literature.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I & II	**ONE ACT PLAY** A. Ball - The Seven Slaves **PROSE** Somerset Maugham - Mr. Know –All **GRAMMAR** Degrees of Comparison **COMPOSITION** Advertisement **COMMUNICATION SKILLS** Speaking About Oneself The Media	**20**	**CO1 & CO2**
III & IV	**ONE ACT PLAY** R.H. Wood - Post Early for Christmas **PROSE** Satyajit Ray - Film Making **GRAMMAR** Determiners **COMPOSITION** Resume Writing **COMMUNICATION SKILLS** Imagining	**20**	**CO3 & CO4**

	Context specific expression - Master of Ceremonies		
V	**PROSE** Isai Tobolsky - Not Just Oranges **GRAMMAR** Reported Speech **COMPOSITION** Precise Writing **COMMUNICATION SKILLS** Inviting Personalities.	**10**	**CO5**
Text Books:			
1.	*G.Damodar, D.Venkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli.* 2009. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad –500 029.		
2.	*Ramamurthy.K.S. 1984.* **Seven-Act Plays**. Published in India by Oxford University. New Delhi–110 001.		
3.	*Sasi Kumar V and Syamala V*. 2006. **Form and Function - A Communicative Grammar for Colleges.** Emerald Publishers. Chennai–600 008.		
4.	*T.M.Farhathullah.* 2006. **Communication Skills For Undergraduates**. Publishers-RBA Publications. Chennai–600 015.		
Reference Books:			
1.	*Raymond Murphy*. 1994. **Intermediate English Grammar.** Cambridge University India Pvt. Ltd, Delhi.		

COURSE OUTCOMES (CO)

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

CO1	Know the different parts of genres in English
CO2	Trace the famous authors of English
CO3	Enrich their grammar knowledge
CO4	Stimulate their writing skills
CO5	Deserve appreciation for their communication

18UECM301	CORE V: MICROPROCESSOR AND INTERFACING	SEMESTER –III

Course Objectives:

The course aims

- To understand the features and applications of 8085 microprocessor with details on the internal architecture and develop assembly language programming.
- To exploit the abilities for the design and peripheral interfacing with real time domains.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**8085 Microprocessor Architecture:** Introduction-Microprocessor-The 8085 MPU- The 8085 Microprocessor Bus timings- A Detailed Look at the 8085 Architecture-Demultiplexing the Bus AD_7-AD_0 Generating Control Signals-Decoding and Executing Instruction-The 8085 Machine Cycle and Bus Timings-Opcode Stack and Subroutines Fetch Machine Cycle-Memory Read Machine Cycle.	10	CO1
II	**Introduction to 8085 Instructions and Programming Techniques:** Instruction format- Addressing modes-Data Transfer Instructions – Arithmetic Instructions – Logical Instructions – Branching Instructions-Machine Control Instructions- Programming Techniques: Looping, Counting, and Indexing. Interrupts-interrupt priority.	10	CO2
III	**Counters and Time Delays:** Counters and Time Delays: Time Delay Using One Register-Register Pair-Loop within a Loop Technique-Hexadecimal Counter-Zero-to-Nine (Modulo Ten) Counter- Stack-Subroutines-Advanced Subroutine Concepts.	10	CO3
IV	**General Purpose Programmable Peripheral Devices:** Block Diagram of the 8255A- I/O Mode - BSR Mode - block diagram of the 8254-Block Diagram of 8279- Direct Memory Access (DMA).	10	CO4

V	**Applications of Microprocessor:** LED Interface-Seven segment display interface-D/A converter interface-A/D converter interface -Temperature controller-Data transfer Methods: Asynchronous data transfer. Serial I/O –Basic concepts-Software-Controlled Asynchronous Serial I/O.	**10**	**CO5**
Text Book			
1.	*Ramesh, S. Gaonkar.* 2006. **Microprocessor Architecture Programming and Application with 8085/8080A.** [Fifth Edition]. Penram Publications, New Delhi.		
Reference Books			
1	*Srinath,. N.K.* 2005. **8085 Microprocessor Programming and Interfacing** [First Edition]. PHI India, New *Delhi*.		
2.	*Douglas,V.Hall.* 2003. **Microprocessors and interfacing: Programming and Hardware**. [Second Edition]**,** Tata McGraw Hill, New Delhi.		
3.	*Vijayendran, V.* 2011. **Fundamentals of Microprocessor 8085 (Architecture, Programming & Interfacing)** Viswanathan.S. (Printers & Publishers) Pvt. Ltd., Chennai.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the evolution of processor and 8085 architectures, pin functions and bus timing.
CO2	compare the instruction formats and write the assembly language program with looping techniques.
CO3	compute and design time delay programs and counters.
CO4	investigate the 8255 interfacing with 8085 microprocessor and various other peripherals and programmable devices.
CO5	design and develop optical display interface, data control and converter

	applications.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	M
CO2	M	M	M	L	L
CO3	M	M	L	L	L
CO4	L	M	H	H	H
CO5	L	M	H	H	H

H-High; M-Medium; L-Low

18UCSECA301	**ALLIED III: PROGRAMMING IN C (For the students of Electronics and Communication)**	**SEMESTER - III**

Course Objectives:

The course aims

- Basic principles of Programming using C.
- How to solve the given problem in the form of coding by using C?

Credits: 2 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Overview of C:** History of C – Importance of C–Sample Programs – Basic Structure of C Programs – Executing a 'C' program. **Constants, Variables, and Data Types:** Introduction - Character Set - C Tokens – Keywords and Identifiers - Constants - Variables - Data Types – Declaration of Variables – Declaration of Storage Class - Defining Symbolic Constants - Overflow and Underflow of Data. **Operators and Expressions**: Arithmetic Operators – Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators – Special Operators – Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators - Type Conversions in Expressions.	**10**	**CO1**
II	**Managing Input and Output Operations:** Reading a Character – Writing a Character - Formatted Input - Formatted Output. **Decision Making and Branching:** Decision making with IF statement – Simple IF statement – The IF…..ELSE statement – Nesting of IF…..ELSE statements– The ELSE IF Ladder – The Switch Statement– The?: Operator – The GOTO Statement - **Decision Making and Looping:** The WHILE statement–The	**10**	**CO2**

	DO statement–The FOR statement – Jumps in LOOPS.		
III	**Arrays:** Introduction–One – Dimensional Arrays – Declaration of One – Dimensional Arrays - Initialization of One – Dimensional Arrays– Two – Dimensional Arrays - Initializing Two – Dimensional Arrays – Multi – Dimensional Arrays – Dynamic Arrays. **Character Arrays and Strings** Declaring and Initializing String Variables - Reading Strings from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters - Putting Strings Together - Comparison of Two Strings – String Handling Functions.	**10**	**CO3**
IV	**User - defined Functions:** Need for User - Defined Function - A Multi - Function Program - Elements of User - Defined Function - Definition of Functions - Return Values and their Types - Function Calls - Function Declaration - Category of Functions - No Arguments and No Return Values – Arguments but No Return Values– Arguments with Return Values–No Arguments but Returns a Value– Functions that Return Multiple Values – Nesting of Functions - Recursion - Passing Arrays to Functions - Passing Strings to Functions – The Scope, Visibility and Lifetime of Variables. **Structures and Unions:** Defining a Structure - Declaring Structure Variables - Accessing Structure Members - Structure Initialization - Copying and Comparing Structure Variables – Operations on Individual Members - Array of Structures – Arrays within Structures – Structures within Structures - Structures and Functions - Unions - Size of Structures - Bit Fields.	**10**	**CO4**
	Pointers: Introduction- Understanding Pointers- Declaring Pointer Variable- Initialization of Pointer Variables- Accessing a	**10**	**CO5**

V	Variable through its Pointer- Pointers and Arrays- Pointers as Function Arguments- Pointers and Structures. **File Management in C:** Introduction– Defining and Opening a File – Closing a File - Input/output Operations on Files - Error Handling During I/O Operations - Random Access to Files - Command Line Arguments.		

Text Book:	
1.	*Balagurusamy,E*. 2009. **Programming in ANSIC.** [*Fourth Edition*]. TataMc - GrawHill, NewDelhi.
Reference Books:	
1.	*Yashavant P.Kanenetkar*.2012. **Let Us C**. [*12th Revised and Updated Edition*],BPB Publications,New Delhi
2.	*Dr.S.Ramasamy and P. Radha Ganesan.* 2014**. [***Second Edition***]** **Programming in C**. Sci Tech Publications, India Pvt. Limited
3.	*J.B.Dixit. 2011. [First Edition]*. **Basics of C Programming**. Laxmi Publications Pvt. Limited
4.	*Sukhendu Dey Debobrata Duffa.* 2013. **Complete Knowledge in C**. [*Second Reprint]*, Narosa Publishing House Pvt. Limited.
WEB REFERENCES:	
1.	https://www.tutorialspoint.com
2.	https://www.w3schools.in/c-tutorial
3.	https://studytonight.com
4.	https://programming simplified.com
5.	https://cprogramming.com

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	Know the basic terminology of C Programming
CO2	Develop programs using control structures
CO3	Understand the Arrays and String handling functions
CO4	Understand the various categories of functions and structures
CO5	Develop the program using file concepts

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	H	M	H
CO2	M	M	H	M	H
CO3	M	M	H	M	H
CO4	M	M	H	M	H
CO5	M	M	H	M	H

H-High; M-Medium; L-Low

18UECMP301	**CORE PRACTICAL V: MICROPROCESSOR AND INTERFACING LAB**	**SEMESTER –III**

Course Objectives:

The Course aims

- To understand the arithmetic and array functions using assembly language programming.
- To apply the peripheral interfacing methods with real time control applications.

Credits:2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
1.	8-bit Addition and Subtraction.	**3**	**CO1**
2.	8-bit Multiplication and Division.	**3**	**CO1**
3.	16- Bit Addition and Subtraction.	**3**	**CO1**
4.	Finding Maximum / Minimum numbers in an array.	**3**	**CO2**
5.	Ascending / Descending order of an array.	**3**	**CO2**
6	ADC Interfacing.	**3**	**CO3**
7	DAC Interfacing.	**3**	**CO3**
8	LED Interfacing	**3**	**CO4**
9	Seven Segment Display Interfacing.	**3**	**CO4**
10.	Traffic light control.	**3**	**CO5**

Reference Books

1.	*Swami, G.T.* 2006. **Microprocessor 8085 Lab Manual.** [First Edition]. Firewall media, New Delhi.
2.	*Douglas,V.Hall.* 2003. **Microprocessors and interfacing: Programming and Hardware**. [Second Edition]**.** Tata McGraw Hill, New Delhi.
3.	*Srinath, N.K.* 2005. **8085 Microprocessor Programming and Interfacing.** [First Edition]. PHI India, New *Delhi*.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	write Assembly language Program for Arithmetic operations.
CO2	identify number sequence for array functions.
CO3	design programs for data conversion applications.
CO4	interface programmable peripherals with help of look up tables.
CO5	manipulate and develop the message display for optical devices.

18UCSECAP301	**ALLIED PRACTICAL I: PROGRAMMING IN C (For the students of Electronics and Communication)**	**SEMESTER - III**

Course Objectives:

The course aims

- To acquire the knowledge of C language.
- To develop basic programming skills.

Credits: 2 **Total Hours: 24**

S.No.	PROGRAMS	Hrs	CO
1.	Program to Find the Sum of N Natural Numbers.	**2**	**CO1**
2.	Program to Check whether a Given Number is Prime or Not.	**2**	**CO2**
3.	Program to Find the Roots of Quadratic Equation.	**2**	**CO2**
4.	Program to Reverse the Given Number	**2**	**CO3**
5.	Program to Sort the Given Numbers in Ascending or Descending Order.	**2**	**CO3**
6.	Program to Generate Fibonacci Series.	**2**	**CO3**
7.	Matrix Manipulation a. Program to Perform Matrix Addition. b. P r o g r a m to Perform Matrix Subtraction. c. Program to Perform Matrix Multiplication. d. Program to Perform Matrix Transpose.	**2**	**CO3**
8.	String Handling a. Program to Reverse a Given String. b. Program to Check whether the Given String is Palindrome or Not.	**2**	**CO4**
9.	Program to Find the Factorial using Recursion.	**2**	**CO4**
10.	Program to Implement the Concept of Structures.	**2**	**CO4**
11.	Program to Implement the Concept of Union.	**2**	**CO4**
12.	Program for Random File Organization.	**2**	**CO5**

WEB REFERENCE:	
1.	https://www.tutorialspoint.com
2.	https://www.w3schools.in/c-tutorial
3	https://studytonight.com
4	https://programming simplified.com
5	https://cprogramming.com

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to::

CO1	Develop simple programs
CO2	Implement various control structures
CO3	Develop program using Arrays
CO4	Implement Function , Structure and Union concepts
CO5	Develop program using files

18UECSBCP301	SBC I: CIRCUIT SIMULATION LAB	SEMESTER –III

Course Objectives:

The Course aims

- To learn the practical skills to design printed circuit boards.
- To perform simulation of various Analog/Digital circuits using software.

Credits:2 **Total Hours: 20**

S.No	Experiments	Hrs	CO
1.	PCB Layout design	**3**	**CO1**
2.	PCB Layout printing and Etching.	**3**	**CO1**
3.	LED on/off using Transistor.	**3**	**CO2**
4.	Blinking LED using 555 timer	**3**	**CO2**
5.	5V power supply	**3**	**CO3**
6	AC-DC converter.	**3**	**CO3**
7	DC motor speed control using SCR	**3**	**CO4**
8	Touch switch	**3**	**CO4**
9	Fan regulator using DIAC	**3**	**CO4**
10.	Automatic solar powered street light	**3**	**CO5**

Reference Books

1.	*Walter C Bosshart*, 1996, **Printed Circuit Boards Design and Technology** [First Edition]**.** Tata Mcgraw-Hill, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	perform different aspects of PCB design.
CO2	create simple circuits using ICs.
CO3	design power circuits for various applications.
CO4	analyze different waveform in designing of AC-DC converter.
CO5	develop power control circuits.

18ULS301	**CAREER COMPETENCY SKILLS – I**	**SEMESTER – III**

Course Objectives:

The course aims

- To understand the basic needs of Communication
- To utilize the communication skills for achieving at the time of Interview

Total Hours: 15

UNIT	CONTENTS	Hrs	CO
I	Basic Grammar – Usage of English – Listening and Speaking (Level-1) Tenses and Voices (Present, Past and Future)	**3**	**CO1**
II	Sentence Correction – Sentence Pattern - Reading Comprehension (Level -1)	**3**	**CO2**
III	Expansion of Proverbs – Closet Test (Level -1)	**3**	**CO3**
IV	Sentence Improvement (Essay Writing, Now- a –Days Vocabulary), Story Writing	**3**	**CO4**
V	E-Mail Building (Sending call letters), Letters (Formal and Informal)	**3**	**CO5**

Text Books:

1.	*Anne Seaton, Mew Y. H.* **Basic English Grammar for English-Book 1.** Learners Saddle point Publishers.
2.	*Mark Newson.* **Basic English Syntax with Exercises.** (E-Copy)

Reference Book:

1.	*Chand S, Agarwal R. S.* **Objective General English.** Arihant Publications (India) Limited.

COURSE OUTCOMES (CO)

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

CO1	Recall the basic grammar in English
CO2	Concentrate on Sentence Correction
CO3	Understand Paragraph Writing
CO4	Improve the ability of Sentence Construction and Story Writing
CO5	Format Web Writing and Formal Writing of letters.

18UTALA401	**TAMIL – IV: சங்க இலக்கியம் - நீதி இலக்கியம்**	**பருவம் - IV**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன :

1.சங்க இலக்கியம், அற இலக்கியங்களின் சிறப்பைஉணர்த்துதல்.

2.இலக்கண நூல்களைகாலவரிசைப்படிஅறியச் செய்தல்.

3.அணி இலக்கணத்தின் சிறப்பைஉணரச் செய்தல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**எட்டுத்தொகை** அ.நற்றிணை–அன்னாய் வாழிப்பத்து (பாடல் எண். 208, 209, 210) ஆ. குறுந்தொகை–யாயும் ஞாயும் (பாடல் எண்.40) இ. கலித்தொகை– ஆற்றுதல் என்பதொன். (பாடல் எண்.103) ஈ. புறநானூறு –பல்சான்றீரேபல்சான்றீரே (பாடல் எண்.195)	10	CO1
II	**பத்துப் பாட்டு** அ. குறிஞ்சிப்பாட்டு (1 முதல் 106 அடிகள் வரை) -கபிலர்	12	CO2
III	**அற இலக்கியங்கள்** அ. நாலடியார் -பாடல் எண் (35,59,94,141,333) ஆ. நான்மணிக்கடிகை - பாடல் எண் (04,09,59,69,80) இ. பழமொழி-பாடல் எண் (05,21,120,149,361) ஈ. சிறுபஞ்சமூலம் - பாடல் எண் (05,17,48,83,99)	10	CO3
IV	**இலக்கியவரலாறு** அ. சங்க இலக்கிய நூல்கள் அறிமுகம் ஆ. முச்சங்கவரலாறு இ. தமிழ் இலக்கண நூல்கள் அறிமுகம் ஈ. அற இலக்கியங்கள் அறிமுகம்	10	CO4
V	**இலக்கணம்** அ. அணி இலக்கணம் 1. உவமைஅணி 2. உருவகஅணி 3. வேற்றுமைஅணி 4. வஞ்சப்புகழ்ச்சிஅணி ஆ. அகத்திணைகள்,புறத்திணைகள் - விளக்கம்	08	CO5

Text Book:

1.	தமிழ்த்துறைவெளியீடு,கே.எஸ்.ரங்கசாமிகலைஅறிவியல் கல்லூரி(தன்னாட்சி), திருச்செங்கோடு– 637 215.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO1	எட்டுத்தொகை நூல்களின் சிறப்பை அறிதல்
CO2	பத்துப்பாட்டு நூல்களின் சுவை அறிதல்
CO3	அற இலக்கியங்கள் பற்றிஅறிதல்
CO4	இலக்கியங்கள் தோற்றமுறையை அறிதல்
CO5	அணி இலக்கணத்தின் பயன் பற்றிஅறிதல்.

18UENLA401	**FOUNDATION ENGLISH - IV**	**SEMESTER – IV**

COURSE OBJECTIVES:

The course aims:

- To promote communication skills through literature.
- To enhance the language learning through activities.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I & II	**ONE ACT PLAY** Monica Thorne - The King Who Limped **PROSE** A.G.Gardiner - On Shaking Hands **GRAMMAR** Punctuation **COMPOSITION** Hints Development **COMMUNICATION SKILLS** Breaking the Law Honoring the Person	20	CO1 & CO2
III & IV	**ONE ACT PLAY** Ella Adkins – The Unexpected **PROSE** Minoo Masani - No Man is an Island **GRAMMAR** Conditional Clause **COMPOSITION** Report Writing **COMMUNICATION SKILLS** Brain Storming	20	CO3 & CO4

V	**PROSE** Arnold Toynbee - India's Contribution to World Unity **GRAMMAR** Simple, Compound and Complex Sentences **COMPOSITION** Jumbled Sentences **COMMUNICATION SKILLS** Role-Play	**10**	**CO5**

Text Books:

1.	*Ramamurthy*.K.S. 1984. **Seven-Act Plays**. Published in India by Oxford University. New Delhi–110 001.
2.	*Damodar.G, D.Venkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli. 2009*.**English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad –500 029.
3.	*SasiKumarV and SyamalaV*. 2006. **Form and Function - A Communicative Grammar for Colleges.** Emerald Publishers. Chennai–600 008.
4.	*Farhathullah.T.M.* 2006. **Communication Skills for Undergraduates**. RBA Publications. Chennai–600 015.

Reference Books:

1.	*Raymond Murphy.* 1994. **Intermediate English Grammar.** Cambridge University India Pvt. New Delhi.

COURSE OUTCOMES (CO)

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

CO1	Understand the text on the basis of close reading analytically and critical views.
CO2	Ability to construct a sustained sophisticated and original argument on a specific topic.
CO3	Acquire language skills through composition.
CO4	Acquire both composition and communication skills.
CO5	Apply basic communication skills.

18UECM401	CORE VI : ICs AND APPLICATIONS	SEMESTER IV

Course Objectives:

The Course aims

- To understand the various steps of fabrication process of monolithic ICs.
- To design basic circuits using op-amp and perform operations.
- Identify grand challenges and directions for future research in the field of Nano materials.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Integrated Circuit fabrication:** Introduction and fundamentals of Monolithic IC technology – Basic planar processes: Silicon wafer preparation – Epitaxial growth – oxidation – Photolithography – Diffusion – Ion implantation – Isolation technique – Metallization – Fabrication of a circuit.	10	CO1
II	**Operational Amplifier:** Operational Amplifier – Ideal Operational Amplifier – Operational Amplifier Parameters - Inverting – Non Inverting Amplifier – Adder -Subtractor - Integrator – Differentiator.	10	CO2
III	**Non linear and analog system:** Comparator – Sample and Hold circuit – AC amplifier - Astable Multivibrator - Monostable multivibrator - Triangular wave generator – Sine Wave generator: Phase shift oscillator.	10	CO3
IV	**PLL and Timers :** Basic Principles – Phase Detector Comparator: Analog Phase detector - Digital Phase detector - Voltage Controlled Oscillator – Phase Locked Loop – PLL Applications – Frequency Multiplication and Division – 555 Timer (Astable and Monostable Multivibrator)-Schmitt Trigger.	10	CO4
V	**Nanotechnology:** Definition – The application – Infrared (IR)	10	CO5

	spectroscopy – Ultraviolet visible spectroscopy – Atomic Force Microscope (AFM) – Scanning Electron Microscope (SEM) – Transmission Electron Microscope (TEM).		
Text Books			
1.	*Roy chouchury Sahil Jain.D. 2003.* **Linear Integrated circuits** [Second Edition]– New age international, New Delhi (Unit - I to IV).		
2.	*Richard Booker, Earl Boysen. 2008.* **Nanotechnology** [First Edition] – Willey Publication India Pvt. Ltd, New Delhi (Unit – V).		
Reference Books			
1.	*Ramakant, A. Gayakwood. 1993.* **Op-amps and Linear integrated Circuits** [Third Edition] – Prentice Hall India, New Delhi.		
2.	*Pradeep.T.* 2007. **Nano: The Essentials understanding Nanoscience and Nanotechnology**- TMH, New Delhi.		
3.	*David, A. Johns and Ken Martin.* 2008. **Analog Integrated Circuit Design.** [First Edition]. Wiley India (P) Ltd., New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	acquire qualitative knowledge about the fabrication process *of* integrated circuit.
CO2	utilize operational amplifier as Adder, Subtractor, Integrator and Differentiator.
CO3	analyze and deign basic op-amp circuits, non-linear circuits, comparator, signal generators, and oscillator.
CO4	design circuits for various PLL applications and timers.
CO5	identify the principles of processing, manufacturing and characterization of Nanomaterials.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	H	M	L
CO2	M	H	L	M	L
CO3	M	H	M	L	M
CO4	H	H	M	M	L
CO5	L	L	H	H	H

H-High; M-Medium; L-Low

18UCSECA401	**ALLIED IV: PROGRAMMING IN JAVA (For the students of Electronics and Communication)**	**SEMESTER - IV**

Course Objectives:

The course aims

- To understand the fundamentals of Object Oriented Programming.
- To explore the programming skills using Java.

Credits: 4 **Total Hours:50**

UNIT	CONTENTS	Hrs	CO
I	**Java Evolution**: Java History – Java Features - How Java differs from C and C++ - Java and Internet – Java and World Wide Web - Web Browsers. **Overview of Java Language:** Simple Java program - Java program Structure - Java Tokens - Java Statements – Java Virtual Machine. **Constants, Variables and Data Types**: Constants - Variables - Data Types - Declaration of Variables –Giving values to variables - Scope of variables - Symbolic Constants - Type casting - Getting value of variables - Standard and default values.	**10**	**CO1**
II	**Operators and Expressions**: Introduction - Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators - Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic operators - Type conversions in Expressions - Operator Precedence and Associativity - Mathematical functions. **Decision Making and Branching:** Decision making with if Statement - Simple if Statement - The If..Else statement - Nesting of If..Else Statements - The Else If Ladder - The Switch Statement – The?: Operator. **Decision Making and Looping:** The while Statement - The do Statement - The for Statement - Jumps in Loops - Labeled Loops.	**10**	**CO2**

III	**Classes, Objects and Methods:** Introduction - Defining a Class - Fields Declaration - Methods Declaration - Creating Objects - Accessing Class Members – Constructors - Methods Overloading - Static Members - Nesting of Methods - Inheritance: Extending a Class - Overriding Methods - Final Variables and Methods - Final Classes - Finalizer Methods - Abstract Methods and Classes - Methods with Varargs - Visibility Control. **Arrays, Strings and Vectors:** Introduction – One - dimensional Arrays - Creating an Array - Two - dimensional Arrays–Strings – Vectors - Wrapper Classes - Enumerated Types. **Interfaces**: **Multiple Inheritances:** Introduction - Defining Interfaces - Extending Interfaces - Implementing Interfaces - Accessing Interface Variables. **Packages**: **Putting classes Together:** Introduction - Java API Packages - Using System Packages - Naming Conventions - Creating Packages - Accessing a Package - Using a Package - Adding a Class to a Package - Hiding Classes - Static Import.	**10**	**CO3**
IV	**Multithreaded Programming:** Introduction - Creating Threads - Extending the Thread Class - Stopping and Blocking a Thread - Life Cycle of Thread - Using Thread Methods - Thread Exception - Thread Priority - Synchronization - Implementing the 'Runnable' Interface. **Managing Errors and Exceptions:** Introduction - Types of Errors - Exceptions - Syntax of Exception Handling Code - Multiple Catch Statements - Using Finally Statement - Throwing Our Own Exceptions - Using Exception for Debugging.	**10**	**CO4**
	Applet Programming: Introduction –How Applets Differ from Applications - Preparing to Write Applets - Building Applet Code - Applet Life Cycle - Creating an Executable Applet -		

V	Designing a Web Page - Applet Tag - Adding Applet to HTML File - Running the Applet - More About Applet Tag - Passing Parameters to Applets - Aligning the Display - More about HTML Tags - Displaying Numerical Values - Getting Input from the User. **Managing Input/Output Files in Java**: Introduction - Concepts of Streams - Stream Classes – Byte Stream classes - Character stream classes - Using streams – Other Useful I/O Classes – Using the File Class – Input/Output Exceptions – Creation of Files – Reading / Writing Characters - Reading / Writing Bytes - Handling Primitive Data Types – Random Access Files.	**10**	**CO5**

Text Book	
1.	*Balagurusamy, E.* 2008**. Programming with Java – A Primer**. **[***Third Edition***]**.Tata McGraw Hill Education Pvt. Limited, New Delhi.
Reference Books	
1.	*C. Xavier***.** 2008**. Programming with Java 2.** [*Seventh Reprint*]. Scitech Publications India Pvt. Limited.
2.	*Yashavant P.Kanenetkar*.2012. **Let Us Java**. [*First Edition*], BPB Publications, New Delhi.
3.	*Mahesh P.Matha***.** 2011. **Core Java a Comprehensive Study**. Prentice Hall of India, New Delhi.
WEB REFERENCES:	
1.	http://www.tutorialpoint.com
2.	http://www.w3school.com
3.	http://java.sun.com

COURSE OUTCOMES (CO):

After the completion of the course, the student will be able to:

CO1	Understand the basic terminology of Java Programming
CO2	Develop programs using control structures
CO3	Able to understand the interfaces and packages
CO4	Understand the multithreaded programming and exceptions
CO5	Develop program using Applets and files

MAPPING:

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	L	M	L
CO2	M	H	M	H	H
CO3	M	M	M	M	H
CO4	M	M	M	M	H
CO5	M	H	M	H	H

H-High; M-Medium; L-Low

18UECMP401	**CORE PRACTICAL – VI: ICs AND APPLICATIONS LAB**	**SEMESTER IV**

Course Objectives:

The Course aims

- To design circuits using operational amplifier for various applications.
- To develop timer based circuits for various applications.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
1.	Inverting and Non Inverting amplifier using Op-Amp	**3**	**CO1**
2.	Adder and Subtractor using Op-Amp	**3**	**CO1**
3.	Differentiator using Op-Amp	**3**	**CO1**
4.	Integrator using Op-Amp	**3**	**CO1**
5.	Astable Multivibrators using Op-Amp	**3**	**CO1**
6	Monostable Multivibrators using Op-Amp	**3**	**CO1**
7	Astable Multivibrators using 555 timer	**3**	**CO2**
8	Monostable Multivibrators using 555 timer	**3**	**CO2**
9	Schmitt Trigger using 555 Timer.	**3**	**CO2**
10.	Waveform Generator using 555 Timer.	**3**	**CO3**

Reference Books

1.	*Roy chouchury Sahil Jain.D. 2003.* **Linear Integrated circuits** [Second Edition]–New age international, New Delhi.
2.	*Poorna Chandar,S and Sasikala,B. 2006*. **Electronics Laboratory Primer A Design Approach.** S.Chand, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	design operational amplifier based circuits.
CO2	design timer based circuits.
CO3	develop waveform generation circuits.

18UCSECAP401	**ALLIED PRACTICAL III: PROGRAMMING IN JAVA (For the students of Electronics and Communication)**	**SEMESTER - IV**

Course Objectives:

The course aims

- Demonstrate the competency in the use of object oriented programming in Java.
- Utilize Java SDK environment to create, debug and run simple Java programs.

Credits: 2 **Total Hours: 20**

S.No.	PROGRAMS	Hrs	CO
1.	Program using Control Statements (IF and Looping Statements).	2	CO1
2.	Program for Array using Command Line arguments.	2	CO1
3.	Program using Class and Object.	2	CO1
4.	Program using Inheritance and Overriding.	2	CO2
5.	Program for creating User Defined Package.	2	CO3
6.	Program using Interface concept.	2	CO3
7.	Program for Exception Handling.	2	CO4
8.	Program for Multithreading.	2	CO4
9.	Program using Applet.	2	CO5
10.	Program using Files.	2	CO5

WEB REFERENCES:

1.	http://www.tutorialpoint.com
2.	http://www.w3school.com
3.	http://java.sun.com

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	Able to build programs using control statements and arrays
CO2	Develop programs using inheritance and overloading
CO3	Able to build programs using interfaces and packages
CO4	Develop programs to handle exceptions
CO5	Able to build program using Applets and files

18UECSBC401	SBC II: CONSUMER ELECTRONICS (100% INTERNAL EVALUATION)	SEMESTER – IV

Course Objectives:

The Course aims

- Know penetration of electronics applications in various fields of society.
- Appreciate influence of electronics in entertainment, automobile and consumer applications.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Audio Devices:** Microphones- Moving coil microphones- Wireless microphones- Headphones and Headsets- Types of Headphones- Hearing aids-Basic Loudspeaker- Crystal Loudspeaker-Woofers- Theatre Sound Reproduction System.	05	CO1
II	**Remote Control:** Ultrasonic Transducers-Frequency signal encoding-PPM encoding-Ultrasonic transmitter - Troubleshooting remote control system.	05	CO2
III	**Consumer Electronics:** Microwave Woven-Principle-Washing Machine- Electronic Controller-Air conditioner-Refrigerator- Set-Top Boxes- Digital Cable TV- Video on Demand vs Pay per View	05	CO3
IV	**Domestic Electronics:** Facsimile-Block Diagram- Operation-Xerography-Digital Clock- Calculators –Structure and Internal Organisation-Bar Codes-Automated Teller Machines (ATMs)	05	CO4
V	**Automobile Electronics:** Need of Electronics in Automobiles-Antilock Braking System (ABS) - Instrument panel displays-Ultrasonic Car safety belt system-Air bag system-Vehicle Proximity Detection System- Satellite based Car Navigation Systems.	05	CO5

Text Book

1.	*Bali,S.P.* 2007**. Consumer Electronics. [**First Edition**].** Pearson Education, New Delhi.

Reference Books	
1.	*Chitode. J .S*. 2007. **Consumer Electronics. [**First Edition**].** Technical Publication, Pune**.**
2.	*Philip Hoff and Philip Herbert Hoff*. 2010. **Consumer Electronics for Engineers. [**First Edition**].** Cambridge University Press, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the principle of various electronic audio devices
CO2	understand the characteristic of the remote control system.
CO3	identify the electronic gadgets for consumer applications.
CO4	demonstrate the impact of electronics in domestic applications.
CO5	apply the concepts in automobile applications.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	M	L
CO2	H	H	L	M	L
CO3	H	M	L	M	L
CO4	L	M	M	M	M
CO5	H	H	M	M	L

H-High; M-Medium; L-Low

18ULS401	CAREER COMPETENCY SKILLS – II	SEMESTER – IV

Course Objectives:

The course aims

- To impart knowledge on the aptitude skills.
- To enhance employability skills and to develop career competency.

Total Hours: 15

UNIT	CONTENTS	Hrs	CO
I	Aptitude: Speed Maths - Multiplication of Numbers - Simplification - Squaring of numbers - Square roots and cube roots – HCF & LCM –Decimals - Averages, Powers and Roots.	**3**	**CO1**
II	Aptitude: Problems on Numbers – Problems on Ages – Surds & Indices – Percentage – Profit & Loss – Ratio & Proportion – Partnership – Chain Rule.	**3**	**CO2**
III	Aptitude: Simple & Compound Interest – Alligation or Mixture - Permutation and Combination.	**3**	**CO3**
IV	Aptitude: Probability – Missing Number series – Wrong Number Series – Races & Games of Skill.	**3**	**CO4**
V	Aptitude: Time & Work – Pipes & Cistern – Time & Distance – Problems on Trains – Boats and Streams.	**3**	**CO5**

Text Book:

1.	*R.S. Aggarwal.* 2017. **Quantitative Aptitude**, *S Chand and Company Limited, New Delhi.*

Reference Book:

1.	*Abhijith Guha.* 2015. **Quantitative Aptitude for Competitive Examinations**, *5th Edition, Tata McGraw Hill, New Delhi.*

COURSE OUTCOMES (CO)

After the completion of the course, the students will be able to :

CO1	Carry out mathematical calculations using shortcuts.
CO2	Calculate problems on age, surds and indices with shortcuts
CO3	Understand the core concepts of SI and CI, Permutation and Combination.
CO4	Obtain knowledge on shortcuts to calculate number series.
CO5	Perform new methods for aptitude calculations.

18UECCSA301	**ALLIED – III: DIGITAL ELECTRONICS & MICROPROCESSOR (For the students of Computer Science)**	**SEMESTER-III**

Course Objectives:

The Course aims

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To introduce students with the architecture and operation of typical microprocessor.
- To familiarize the students with the programming and interfacing of microprocessor.

Credits:3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Number Systems:** The decimal number system- The binary number system-Binary to Decimal conversion –Decimal to binary conversion-Octal number system-Octal to decimal conversion-Decimal to octal conversion-Octal to binary conversion-Binary to octal conversion- Hexa decimal number system- Hexa decimal to binary conversion-Binary to hexa decimal-Hexadecimal to decimal conversion-Decimal to hexadecimal conversion-Hexa decimal to octal conversion-Octal to hexadecimal conversion-Excess-3 code-Gray code.	**10**	**CO1**
II	**Arithmetic operations & Logic Gates:** Binary Addition-Binary subtraction-Binary Multiplication- Binary division- 1's complement-2's complement-Logic gates: AND–OR-NOT-NOR-NAND-EX-OR-EX-NOR-RS Flip flop-D-Flip flop-JK Flip flop.	**10**	**CO2**
III	**Microprocessor:**Introduction-Microprocessors-Microcomputers-8085 programming model: Registers- Accumulator-Flags-Program counter-Stack pointer-Address bus-Data bus-control bus-memory-The 8085 microprocessor-Generating control	**10**	**CO3**

	signals-8085 Architecture.		
IV	**Introduction to 8085 instruction:** Data transfer operations-Arithmetic operations-Logic operations-Branch operations-Machine control instructions-Rotate instructions-Addressing modes-stack-subroutine-Advanced subroutine concepts-Assembly language program for 8-bit Addition, subtraction, multiplication and Division.	**10**	**CO4**
V	**Microprocessor Applications:** Scanned multiplexed displays (LED)-Interfacing a liquid crystal display (LCD)-Interfacing a matrix keyboard-Memory design-EPROM memory.	**10**	**CO5**
Text Books			
1.	*Basavaraj,.B.* 1998. **Digital Fundamentals.** [First Edition].Vikas Publications House Private Limited, New Delhi.		
2.	*Ramesh, S. Gaonkar.* 2006. **Microprocessor Architecture Programming and Application with 8085/8080A.** [Fifth Edition]. Penram Publications, New Delhi.		
Reference Books			
1.	*Donald,P.Leach, Albert Paul Malvino and Goutam Saha.* 2008. **Digital Principles and Applications.** [Sixth Edition]. Tata Mc Graw Hill, New Delhi.		
2.	*Tokheim.* 2004. **Digital Electronics Principles and Applications.** [Sixth Edition]. Tata Mc Graw Hill, New Delhi.		
3.	*Douglas,V.Hall.* 2003. **Microprocessors and interfacing: Programming and Hardware**.[Second Edition]**,** Tata McGraw Hill, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the structure of various number systems and its application in digital design.
CO2	acquire the fundamental concepts and techniques used in digital electronics.
CO3	examine the units in microcomputer based system.
CO4	apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
CO5	design real world applications using 8085 microprocessor.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	L
CO2	H	M	L	M	L
CO3	H	H	M	L	L
CO4	M	M	L	L	L
CO5	H	H	M	H	M

H-High; M-Medium; L-Low

18UECCSA401	**ALLIED-IV: INTERNET OF THINGS (For the students of Computer Science)**	**SEMESTER – IV**

Course Objectives:

The Course aims

- To understand how multiple smart electronic devices can connect themselves together through internetworking.
- To aquire the fundamentals of designing, programming and configuring devices for the smart infrastructure development and maintenance.

Credits:3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Internet of Things:** IoT Definition – Vision – Smart and Hyper connected devices – IoT Conceptual framework – IoT Architectural view – Technology behind IoT.	10	CO1
II	**Sources for IoT:** Development boards – RFID- WSN- M2M Communication. Examples of IoT: Wearable smart watch- Smart home- Smart cities. Design Principles for Connected devises- IoT/M2M Systems layers – Design Standardization.	10	CO2
III	**Sensors for IoT:** Introduction - Sensor Technology – Participatory Sensing – Industrial IoT – Automotive IoT – Basics of Actuator – Sensor data communication Protocols – Radio Frequency Identification Technology.	10	CO3
IV	**Prototyping the Embedded devices for IoT and M2M :** Introduction - Embedded computing basics – Embedded platforms for prototyping . Prototyping and designing the software for IoT applications: Introduction – Prototyping embedded device software.	10	CO4
V	**IoT case studies (Quantitative study):** IoT application in Premises – IoT application in connected car and services – IoT application in environment monitoring – IoT applications in	10	CO5

	Agriculture.		
Text Book:			
1.	*Raj Kamal*. 2017. Internet of Things- **Architecture and design principles.** [First Edition]. Mc Grawhill Education, Chennai.		
Reference Book:			
1.	*Rajkumar Buyya, Amir Vahid Dastjerdi*. 2016. Internet of Things: Principles and Paradigms. Morgon Kaufmann- Elsevier Publications.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the basic principles, requirements, functions and system architecture of IoT.
CO2	design IoT development boards and devises for RFID, WSN and M2M communication.
CO3	choose sensors for Industrial and Automotive IoT, configure data communication Protocols.
CO4	prototype embedded devices for IoT and M2M , embedded platforms and design software for IoT applications.
CO5	analyze the functioning of IoT applications in smart premises, connected car, environment monitoring and agriculture through quantitative case studies.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	L
CO2	H	H	L	M	L
CO3	M	H	M	M	M
CO4	H	M	M	M	M
CO5	M	M	M	H	H

H-High; M-Medium; L-Low

18PECPHI301	INTER DISCIPLINARY COURSE II: MODERN BIOMEDICAL INSTRUMENTATION	SEMESTER – III

COURESE OBJECTIVES:

The course aims

- To impart knowledge on the human physiological systems, operation theatre and medical imaging equipments.
- To impart basic knowledge on modern instruments used in biomedical field, their construction and working.

Credits: 4 **Total Hours**: **40**

UNIT	CONTENTS	Hrs	CO
I	**Human physiological systems:** Cells and their structures – Nature of cancer cells -Transport of ions through cell membrane - Resting and action potential - Bioelectric potentials – Different systems of human body.	8	CO1
II	**Electrodes and transducers:** Components of the biomedical instrument system- Electrodes: Microelectrodes - Depth and Needle electrodes - Surface electrodes - Half cell potential – Transducers: Active and Passive.	8	CO2
III	**Biopotential recorders:** Electrocardiography (ECG) - Lead configuration - Recording setup - Electroencephalogram (EEG) – Brain waves – Placement of electrodes – EEG recording set up - Electromyography (EMG) – ERG – EOG - Audiometer.	8	CO3
IV	**Physiological assist devices:** Pacemakers – Defibrillators: AC defibrillator – DC defibrillator - Heart Lung Machine – Ventilators- Blood pressure measurement - Blood flow meters: LASER blood flow meters- – Blood pH measurement - Measurement of Respiration rate –Thermometer.	8	CO4
V	**Diathermy and Modern Imaging:** Surgical diathermy –	8	CO5

	Shortwave & Microwave diathermy – Ultrasonic diathermy – Electron Microscope – Ultrasonic Imaging – Angiography- X-ray machine – CT Scan – Magnetic Resonance Imaging.		

Text Books:

1.	*Arumugam, M.* 2011. **Biomedical Instrumentation.** [Second Edition]. Anuradha Publications, Kumbakonam.

Reference Books:

1.	*Khandpur R.S.*, 2010. **Hand book of Biomedical Instrumentation**, Tata McGraw Hill, New Delhi.
2.	*Leslie Cromwell, Fred J. Webell., Erich A. Pfeffer*. 2006, **Bio-medical Instrumentation and Measurements**, Prentice Hall of India, New Delhi.

Web References:

1.	http://biomedikal.in/2009/12/lecture-notes-on-biomedical-instrumentation/
2.	https://epgp.inflibnet.ac.in/ahl.php?csrno=1174

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	Know the fundamentals of human physiological systems and bioelectric potentials.
CO2	Describe the operations of electrodes and transducers.
CO3	Explain the types of bioelectric signals and instruments to be used to detect.
CO4	Evaluate the operation of physiological assist devices.
CO5	Describe the operation theatre and medical imaging equipments.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	M	H
CO2	H	H	M	H	H
CO3	H	H	M	H	H
CO4	M	H	L	H	H
CO5	M	M	L	H	H

H-High; M-Medium; L-Low

18UECNM301	NMEC I: COMPUTER SYSTEMS AND MAINTENANCE	SEMESTER – III

Course Objectives:

The Course aims

- To identify different internal and external components of a computer.
- To learn about the principle of memory and I/O Devices.
- Understand the basic procedures for adding and removing field replaceable modules for computers.

Credits:2 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Introduction:** Development of PC- Computer History- Modern Computers- Tubes-Transistors- Integrated Circuits- Motherboard and Buses- Chipset Evolution- Intel Chipsets- Model Numbers- Motherboard connectors.	05	CO1
II	**Memory:** Memory Basics- ROM-DRAM-Cache Memory-SRAM-Hard Disk Storage- Definition- Hard Drive Advancements- Optical Storage- Optical Technology-CD-DVD-BD-HD-DVD.	05	CO2
III	**IO Peripherals:** Keyboard- Trouble Shooting and Repair-Pointing Devices (Mouse)- Mouse Trouble Shooting-Wireless Input Devices- Trouble Shooting Wireless Input- Display Adapters and Monitors-Speakers- Microphones.	05	CO3
IV	**Building or Upgrading System:** Local Area Network-Defining a Network-Types of Network- System Assembly and Disassembly- Installing the Drives- Installing a Video card-Installing OS- Troubleshooting New Installation	05	CO4
V	**PC Diagnosis, Testing and Maintenance:** PC Maintenance Tools-Preventive Maintenance-Trouble Shooting Tips and Techniques- Repair and Replace.	05	CO5

Text Book:	
1.	*Scott Muller,* 2012**. Upgrading and Repairing PC. [**Twentith Edition**].** Pearson Education, New Delhi.
Reference Book:	
1.	*B.Govindarajalu*, 1991. **IBM PC AND CLONES** Hardware,Troubleshooting And Maintenance. Tata McGraw-Hill publishing Company Limited New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	identify the components of the computer.
CO2	gain the knowledge of the memory devices.
CO3	troubleshoot the problems in the IO peripherals.
CO4	know the procedures for installing/ configuring device drivers and required software.
CO5	understand the problems of the PC and troubleshooting techniques.

18UECNM401	**NMEC II: ELECTRONIC GADGETS AND MAINTENANCE**	**SEMESTER – IV**

Course Objectives:

The Course aims

- To understand the principle of audio devices.
- Troubleshoot the home and office appliances.
- To acquaint with various devices related to automobile electronics.

Credits:2 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Audio I/O Equipments:** Microphones- Characteristics-Types-Headphones and Headsets-Types of Headphones-Hearing Aids- Ideal Loudspeakers- Basic Loudspeakers-Woofers-Tweeters.	**05**	**CO1**
II	**Home Appliances:** Microwave Woven- Block Diagram-Types- Washing Machines-Types-Air Conditioners- Split Air Conditioner-Refrigerators.	**05**	**CO2**
III	**Office Appliances:** Facsimile Machine-Block Diagram-Xerographic Process-Calculators- Digital Clock.	**05**	**CO3**
IV	**Remote Control:** Ultrasonic Transducers-Remote Control Transmitter-Ultrasonic Transmitter- Troubleshooting remote control system- Remote Control Operation.	**05**	**CO4**
V	**In- Car Computers:** Antilock Braking System (ABS) - Instrument panel displays-Ultrasonic Car safety belt system-Air bag system-Satellite based Car Navigation Systems.	**05**	**CO5**

Text Book:

1.	*Bali,S.P.* 2007**. Consumer Electronics. [**First Edition**].** Pearson Education, New Delhi.

Reference Books:

1.	*Chitode. J .S.* 2007. **Consumer Electronics. [**First Edition**].** Technical

	Publication, Pune**.**
2.	*Philip Hoff and Philip Herbert Hoff.* 2010. **Consumer Electronics for Engineers. [**First Edition**].** Cambridge University Press, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the basics and working of different audio devices.
CO2	identify the need of preventive maintenance for home appliances.
CO3	trouble shoots the problems in the office appliances.
CO4	understand the basics of remote control system.
CO5	study the electronic gadgets through the automobile applications.

18UECAC301	ADD-ON COURSE I: PCB DESIGN	SEMESTER – III

Course Objectives:

The Course aims

- To analyze and interpret test results and measurements on electric circuits.
- To learn about effective use of design rules & interfacing between schematic & PCBs.
- Understand the basic component placement & routing techniques for various technologies.

Total Hours: 25

UNIT	CONTENTS	Hrs	CO
I	**Basics of PCBs:** Evaluation of PCBs-Classification of PCBs-Development of PC- Single-sided PCBs-Manufacturing of basic PCBs-Single-sided boards-Challenges in modern PCB design and Manufacture- Standard on PCBs.	05	CO1
II	**Layout Planning and design:** Reading drawings and diagrams-Block diagram-General PCB design considerations-Important design elements-Mechanical design considerations-Board mounting techniques-Board guiding and retaining-Input/output terminations-Board extraction-Testing and servicing-Mechanical stress-Board thickness-Layout design-Grid systems-Layout scale.	05	CO2
III	**Artwork Generation:** Basic approach to manual artwork-Ink drawing on white card board sheets-General design guidelines for artwork preparation-Conductor orientation-Conductor routing- Conductor spacing-Hole diameter and solder pad diameter-The square land/pad.	05	CO3
IV	**Etching Techniques:** Etching solutions and chemistry-Ferric chloride-Hydrogen peroxide-sulphuric acid-Etching arrangements-Simple batch production etching-Equipment and	05	CO4

	techniques-Immersion Etching-Bubble Etching-Splash Etching-Spray Etching.		
V	**Multi-layer boards:** Interconnection techniques-Conventional plated through-hole-Buried Via-Blind Vias-Materials for Multi-layer boards-Resin system-Reinforcement materials-Prepreg-copper foil-Fabrication process for multi-layer boards-General process-Lamination-Post-lamination process- Multi-layer drilling-Schematic key for multi-layer built-ups.	**05**	**CO5**
Text Book			
1.	*R.S.Khandpur.* 2005**. Printed Circuit Boards, Design, Fabrication, Assembly and testing.** TMH, New Delhi.		
Reference Book			
1.	Christopher T. Robertson, 2004. **Printed Circuit Board Designers Reference basics**, Pearson Education, New Jersey.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	analyze the fundamentals on all the basics of PCB designing.
CO2	perform the chemical and mechanical processes by using positive/negative masks.
CO3	gain the knowledge of art work preparation.
CO4	understand the etching process for final PCBs.
CO5	design the interconnection technique for multilayer boards.

18UECAC401	ADD ON COURSE II: COMPUTER HARDWARE INSTALLATION AND SERVICING	SEMESTER –IV

Course Objectives:

The Course aims

- Assemble and upgrade personal computer systems.
- Perform installation, configuration, and upgrading of microcomputer hardware and software.
- Diagnose and troubleshoot microcomputer systems hardware and software.

Total Hours:25

UNIT	CONTENTS	Hrs	CO
I	**Personal Computer:** Evolution –PC to Pentium –IBM PC- IBM PC- XT- IBM PC-AT- Pentium-Technical Specifications: IBM PC- IBM PC-XT- IBM PC-AT 286- IBM PC-AT 386- IBM PC -486-Pentium- PC System: Personal Computer System- Functional Blocks.	5	CO1
II	**Inside PC:** Motherboard- Fuctional Blocks- BIOS-BIOS Services-BIOS Interaction- CMOS-RAM-Motherboard Types.	5	CO2
III	**Hard Disk Drive and Controller:** Hard Disk Controller- HDC–Functional Blocks- HDC Functions- Interface Types- IDE-SCSI-ATA/EIDE/ATA-2- RAID- Installations and Configuration: Configuring- Formatting.	5	CO3
IV	**Monitors and Display Adapters:** CRT- Scanning Methods- CRT Controller Functions- Video Buffer RAM-4KB- Graphics Cards: Accelerated Video Cards-3-D Video- CGA – Colour Graphics Adapter- EGA –Enhanced Graphics Adapter-VGA.	5	CO4

V	**Troubleshooting and Servicing:** Post- Functions- IPL Hardware- Test Sequence- Error Message- Troubleshooting the Motherboard: Possible Problems-Diagnosis Procedure and Troubleshooting- Diagnosis Procedure and Troubleshooting-Hard Disk Drive.	**5**	**CO5**
Text Book			
1.	*Balasubramanian,. D.* 2005. **Computer Installation and Servicing** [Second Edition]. Tata McGraw-Hill Publishing Company Limited, New Delhi.		
Reference Books			
1.	*Mathivanan., N.* 2010. **Microprocessors, PC hardware and Interfacing.** [First Edition].PHI India, New Delhi.		
2.	*Govindarajalu., B.* 2002. **IBM PC and clones (Hardware, Trouble shooting and Maintenance).** [Second Edition]. Tata McGraw Hill, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the evolution of personal computer.
CO2	create the computer hardware knowledge for inside PC.
CO3	design for hard disk drive controller.
CO4	investigate the display devices.
CO5	diagnosis and troubleshooting the personal computer hardware.

18UECAL401	ADVANCED LEARNERS COURSE I: DIGITAL SIGNAL AND IMAGE PROCESSING	SEMESTER –IV

Course Objectives:

The Course aims

- To become familiar with digital image fundamentals.
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To understand the image segmentation and representation techniques.
- To Apply image compression and recognition methods.

UNIT	CONTENTS	Hrs	CO
I	**Digital Image Fundamentals:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.	-	CO1
II	**Image Enhancement:** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	-	CO2
III	**Image Restoration:** Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	-	CO3

IV	**Image Segmentation:** Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	**-**	**CO4**
V	**Image Compression and Recognition:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.	**-**	**CO5**
Text Book			
1.	N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.		
Reference Books			
1.	S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.		
2.	Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.		
3.	Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the basics and fundamentals of digital image processing, digitization, sampling and quantization.
CO2	apply the techniques of smoothing, sharpening and enhancement on digital images.
CO3	understand the restoration concepts and filtering techniques.
CO4	learn the basics of segmentation and features extraction methods.
CO5	learn the basics of compression and recognition methods.

18UECAL402	ADVANCED LEARNERS COURSE II: ARTIFICIAL INTELLIGENCE	SEMESTER –IV

Course Objectives:

The Course aims

- To understand the concept of artificial intelligence and identify its application areas.
- To understand the need for machine learning for various problem solving techniques.
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning.

UNIT	CONTENTS	Hrs	CO
I	**Introduction to Artificial Intelligence:** Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.	-	CO1
II	**Artificial Neural Networks:** Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.	-	CO2
III	**Fuzzy Systems:** Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures -Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.	-	CO3

IV	**Introduction:** Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.	**-**	**CO4**
V	**Genetic Algorithms:** Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	**-**	**CO5**
Text Book			
1.	N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.		
Reference Books			
1.	S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.		
2.	Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.		
3.	Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	describe the fundamentals of artificial intelligence
CO2	analyze various neural network based soft computing techniques for complex problems.
CO3	differentiate between supervised, unsupervised, semi-supervised machine learning approaches.
CO4	identify and Apply fuzzy logic technique for solving specific problems.
CO5	analyse and choose the appropriate machine learning approach for the various types of applications

GUIDELINES

1. **SUBMISSION OF RECORD NOTE BOOKS AND PROJECT DISSERTATION:** Candidates appearing for Practical Examinations and Project Viva-voce shall submit Bonafide Record Note Books/ Dissertation prescribed for Practical/ Project Viva-voce Examinations, otherwise the candidates will not be permitted to appear for the Practical/ Project Viva-voce Examinations.

2. **PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory and Practical)**

(i) THEORY

The candidate shall be declared to have passed the Examination, if the candidate secures not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Marks Distribution [CA- Total Marks: 25]

Attendance	: 5 Marks
Assignment/Seminar	: 5 Marks (2 Assignments and 1 Seminar)
Internal Examinations	: 15 Marks
Total	**: 25 Marks**

(ii) THEORY (If Internal Evaluation is for 100 Marks)

The candidate shall be declared to have passed the Examination, if the candidates secure not less than 40 marks out of 100 in the Comprehensive Examination (Internal Evaluation only).

Internal Marks Distribution [CA- Total Marks: 100]

Attendance	: 10 Marks
Assignment and Seminar	: 30 Marks (2 Assignments and 1 Seminar)
Internal Examinations	: 60 Marks
Total	**: 100 Marks**

(iii) PRACTICAL

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

Internal Marks Distribution [CA- Total Marks: 40]

Experiment	: 10 Marks (10-12 Experiments)
Attendance	: 5 Marks
Record	: 5 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

(iv) CAREER COMPETENCY SKILLS

- **Viva voce– Semester III**
  - The student has to come in proper dress code for the Viva Voce
  - Questions will be asked to evaluate the reading, speaking and listening skills of the students.
  - E-mail and Letter drafting exercises will be given.

- **On Line Objective Examination (Multiple Choice questions) – Semester IV**
  - 100 questions-100 minutes
  - Twenty questions from each UNIT.
  - Online examination will be conducted at the end of the IV Semester.

3. QUESTION PAPER PATTERN AND MARK DISTRIBUTION

(i) THEORY

Question Paper Pattern and Mark Distribution [Maximum Marks 75]

1. PART – A (10 x 2 = 20 Marks)

Answer ALL questions Two questions from each UNIT

2. PART – B (5 x 5 = 25 Marks)

Answer ALL questions

One question from each UNIT with Internal Choice

3. PART – C (3 x 10 = 30 Marks)

Answer ANY THREE questions Open Choice – 3 out of 5 questions

One question from each UNIT.

Question Paper Pattern and Mark Distribution [Maximum Marks 100]

1. PART – A (10 x 2 = 20 Marks)

Answer ALL questions Two questions from each UNIT

2. PART – B (5 x 7= 35 Marks)

Answer ALL questions One question from each UNIT with Internal Choice

3. PART – C (3 x 15 = 45 Marks)

Answer ANY THREE questions Open Choice – 3 out of 5 questions One question from each UNIT

(ii) PRACTICAL

Question Paper Pattern and Mark Distribution [Maximum Marks 60]

Question Paper Pattern

Practical Examinations shall be conducted at the end of every Semester.

***External Marks Distribution* [CE- Total Marks: 60]**

i) Objective	: 10 Marks
ii) Circuit diagram/ Program	: 20 Marks
iii) Construction	:10 Marks
iv) Result Declaration	: 20 Marks
Total	**: 60 Marks**

Computer Practical Distribution

***External Marks Distribution* [CE- Total Marks: 60 (30+30]**

For each Practical question the marks shall be awarded as follows:

i) Aim	: 5 Marks
ii) Algorithm/Flowchart	: 10 Marks
iii) Writing the Source Code	: 15 Marks
iv) Test and Debug the Source Code	: 15 Marks
v) Displaying the Output	: 10 Marks
vi) Result Declaration	: 5 Marks
Total	**: 60 Marks**

18UECM501	**CORE VII: COMPUTER NETWORKS**	**SEMESTER – V**

Course Objectives:

The Course aims

- To understand the need for data communication and computer networks.
- To learn about the operation of networking and internetworking devices.
- To investigate about advanced networking technologies.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	Introduction – Data Communications –Components- Networks– The Internet – Protocols and Standards – The OSI Model – Functions of the Layers.	**10**	**CO1**
II	Signals- Analog and Digital- Periodic and Aperiodic- Time and Frequency Domains-Composite Signals. Digital to Digital Conversion- Digital to Analog Conversion- ASK-FSK-PSK-QAM. Multiplexing – FDM – WDM – Synchronous and Statistical TDM.	**10**	**CO2**
III	Spread Spectrum -Frequency Hopping Spread Spectrum –Direct Sequence Spread Spectrum – Guided Media: Twisted pair cable- Coaxial Cable- Fiber optic cable. Switching: Circuit switched Networks – Datagram and Virtual circuit networks. Structure of a Switch -Dial –Up MODEMS – Digital Subscriber Line.	**10**	**CO3**
IV	Data Link Control: Framing-Flow and error control- HDLC. Basics of Carrier Sense Multiple Access– IEEE Standards – Standard Ethernet - Fast Ethernet – Gigabit Ethernet – Connecting Devices – Repeater – Bridge – Router- Gateway.	**10**	**CO4**
V	Frame Relay –Architecture and Layers –ATM Design goals – Architecture – ATM Layers –- IPv6 datagram format- UDP Datagram format- TCP Datagram format –Domain Name System– Electronic Mail- File Transfer.	**10**	**CO5**

Text Book

1 *Behrouz,A. Forouzan.* 2013. **Data Communication and Networking.** [Fifth Edition]. Tata McGraw Hill, New Delhi.

Reference Books	
1.	*William Stalings.* 2002. **High Speed Networks and Internets.** [Second Edition]. PHI, New Delhi.
2.	*Tanenbaum, A.S.* 2003. **Computer Networks.** [Fourth Edition]. PHI, New Delhi.
3.	*Larry, L. Peterson and Bruce, S. Davie.* 2007. **Computer Networks: a systems approach.** [Fourth Edition]. PHI, New Delhi.

COURSE OUTCOMES (CO)

After Completion of the course, the students will be able to

CO1	comprehend the fundamental concepts of computer networking.
CO2	classify the types of signals and conversions.
CO3	state the principles of the connecting media and switching networks
CO4	describe the functions of data link layer and explain the protocols.
CO5	analyze the architecture and role of the layers.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	M
CO2	L	L	M	M	H
CO3	M	M	H	H	M
CO4	L	M	M	H	H
CO5	H	M	M	H	M

H-High; M-Medium; L-Low

18UECM502	CORE VIII: EMBEDDED SYSTEMS	SEMESTER – V

Course Objectives:

The Course aims

- To understand the basics of microcontroller architecture and memory systems.
- To provide strong foundation for designing real world applications using microcontroller and PIC microcontroller.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction to Microcontroller:** Microprocessor and Microcontroller- The 8051 Microcontroller: Features-Architecture of 8051: Processor- Memory- Digital I/O port and peripherals- Pin diagram of 8051- Memory organization- External memory interfacing- Stacks.	10	CO1
II	**8051 Addressing modes and Instructions set:** Instruction syntax- Data types- Subroutines- Addressing modes- 8051 instructions: Data transfer instructions- Arithmetic instructions- Logical instructions- Branch instruction- Bit manipulation instructions.	10	CO2
III	**8051 Parallel Ports/Communication**- Port structures and operation- 8051 interrupt structure- 8051 Timers/Counters- 8051 serial communication- Serial communication modes- RS232.	10	CO3
IV	**PIC 16F877 Microcontrollers:** PIC hardware-Processor system-Processor-Memory-Input and output-Architecture-Pin out-Instruction set-Instruction types-Indirect file register addressing-Interrupt control registers-Peripheral control registers.	10	CO4
V	**Application of PIC Microcontrollers:** LED hardware – Program – simulation- Switch interface- Keypad interface-LCD application.	10	CO5

Text Books

1. *Udayashangara,V and Mallikajunaswamy, M.S.* 2009. **8051 Microcontroller Hardware, Software and applications.** [First Edition]. Tata McGraw Hill, New Delhi. (UNIT-I to III).
2. *Martin Bates*. 2006. **Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation.** Elsevier Publications. (UNIT-IV and V).

Reference Books

1.	*Muhammad Ali Mazidi and Janice Gillispie* Mazidi. 2009. **The 8051 microcontroller and Embedded System.** [Fourth Edition]. Pearson International Publishing (I) Pvt. Ltd., New Delhi.
2.	*Kenneth, J. Ayala.* 2004. **8051 Microcontroller, the Architecture, Programming and Applications.** [Second Edition]. Pearson International Publishing (I) Pvt. Ltd., New Delhi.
3.	***Ajay V Deshmukh.*** 2005. **Microcontrollers: Theory and Applications.** Tata McGraw Hill, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the basic features, functions, memory and internal architecture of 8051 microcontroller.
CO2	apply knowledge and demonstrate programming proficiency using the various addressing modes and instructions set of the microcontroller.
CO3	analyze port structure, timer/counter and operation of serial communication for real time practical applications.
CO4	identify and understand the function of different blocks of PIC microcontroller.
CO5	develop programs using special function registers and interrupt.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	L	L
CO2	H	H	L	M	L
CO3	M	H	M	M	M
CO4	H	M	H	M	M
CO5	M	M	M	H	H

H-High; M-Medium; L-Low

18UECM503	CORE IX: ARDUINO AND INTERNET OF THINGS	SEMESTER – V

Course Objectives:

- To understand how multiple smart electronic devices can connect themselves together through internetworking.
- To acquire the fundamentals of designing, programming and configuring devices for the smart infrastructure development and maintenance.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Arduino:** Introduction to Arduino-Functional block diagram of Arduino-Arduino family of boards-Arduino UNO- Features-Communication-Platform-Terminology-Introduction to Arduino Programming-Keywords –Inbuilt Functions –Variables and data types-Libraries- Arduino Boot Loader.	**10**	**CO1**
II	**Atmega328:** Pin function of Arduino UNO-Digital GPIO Programming-Working with pins as input and output-Working with PWM outputs-Working with analog inputs using on-chip ADC Serial communication between Arduino hardware and PC-Interrupt- Blinking of LED-Interfacing LCD.	**10**	**CO2**
III	**Internet of Things: IoT** Definition –vision-Smart and hyper connected devices-IoT Conceptual framework- IoT Architectural view-technology behind IoT- Big Data Analytics.	**10**	**CO3**
IV	**Design Principles for Connected Devices**- IoT/M2M systems layers and designs standardization; communication technologies -Design principles for Web Connectivity-Web Communication Protocols for Connected Devices-Internet connectivity Principles-Internet Connectivity-Internet Based Communication.	**10**	**CO4**
V	**Applications of IoT:** IoT application for smart homes-Smart City-Smart city parking-Connected car and services-Smart Environment monitoring-Weather monitoring System-Air pollution Monitoring System–Forest Fire Detection-Agriculture-Smart irrigation-Smart wine quality enhancing-	**10**	**CO5**

	Smart city street lights Control.		
Text Books			
1.	*Michael McRoberts,* 2013 **Beginning Arduino,** Second Edition, Apress, (Unit I & II)		
2.	*Raj Kamal,*2017 **Internet of Things Architecture and Design Principles,** McGraw Hill Education Pvt.Ltd.,[First edition] (Unit III ,IV &V)		
Reference Books			
1.	*John-David Warren, Josh Adams, Harald Molle,* 2011 **Arduino Robotics ,Apress.**		
2.	*Rajkumar Buyya, Amir Vahid Dastjerdi*. 2016. **Internet of Things: Principles and Paradigms.** Morgon Kaufmann- Elsevier Publications.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the structure of arduino boards and programming concepts.
CO2	describe the function of arduino UNO and interfacing concepts
CO3	understand the basic principles, requirements, functions and system architecture of IoT.
CO4	prototype embedded devices for IoT and M2M , embedded platforms and design software for IoT applications.
CO5	analyze the functioning of IoT applications in smart premises, connected car, environment monitoring and agriculture through quantitative case studies.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	M
CO2	L	L	M	M	H
CO3	M	M	H	H	M
CO4	L	M	M	H	H
CO5	H	M	M	H	M

H-High; M-Medium; L-Low

18UECMP501	CORE PRACTICAL VII: EMBEDDED SYSTEMS LAB	SEMESTER – V

Course Objectives:

The Course aims

- To develop assembly level programs and machine level codes for various operations.
- To interface simple peripheral devices to a PIC microcontroller.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
8051 Microcontroller:			
1.	Performing Arithmetic Operation for two 8-bit Numbers.	**3**	**CO1**
2.	16- bit Addition and Subtraction.	**3**	**CO1**
3.	Finding Ascending and Descending order.	**3**	**CO2**
4.	Finding Biggest and Smallest Number.	**3**	**CO2**
5.	Display interfacing.	**3**	**CO3**
6.	Traffic light control.	**3**	**CO3**
PIC 16F877 Microcontroller:			
7.	LED interface.	**3**	**CO3**
8.	LCD interface.	**3**	**CO3**
9.	Switch interface.	**3**	**CO3**
10.	Remote relay control.	**3**	**CO3**

Reference Books

1.	*Kenneth, J. Ayala.* 2004. **8051 Microcontroller, the Architecture, Programming and Applications.** [Second Edition]. Pearson International Publishing (I) Pvt. Ltd., New Delhi.
2.	*Udayashangara,V and Mallikajunaswamy, M.S.* 2009. **8051 Microcontroller Hardware, Software and applications.** [First Edition]. Tata McGraw Hill, New Delhi.
3.	*Martin Bates*. 2006. **Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation.** Elsevier Publications.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand assembly language program for arithmetic operations.
CO2	identify the different ways of interfacing memory and I/O with microcontrollers.
CO3	develop programs for interfacing with real world devices.

18UECMP502	**CORE PRACTICAL VIII:INTERNET OF THINGS LAB**	**SEMESTER – V**

Course Objectives:

The Course aims

- To provide knowledge about arduino boards and basic components.
- To develop skills to design and implement various smart system applications.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
1.	Blinking and Sequential LED	**3**	**CO1**
2.	Key interfacing	**3**	**CO1**
3.	Interfacing LCD	**3**	**CO1**
4.	Interfacing Ultrasonic Sensor	**3**	**CO1**
5.	Bluetooth based home automation	**3**	**CO2**
6.	IR sensor interfacing	**3**	**CO2**
7.	DC motor Speed Control using PWM	**3**	**CO2**
8.	Arduino Based Serial Communication	**3**	**CO3**
9.	Build an ESP8266 Web Server and Weather Forecaster	**3**	**CO3**
10.	IoT Based Street Light Monitoring System	**3**	**CO3**

Reference Books

1.	*Michael McRoberts,* Apress,2013.**Beginning Arduino [** Second Edition]
2.	*John-David Warren, Josh Adams, Harald Molle,* Apress,2011 **Arduino Robotics**

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understand the basic programming with arduino
CO2	design different sensors for automation
CO3	develop interfacing to real world devices

18UECSB501	**SBC III: ELECTRONIC MEDIA**	**SEMESTER – V**

Course Objectives:

The Course aims

- To understand the concepts of sound and image
- To analyze the representation of signals in various media
- To understand the concept of storage and electronic media services and applications.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Sound and Audio:** Basic Sound Concepts- Computer representation- Audio Formats- Music- MIDI concepts- Devices- Speech- Generation Analysis- Transmission.	05	CO1
II	**Images and Graphics:** Digital Image Representation- Image format- Graphics format- Computer image Processing- Image synthesis- Image analysis- Image transmission.	05	CO2
III	**Video:** Video Signal Representation- Computer Video format- Data Compression- JPEG- Image Preparation- Lossy DCT mode- Lossless mode- MPEG: Video Encoding- Audio Encoding	05	CO3
IV	**Optical Storage Media:** Basic Technology- Compact Disk Digital Audio- CD ROM: Blocks- Modes- Logical Data format- Limitations- CD Write Once: Principles- Sessions.	05	CO4
V	**Applications:** Conversational Service: Video Conferencing- Video Phone- Messaging services- Retrieval Services- Tele Action Services- Tele Operation Services- Applications of Teleservices- Media Entertainment- Virtual reality- Interactive Video- Interactive audio- Games	05	CO5

Text Book

1	*Ralf Steinmetz and Klara Nahrstedt.* 2009. **Multimedia: Computing, Communications & Applications.** [Sixth Edition]. Pearson Education, New Delhi.

Reference Books

1.	*Gokul, S.* 2000. **Multimedia Magic.** [Second Edition]. BPB Publications, New Delhi.
2.	*Fred Halsall.* 2008. **Multimedia Communications: Applications, Networks, Protocols & Standards.** [Second Edition]. Pearson Education, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the concepts of sound and audio.
CO2	familiarize with the concepts of image and graphics
CO3	analyze the representation and modes of the video signal.
CO4	understand the principle and types of the storage media.
CO5	apply the techniques in real world applications of electronic media.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	M
CO2	L	L	M	M	H
CO3	M	M	H	H	M
CO4	H	M	L	H	H
CO5	H	M	M	H	M

H-High; M-Medium; L-Low

18UECEL501	**ELECTIVE I: SENSORS AND TRANSDUCERS**	**SEMESTER – V**

Course Objectives:

The Course aims

- To understand the constructions and working principle of different types of sensors and transducers.
- To apply the concepts in designing measuring instruments using different transducers.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Science Of Measurements And Transducers:** Units and Standards-Calibration Methods-Static Calibration-Classification of Errors –Error Analysis Statistical Methods-Odds and Uncertainty-Classification of Transducers- Static characteristics: Accuracy, precision, Resolution, Sensitivity, Linearity, Threshold Resolution, Hysteresis Dynamic Characteristics.	**10**	**CO1**
II	**Resistance Transducers:** Mathematical model of Transducer-Zero and Second order Transducers. Response to Impulse, Step, Ramp and Sinusoidal Inputs. Resistance potentiometer- Strain Gauge- Resistance Thermometer- Thermistor- Hotwire Anemometer- Piezoresistive Sensor -Humidity Sensor.	**10**	**CO2**
III	**Capacitive and Inductive Transducers:** Induction potentiometer-Variable Inductance Transducers- LVDT-Capacitive transducer - Capacitor Microphone. Piezoelectric transducer, Magnetostrictive.	**10**	**CO3**
IV	**MEMS:** IC sensors -Digital Transducers-Smart sensor- Fibre optic sensors, SQUID sensors, Film sensors. Ultrasonic sensors –IR Sensors.	**10**	**CO4**
V	**Microsystems Fabrication Processes: Overview** of MEMS and Microsystems-Working principles of Microsystems: Micro sensors-Microactutation-MEMS with Microactuators- Microaccelerometers. **Overview of Micro Manufacturing:** Bulk Micro manufacturing-Surface Micromachining-The LIGA Process.	**10**	**CO5**

Text Book

1	*A.K.Sawhney,*2004 **"A course in Electrical & Electronic Measurement and Instrumentation"** Dhanpat Raj and Co (P) Ltd.

Reference Books	
1.	*H.S.Kalsi,* 2004 **"Electronic Instrumentation",** Tata Mc Graw Hill Publishing.
2.	*D.Patranabis,* 1999 **"Sensors and Transducers"**, Prentice Hall of India,.
3.	*John P.Bentley,* **"Principles of Measurement Systems"**,III Edition, Pearson Education, 2000.
4.	*Hermann K.P.Neubert,* 2000 **"Instrument Transducers"**, Oxford University Press,.
5.	*D.V.S.Murthy,* 2001 **"Transducers and Instrumentation",** Prentice Hall of India,.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	state the concepts of common methods of measurement and characteristics.
CO2	comprehent the principle of resistive transducers
CO3	understand the principle of various capacitive and inductive transducers
CO4	analyze the working principle and application of different sensors.
CO5	describe about the microsystem fabrication process

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	H	L	L	M
CO2	L	L	L	M	H
CO3	H	H	M	M	M
CO4	H	M	H	H	H
CO5	M	H	H	H	M

H-High; M-Medium; L-Low

18UECEL502	ELECTIVE II: MICROWAVE AND FIBER OPTIC COMMUNICATION	SEMESTER – V

Course Objectives:

The Course aims

- To impart knowledge on basics of microwave electron beam devices and their applications.
- To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction to Microwaves:** Microwave region and Band designations - Advantages of Microwaves - Applications of Microwaves Maxwell's equation: Amperes law - Faradays law - Gauss law - Wave equation -Wave guides - Propagation of TM waves in rectangular wave guide.	10	CO1
II	**Microwave Amplifiers and Oscillators:** Microwave tubes - Two cavity Klystron - Multi cavity Klystron - Reflex Klystron -Travelling Wave Tube (TWT) - Backward Wave Oscillator (BWO) – Magnetron – Applications.	10	CO2
III	**Microwave Devices:** Microwave transistors Gallium Arsenide (GaAs) metal semiconductor FET - Schottky diode - Gunn diode - IMPATT diode - BARITT diode- Maser principle – Applications.	10	CO3
IV	**RADAR:** Introduction - Block diagram - classification – Radar range equation - Factors affecting the range of a radar receiver - Line pulse modulator - PPI (Plane Position indicator) - Moving Target Indicator (MTI) - FM CW Radar - Applications.	10	CO4
V	**Optical Fiber Communication:** Evolution - Elements of an optical fiber communication link - Advantages -Total internal reflection - Acceptance angle - Numerical Aperture-Modes: Single Mode-Multi Mode- Propagation: Step Index- Graded Index -Fiber optical sources-	10	CO5

	LED structure – Laser Diode structure - Optical detectors: PIN diode - Avalanche photo diode.		
Text Books			
1.	*M. Kulkarni*. 2014. **Microwave and Radar Engineering.** [Fifth Edition]. Umesh Publications, New Delhi.		
2.	*Sathyamurthy, Jayanthy Daniel, Nisha Lawrence.* 2009. **Optical Communication**. [First Edition]. Sams Publishers. United States.		
Reference Books			
1.	*Samuel Y.Liao*. 2005. **Microwave Devices and Circuits.** [Third Edition]. Prentice Hall.		
2.	*Sen.A.K & Bhattacharya.A.B.* 2002. **Radar system and Radio aids to Navigation**. [Fifteenth Edition]. Khanna Publications. New Delhi.		
3.	*Keiser G.* 2010. **Optical Fiber Communication Systems.** [Fourth Edition]. Tata McGraw Hill, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understand the theory of microwave and fiber optic communication.
CO2	state the working of microwave amplifiers, oscillators and devices.
CO3	design and analyze the microwave amplifiers, oscillator and devices.
CO4	understand the basics of Radar technology.
CO5	describe the different characteristics of optical fiber.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	L
CO2	L	L	M	M	H
CO3	H	M	H	H	M
CO4	M	H	M	M	H
CO5	H	M	M	H	M

H-High; M-Medium; L-Low

18UECM601	CORE X: MOBILE AND CELLULAR COMMUNICATION	SEMESTER – VI

Course Objectives:

The Course aims

- Learn the architecture and working principles of mobile communication systems
- Analyze various standards of mobile communication.
- Study the recent technologies in mobile communication with their architecture and protocols

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**The Cellular Concepts and Its Initial Implementations:** The cellular concepts–Multiple access technologies for cellular systems – Cellular system operation and planning: System Architecture-Location Updating and Call Setup-Handoff and Power Control– Initial implementations of cellular Concepts: Analog cellular system-The AMPS System-The TACS System.	10	CO1
II	**Telecommunication system :** Introduction – GSM: Mobile services – System architecture – Radio interface – Protocols – Localization and calling – Hand over – Security- UMTS and IMT – 2000**:** UMTS releases and standardization – UMTS system architecture – UMTS radio interface – UTRAN-CDMA.	10	CO2
III	**Wireless LAN And Mobile Standard:** Infrared Vs Radio transmission-Infrastructure and ad-hoc network-IEEE 802.11: System architecture-Protocol architecture-802.11b-802.11a. **Mobile standards:** EDGE - CDMA digital cellular standard - 3G CDMA 2000 - 3G W-CDMA - 4G LTE- 5G.	10	CO3
IV	**Mobile network layer:** Mobile IP: Goals, assumptions and requirements-Entities and terminology-IP packet delivery-Registration-Tunneling and encapsulation-Optimizations-Reverse tunneling- Mobile ad-hoc networks: Routing	10	CO4
V	**Fourth Generation Systems and Technologies:** 4G vision, features	10	CO5

	and challenges, applications, 4G technologies: Multicarrier modulation, smart antenna techniques, OFDM – MIMO systems. Indirect TCP- Snooping TCP-Mobile TCP-Oriented TCP-TCP Over 2.5-3G Wireless networks.		

Text Books	
1	*Jochen, H. Schiller, J.* 2009. **Mobile Communications.** [Second Edition]. Addition Wesley Publishers, New Delhi.
2	*Vijay K Garg*, 2010. **Wireless Communication and Networking. [** First Edition]Morgan Kaufmann Publishers.
Reference Books	
1	*Lee, W.C.Y.* 2011. **Mobile Cellular Communications: Analog and Digital systems.** [Second Edition]. TMH, New Delhi.
2	*Theodore, S. Rappaport.* 2002. **Wireless Communication**: **Principles and Practice. [**Second Edition]. Prentice hall of India, New Delhi.
3	*William C.Y. Lee*. 1998. **Mobile Communication Engineering: Theory & Applications**. [Second Edition] McGraw Hill, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	recall and describe the challenges in Cellular communication.
CO2	describe the mobile communication architecture and standards.
CO3	explore the new mobile technologies.
CO4	design and analyze mobile routing protocols.
CO5	survey the progress of new mobile technologies.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	L	M
CO2	M	L	M	M	H
CO3	L	M	H	M	M
CO4	M	H	M	H	H
CO5	H	M	H	H	M

H-High; M-Medium; L-Low

18UECM602	CORE XI: VLSI DESIGN AND VHDL	SEMESTER – VI

Course Objectives:

The Course aims

- Learn the Basic MOS structure operation and fabrication process.
- Understand the MOS circuit design process layout and rules.
- Understand the basic VHDL programming and methodology.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction:** Basic MOS Structure- Basic MOS Transistor operation- MOS Transistor Switches-NMOS Fabrication-Basic CMOS technology- CMOS Process Enhancements-BiCMOS Technology	10	CO1
II	**MOS Circuit Design Process:** MOS layers- Stick Diagrams- Stick layout using NMOS design- Stick layout using CMOS design- Design Rules & Layout-Double metal MOS process rules- Elements of Physical Design- Basic Concepts- Design Hierarchies.	10	CO2
III	**Basic Concepts in VHDL:** Introduction to VHDL-History of VHDL – Capabilities of VHDL- Hardware abstraction- **Basic terminology-** Entity declaration- Architecture body declaration- Configuration declaration – Package Declaration- Package Body.	10	CO3
IV	**Basic Language Elements:** Identifiers- Data objects- Data types- Subtypes- Scalar Types-Composite Types- Access Types-Incomplete Types- File Types-Operators- Logical Operators- Relation Operators- Shift Operators-Adding Operators- Multiplying Operators- Miscellaneous operators.	10	CO4
V	**Modeling Concepts in VHDL: Behavioral Modeling-**Process Statement- Variable Assignment Statement- Signal Assignment Statement- Wait Statement- If Statement-Case Statement- Loop Statement.-**Dataflow and Structural Modeling:** Concurrent Signal Assignment Statement – Concurrent versus Sequential Signal Assignment- Conditional Signal Assignment Statement- Component	10	CO5

	Declaration- Component Instantiation- Subprograms and Overloading.		
Text Books			
1	*Albert Raj* and *Latha.* 2002. **VLSI Design.** [First Edition]. PHI Publications, New Delhi. (UNIT- I & II)		
2	*Bhasker, J.* 1999. A **VHDL Primer.** [Third Edition]. Prentice Hall of India Publication, New Delhi.(UNIT- III,IV & V)		
Reference Books			
1	*Neil, H.E. Weste and Kamrun Eshraghian.* 2000. **Principles of CMOS VLSI Design. [**Second Edition], Pearson Education, New Delhi.		
2	*Sze, S.M.* 2003. **VLSI Technology.** [Second Edition]. McGraw Hill Book Company, New Delhi.		
3	*Prasanna Raj Cyril.* 2010. **Fundamentals of *HDL Design*: An Engineering Approach.** [First Edition]. Pearson Education, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understand the operation and fabrication process of MOS transistor
CO2	study the concept of MOS circuit process layout and rules
CO3	understand the basic concepts in VHDL
CO4	state the basic terminologies used in VHDL
CO5	analyze the various modeling concepts in VHDL

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	H	L	M	M
CO2	L	L	M	M	H
CO3	L	M	H	M	H
CO4	M	M	H	H	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low

18UECM603	CORE XII: BIOMEDICAL INSTRUMENTATION	SEMESTER – VI

Course Objectives:

The Course aims

- To provide the concepts and methods of various physiological signal measurements and various assisting devices.
- To illustrate the basic principles of different instruments used in medical industry.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Basic Physiology:** Cells and their structures - Transport of ions through cell membrane - Resting and action potential - Bioelectric potentials – Different systems of human body- Electrodes – Types of electrodes.	10	CO1
II	**Biopotential Recorders:** Electrical and mechanical activities of the heart - Typical Electrocardiogram (ECG) – ECG Lead Configurations – ECG recording setup - Electroencephalogram (EEG) – Brain waves – Placement of electrodes – EEG recording set up - Electromyography (EMG) – ERG – EOG.	10	CO2
III	**Physiological Assist Devices:** Pacemakers – Energy requirement to excite heart muscles – Methods of stimulation- Defibrillators – Different types of defibrillators – AC defibrillator – DC defibrillator – Nerve and Muscle Stimulator – Stimulation of Nerves – Different types of Nerve Stimulator – Heart Lung Machine – Blood Flow meters – Electromagnetic Blood Flow meters – Ultrasonic Blood Flow meters – LASER Blood Flow meters.	10	CO3
IV	**Operation Theatre Equipments:** Surgical diathermy– Shortwave diathermy – Microwave diathermy – Ultrasonic diathermy – Blood Pressure Measurement. **Biotelemetry:** Elements of Biotelemetry – Design of a biotelemetry system – Problems in Implant Telemetry – Uses of Biotelemetry	10	CO4
V	**Medical Imaging Systems:** Electron Microscope – X-Ray Machine - Computers in medicine – Lasers in Medicine – Computer Tomography	10	CO5

	(CT) – Ultrasonic imaging systems – Magnetic Resonance Imaging (MRI).		
Text Book			
1	*Arumugam.M*. 2012. **Bio Medical Instrumentation**.[Second Edition]**.** Anuradha agencies Publications, Chennai.		
Reference Books			
1	*Khandpur R.S*., 2008. **Hand book of Biomedical Instrumentation**.[Second Edition]**.** Tata McGraw Hill, NewDelhi.		
2	*Leslie Cromwell., Fred J. Webell., Erich A. Pfeffer*. 2006, **Bio-medical Instrumentation and Measurements. [Second Edition].** Prentice Hall of India, New Delhi.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understand the basic physiology of the human and the types of electrodes.
CO2	identify various biopotential and their specifications in terms of amplitude and frequency.
CO3	analyze the principle and working of the various physiological assist devices.
CO4	describe the operation theatre equipments and their working principles.
CO5	acquire detailed information about the imaging systems and instruments

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	L	M
CO2	L	L	M	M	M
CO3	M	M	M	L	H
CO4	H	M	H	H	M
CO5	M	H	H	H	H

H-High; M-Medium; L-Low

18UECMP601	CORE PRACTICAL IX: VHDL PROGRAMMING AND SIMULATION LAB	SEMESTER – VI

Course Objectives:

The Course aims

- To introduce a hardware description language for the specification and simulation of digital logic systems.
- To implement combinational and sequential circuits using VHDL.
- To practice the design and simulation of different circuits.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
VHDL PROGRAMMING			
1.	Verification of Logic Gates	**3**	**CO1**
2.	Half Adder and Full Adder	**3**	**CO2**
3.	Half Subractor and Full Subractor	**3**	**CO2**
4.	Multiplexer and Demultiplexer	**3**	**CO2**
5.	Encoder and decoder	**3**	**CO2**
6.	Flip Flops (RS & D)	**3**	**CO2**
7.	Solving Boolean Equation.	**3**	**CO2**
MATLAB SIMULATION			
8.	Solving Arithmetic Equation	**3**	**CO3**
9.	Solving Matrix (Rows and Columns, Inverse Matrix, Transpose Matrix)	**3**	**CO3**
10.	Plotting the Curve	**3**	**CO3**

Reference Book

1. *Bhasker, J.* 1999. A **VHDL Primer.** [Third Edition]. Prentice Hall of India Publication, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understanding the synthesis and simulation process of codes.
CO2	analyze, design and simulate combinational and sequential logic circuits
CO3	design and develop applications using simulation packages.

18UECSB601	**SBC IV: PLC & SCADA**	**SEMESTER –VI**

Course Objectives:

The Course aims

- To understand the concept of Programmable logic controller and identify its application areas.
- To understand the need for PLC Programming and PLC Instructions.
- To apply the SCADA for the design of real time industrial Applications.

Credits: 2 **Total Hours:25**

UNIT	CONTENTS	Hrs	CO
I	**Programmable Logic Controllers (PLCs):** Parts of PLC - Principles of operation - Modifying the operation - PLC size and application - PLC Hardware Components: The I/O section - Discrete section - Analog section - Special I/O modules.	05	CO1
II	**Basics of PLC Programming:** Processor memory organization – Program files - Data files – Program scan - PLC Programming Languages - Relay type instructions - Instruction addressing - Programming Examine IF closed and Examine IF open instructions - Electromagnetic control relay.	05	CO2
III	**PLC Instructions:** Timer Instructions: ON Delay timer instructions - OFF Delay timer instructions - Retentive Timer - Cascading Timers - Counter Instructions: UP Counter - Down Counter.	05	CO3
IV	**SCADA:** Convergence of Evolving Technologies-Early Automation systems – The Human Interface – Communications and Integration-Basics of SCADA Signal Processing - Defining the Scope of SCADA Software - Use of Generalized Terminology.	05	CO4
V	**SCADA Software:** Typical SCADA System Architecture - Field Devices and Signals- Programmable Process Controller - SCADA Operations-User Workstation- Communication Network - Sample Application: WTP SCADA System (Qualitative study).	05	CO5

Text Books

1. *Frank D. Petruzella.* 2010. **Programmable Logic Controllers.** [Third Edition]. Tata McGraw

	Hill, New Delhi. (UNIT-I) to (UNIT-III).
2.	*Stuart G. McCrady.* 2013. **Designing SCADA Application Software: A Practical Approach.** [First Edition]. Elsevier. (UNIT-IV and V).
Reference Books	
1.	*W. Bolton.* 2011. **Programmable Logic Controllers**. [Fifth Edition]. Elsevier Publications.
2.	Stuart A. Boyer. 2010. **SCADA: Supervisory Control and Data Acquisition.** [Fourth Edition]. International Society of Automation. United States.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the theory of Programmable Logic Controller
CO2	understand the basics of PLC programming
CO3	substantiate the PLC Instructions
CO4	understand the theoretical concepts of SCADA
CO5	analyze the SCADA sample applications

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	M
CO2	L	L	M	M	H
CO3	L	M	H	H	M
CO4	M	M	M	H	H
CO5	M	M	M	H	M

H-High; M-Medium; L-Low

18UECEL601	ELECTIVE III: INTELLIGENT INSTRUMENTATION	SEMESTER –VI

Course Objectives:

The Course aims

- To introduce the concept of virtual instrumentation.
- To develop basic VI programs using loop, case structure etc.,
- To explore applications in image, signal processing and motion control.

Credits: 4 **Total Hours:50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction:** Types of instrumentation system- Definition of intelligent instrumentation-Components of intelligent instrumentation system. **Virtual instrumentation** Virtual Instrumentation- Virtual Instrument and Traditional Instrument- Virtual Instrumentation for Test, Control, and Design- Virtual Instrumentation in the Engineering Process- Graphical system design using LabVIEW, Graphical programming and Textual Programming.	10	CO1
II	**Introduction to LabVIEW and Loops** :Introduction- Advantages of LabVIEW- Software Environment – Front Panel Control and Indicators- Block diagram- Data Types- Data Flow Program- LOOPS: For Loop- While Loop- Structure Tunnels- Shift registers- Feedback Nodes- Control Timing- Communication among multiple loops- Local variables- Global variables.	10	CO2
III	**Arrays and Clusters**: Introduction- Arrays in LabVIEW- One Dimensional array- Two Dimensional array- Multi dimensional array- Initializing arrays- Deletion, Inserting and Replacing – Array functionsMatrix operations with array. Clusters: Introduction- creating controls, Indicators and constant,- Cluster operations- Assembling and Disassembling clusters- conversion between arrays and clusters. Waveforms - waveform chart- XY graphics.	10	CO3

IV	**Data Acquisition**: Introduction- signals- signal conditioning- DAQ hardware configuration- DAQ hardware Analog Inputs- Analog outputs- Counters- DAQ software architecture- DAQ assistant Selecting and configuring a data acquisition device- Components of computer based measurements system.	**10**	**CO4**
V	**Analysis tools and Applications in VI:** Fourier transform-Power spectrum-Correlation-Windowing and filtering tools - Simple temperature indicator-ON/OFF controller - P-I-D controller – Oscilloscope emulation Simulation of a simple second order system.	**10**	**CO5**

Text Books

1.	G.C.Barney, **"Intelligent Instrumentation"**, Prentice Hall
2.	Jovitha Jerome, 2010. **"Virtual Instrumentation Using LabVIEW"**, Eastern Economy Edition, PHI Learning private ltd

Reference Books

1.	*S.Gupta and J.P.Gupta.*,1994 **PC Interfacing for Data Acquisition and Process Control** Instrument society of America,
2.	*Peter W. Gofton*,"**Understanding Serial Communications"** Sybex International.
3.	Robert H.Bishop, 2003."**Learning with LabVIEW"** Prentice Hall.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	demonstrate the working of Labview
CO2	classify the various types of structures used in LabView
CO3	describe the use of LabView for signal processing, image processing etc.
CO4	analyze and design different type of program based on data acquisition
CO5	explore the concept of advanced control schemes used in process control.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	L	L
CO2	L	L	M	M	M
CO3	L	M	L	M	H
CO4	M	H	H	H	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low

18UECEL602	**ELECTIVE IV: ROBOTICS**	**SEMESTER –VI**

Course Objectives:

The Course aims

- To introduce the concept of Robotic system.
- To develop its components, instrumentation and control related to robotics.
- To design applications using VAL programming

Credits: 4 **Total Hours:50**

UNIT	CONTENTS	Hrs	CO
I	**Basic Concepts In Robotics:** Introduction- Basic structure of Robots-Numerical control of machine tools-Resolution-Accuracy-Repeatability-Position representation-Advantages and Application of Robots.	10	CO1
II	**Robot Control:** Control loops of robotic systems-Manipulator-Cartesian coordinate robots-Cylindrical coordinate robots-Spherical coordinates robots-Wrist motion & the gripper-Structure of continuous path robot system-Control approaches of robots.	10	CO2
III	**Sensors In Robotics:** Introduction to robotic sensors-Vision systems-vision equipment-image processing-Range detector-Force and torque sensors-six component sensor-Three component force sensors.	10	CO3
IV	**Robot Programming:** Programming Languages- Programming with graphics-Storing and operating task programs-point to point robots-Continuous-path robots. **Installing a Robot**: A plant survey- selecting robot- Economic analysis-Case study- Robot safety.	10	CO4
V	**Applications using VAL programming:** Single machine tool-Manufacturing cell- Welding- Spray painting- Design for automatic assembly- Machining- Drilling- Deburring metal parts.	10	CO5

Text Book

1.	*Yoram Koren* 2014.,**" Robotics for Engineering"** McGraw-Hill book company.

Reference Books

1.	*Nikku,S.B.,* 2002 **Introduction to robotics,** Prentice- Hall of India Pvt.Ltd

2.	*Schiling. R.J.,* 2006 **Fundamental of robotics:** Analysis and Control, Prentice Hall of India Pvt.Ltd
3.	*Craig.J.,* 2006 **Fundamental of robotics: Analysis and Control,** Prentice Hall of India Pvt.Ltd

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	comprehend the fundamentals of robotics and its components
CO2	illustrate the control and coordinates of robot.
CO3	elucidate the need of different sensors and operations
CO4	analyze the uses of programming languages and installing a robot
CO5	demonstrate the application in real world applications.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	L	L
CO2	L	L	M	M	M
CO3	L	M	L	M	M
CO4	M	M	H	H	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low

18UECAL501	ADVANCED LEARNERS COURSE III: ENERGY AUDITING	SEMESTER –V

Course Objectives:

The Course aims

- To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of energy conservation and energy auditing.
- To enable the students to develop managerial skills to assess feasibility of alternative approaches and drive strategies regarding energy conservation and energy auditing.

Credits: 4

UNIT	CONTENTS	CO
I	**ENERGY CONSERVATION CONCEPTS:** Energy – classification – scenario – energy pricing – energy and environment – energy conservation and its importance – energy strategy for the future – energy conservation act and its Features.	CO1
II	**ENERGY AUDITING AND ECONOMICS:** Objectives of energy management – principles – energy audit strategy - types – detailed energy audit –steps. Energy performance - bench marking – fuel substitutions – energy audit instruments – material and energy balance – energy conversion – energy index – cost index – financial management – financing options.	CO2
III	**THERMAL ENERGY AUDIT:** Energy efficiency in thermal utilities – methodology – stoichiometric analysis of combustion in a boiler – performance evaluation – boiler losses - analysis – feed water treatment – energy conservation opportunities in boilers and steam system – furnaces – insulation and refractories – cogeneration – principles of operation - waste heat recovery systems – case study – analysis.	CO3
IV	**ELECTRICAL ENERGY AUDIT:** Electrical systems – introduction – electricity billing – load management – power factor – improvements and benefits – transformers – distribution losses – analysis – energy audit in electrical utilities methodology – energy conservation opportunities in motors – efficiency – energy efficient motors – motor losses – analysis – energy efficiency in compressed air system	CO4

V	**ELECTRICAL ENERGY AUDIT – II:** HVAC and refrigeration system – fans and blowers – fan performance – pumps - lighting system - energy auditing and reporting in industries – replacement of renewable energy technology option – case study in agro-industries	**CO5**
Text Books		
1.	*Capehart B.L., Turner W.C., Kennedy W.J.* 2011. **Guide to Energy Management** [Seventh Edition). Fairmont Press.	
2.	*Patrick D.R., Fardo S.W., Richardson R.E., Fardo B.W.* 2014. **Energy Conservation Guidebook** [Third Edition]. Fairmont Press.	
Reference Books		
1.	*Murphy, W.R. and McKay, G.*1990 **Energy Management.** Butterworth & Co., Publishers Ltd., London.	
2.	*Craig B. Smith.*2016 **Energy Management Principles, Applications, benefits & savings.** Pergamon Press Inc.	
3.	*Murgai, M.P. and Ram Chandra.* 1990 **Progress in Energy Auditing and Conservation – Boiler Operations,** Wiley Eastern Ltd.	
4.	*Kreith F., Goswami D.Y.* 2007. **Energy Management and Conservation Handbook.** CRC Press.	

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	acquire the knowledge on fundamentals of economic operation of an electrical system
CO2	conceptual knowledge of the technology, economics and regulation related issues associated with energy conservation and energy auditing
CO3	calculate the efficiency of various thermal utilities
CO4	understand the electricity load, power, loss and efficiency
CO5	analyze the viability of house-hold and agro industry products

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	M
CO2	L	L	M	M	H
CO3	L	M	H	M	M
CO4	M	M	H	M	H
CO5	M	H	M	H	H

H-High; M-Medium; L-Low

18UECAL502	ADVANCED LEARNERS COURSE IV: ELECTRONIC APPLICATIONS IN AGRICULTURE	SEMESTER –V

Course Objectives:

The Course aims

- To expose the students to the applications of Electronics in Irrigation Automation
- To introduce the concepts of Automatic Systems and IoT applications
- To expose the students to IT applications in precision farming, environmental control systems, agricultural systems management and weather prediction models.

Credits: 4

UNIT	CONTENTS	CO
I	**Introduction to Automation**: Automatic Irrigation – Traditional methods of Irrigation – Need for Automation – Comparison between Traditional and Automated Irrigation – Advantages – Disadvantages – Economic Impacts of Automation on Agricultural Firms – Future of Automation.	**CO1**
II	**Systems of Automation:** Automated Irrigation – Pneumatic System – Portable timer system – Timer/Sensor Hybrid/SCADA – Methods of automating Irrigation layout – Machine Learning in Tank Monitoring System.	**CO2**
III	**IoT in Irrigation:** IoT based Automated Irrigation System – IoT based Smart Irrigation – Sensor based Automation – types – operation – Solar based Automatic Irrigation System – components – operation - Automation by sensing soil moisture – Automation using ANN based controller – operation.	**CO3**
IV	**Precision Farming and Agricultural Systems:** Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Artificial light systems, management of crop growth in greenhouses - Artificial intelligence and decision support systems.	**CO4**
V	**E-Governance in Agricultural Systems:** Expert systems - Agricultural and biological databases - e-commerce – e-business systems & applications, Technology enhanced learning systems and solutions, e-learning, Rural development and information society.	**CO5**

Text Books	
1.	*H.R.Haise, E.G.Kruse.,* 1981. **Automation of Surface Irrigation:** 15 years of USDA Research and Development at Fort Collins, Colorado
2.	*National Research Council* 1997 **"Precision Agriculture in the 21st Century"**, National Academies Press, Canada.
3.	*H. Krug, Liebig, H.P.* 1989 **"International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation"**
Reference Books	
1.	*Brian Wahlin and Darell Zimbelman,* 2014 **Canal Automation for Irrigation Systems, American Society of Civil Engineers.**
2.	*Darell D.Zimbelman,* 1987 **Planning, Operation, Rehabilitation and Automation of Irrigation water delivery system, American Society of Agricultural Engineers**
3.	*Hammer, G.L., Nicholls, N., and Mitchell, C.,* 2000 **"Applications of Seasonal Climate"**, Springer, Germany.
4.	*Peart, R.M., and Shoup, W. D.,* 2004 **"Agricultural Systems Management"**, Marcel Dekker, New York.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the technologies available for automation
CO2	design conventional methods as automated system to be more efficient
CO3	understand the IT applications in environmental control Systems
CO4	understand precision farming, agricultural systems management and weather prediction models
CO5	understand agricultural marketing, challenges and prospects for improving agricultural marketing system

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	M
CO2	L	L	M	M	H
CO3	L	M	H	M	M
CO4	M	M	H	M	H
CO5	M	H	M	H	H

H-High; M-Medium; L-Low

GUIDELINES

1. SUBMISSION OF RECORD NOTE BOOKS AND PROJECT DISSERTATION: Candidates appearing for Practical Examinations and Project Viva-voce shall submit Bonafide Record Note Books/ Dissertation prescribed for Practical/ Project Viva-voce Examinations, otherwise the candidates will not be permitted to appear for the Practical/ Project Viva-voce Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory and Practical)

(i) THEORY

The candidate shall be declared to have passed the Examination, if the candidate secures not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Marks Distribution [CA- Total Marks: 25]

Attendance	: 5 Marks
Assignment/Seminar	: 5 Marks (2 Assignments and 1 Seminar)
Internal Examinations	: 15 Marks
Total	**: 25 Marks**

(ii) THEORY (If Internal Evaluation is for 100 Marks)

The candidate shall be declared to have passed the Examination, if the candidates secure not less than 40 marks out of 100 in the Comprehensive Examination (Internal Evaluation only).

Internal Marks Distribution [CA- Total Marks: 100]

Attendance	: 10 Marks
Assignment and Seminar	: 30 Marks (2 Assignments and 1 Seminar)
Internal Examinations	: 60 Marks
Total	**: 100 Marks**

(iii) PRACTICAL

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

***Internal Marks Distribution* [CA- Total Marks: 40]**

Experiment	: 10 Marks (10 Experiments)
Attendance	: 5 Marks
Record	: 15 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

(iv) CAREER COMPETENCY SKILLS

Viva voce– Semester V

- The student has to come in proper dress code for the Viva Voce
- Questions will be asked to evaluate the reading, speaking and listening skills of the students.
- E-mail and Letter drafting exercises will be given.

On Line Objective Examination (Multiple Choice questions) – Semester VI

- 100 questions - 100 minutes.
- Twenty questions from each UNIT.
- Online examination will be conducted at the end of the IV.

(v) ADD ON COURSES

The candidate shall be declared to have passed the Examination, if the candidate secures not less than 40 marks out of 100 in the Comprehensive Examination in each Theory paper (or) Practical.

(vi) ELECTIVE COURCES

The candidate has to select one Elective Course each in Semester V and Semester VI. The candidate shall be declared to have passed the Examination, if the candidate secures not less than 40 marks put together out of 100 in the Comprehensive Examination.

(vii) ADVANCED LEARNERS COURSE

The candidate with minimum 60% of Marks with no arrears has the option to select one advanced learners course each in Semester IV and Semester V. The candidate shall be declared to have passed the Examination and awarded two extra credits, if the candidate secures not less than 40 marks out of 100 in the Comprehensive Examination. Alternatively, the candidate may enroll and complete any MOOC and by producing the certificate, he/ she shall obtain two extra credits.

3. QUESTION PAPER PATTERN AND MARK DISTRIBUTION

(i) THEORY

Question Paper Pattern and Mark Distribution [Maximum Marks 75]

1. PART – A (10 x 2 = 20 Marks)

Answer ALL questions Two questions from each UNIT

2. PART – B (5 x 5 = 25 Marks)

Answer ALL questions

One question from each UNIT with Internal Choice

3. PART – C (3 x 10 = 30 Marks)

Answer ANY THREE questions Open Choice – 3 out of 5 questions

One question from each UNIT.

Question Paper Pattern and Mark Distribution [Maximum Marks 100]

1. PART – A (10 x 2 = 20 Marks)

Answer ALL questions Two questions from each UNIT

2. PART – B (5 x 7= 35 Marks)

Answer ALL questions One question from each UNIT with Internal Choice

3. PART – C (3 x 15 = 45 Marks)

Answer ANY THREE questions Open Choice – 3 out of 5 questions One question from each UNIT

(ii) PRACTICAL

Question Paper Pattern and Mark Distribution [Maximum Marks 60]

Question Paper Pattern

Practical Examinations shall be conducted at the end of every Semester.

External Marks Distribution [CE- Total Marks: 60]

i) Circuit diagram/ Program	: 20 Marks
ii) Construction / Coding	: 20 Marks
iii) Result	: 20 Marks
Total	**: 60 Marks**