15LSU101	தமிழ் முதல் தாள்	Semester-I			
		L	T	P	C
		5	-	-	5

கற்பகம்உயர்கல்விகலைக்கழகம்

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2015 - 2016)

முதல்பருவம்

(இளநிலை அறிவியல் பட்டவகுப்புகளுக்குரியது)

(For I-UG Science Degree Classes) 15LSU101

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன்விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக்கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத்துறை சார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	4	3	40 / 60	100	4

அலகு – I : இக்கால இலக்கியம்

தத்துவம் : மகாகவி பாரதியார் – பகைவனுக்கு அருள்வாய்.
கவிஞர் ந.பிச்சமூர்த்தி – கிளிக்கூண்டு
இயற்கை : பாவேந்தர் பாரதிதாசன் – அழகின் சிரிப்பு – ஞாயிறு.
சமுதாயம் : கவிக்கோ அப்துல் ரகுமான் – இன்றைய நிலை
அறிவியல் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் – காலம்.
பெண்ணியம் : கவிஞர் சிவரமணி – வையகத்தை வெற்றிகொள்ள
சூழலியல் : அன்பாதவன் - மரணம்
காதல் : வைரமுத்து - காதல் உயில்
தன்னம்பிக்கை பா.விஜய் - தன்னம்பிக்கை

அலகு – II : அற இலக்கியம்

1. திருக்குறள் - தேர்ந்தெடுக்கப்பட்ட குறள்கள் 20
2. நான்மணிக்கடிகை - தேர்ந்தெடுக்கப்பட்ட ஐந்து பாடல்கள்
3. திரிகடுகம் - தேர்ந்தெடுக்கப்பட்ட ஐந்து பாடல்கள்

அலகு - III : சிற்றிலக்கியம்

1. நரிவிருத்தம் - அறன் வலியுறுத்தல்
2. தமிழ் விடு தூது - தமிழின் சிறப்புரைத்தல்
3. மதுரை மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தொடுக்கும் கடவுள் பழம்பாடல்

அலகு – IV : சிறுகதை

1. புதுமைப்பித்தன் - நிகும்பலை
2. தனுஷ்கோடி ராமசாமி - கந்தகக் கிடங்கிலே
3. கந்தர்வன் - துண்டு
4. வாஸந்தி - வடிகால்
5. சி.ஆர். ரவீந்திரன் - வழுக்குமரம்

அலகு- V : மொழிப்பயிற்சி

1. விண்ணப்பங்கள் எழுதுதல் மற்றும் கடிதப் பயிற்சி
2. மொழிபெயர்ப்புப் பயிற்சி

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

15ENU101	ENGLISH - I	Semester-I			
		L	T	P	C
		4	-	-	4

Course Objectives:

- To enable the learners to acquire English language skills at a faster pace.
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar.

Course Outcomes:

- Learn to reflect on the literary works and communicate flexibly.
- Reading and comprehending literary works
- Genres of literature to provide moral education
- Develop communication skills in business environment
- Interpersonal skills will be developed.
- Betterment of language competence

UNIT I:

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefixes, Antonyms, Sentence Completion
Grammar: Articles, Adverbs, Pronouns
Composition: Proverb Expansion

UNIT II:

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffixes, Analogies
Grammar: Nouns, Adjectives
Composition: Dialogue Writing

UNIT III:

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verbs, Conjunctions and Interjection, Indirect/Reported Speech

UNIT IV:

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Prepositions, Voice- Active and Passive
Composition: Letter Writing- Informal

UNIT V:

Short Story: The Bird **–** Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitute
Grammar: Questions, Pronunciation
Composition: Letter Writing- Formal

PRESCRIBED TEXT

1. Rao, G. Chandralekha and et al. Spring 2013. Emerald Publishers: Chennai.

REFERENCES

2. Syamala, V. English for Communication. 2006. Emerald Publishers: Chennai

15ECU101	ELECTRONIC DEVICES AND CIRCUITS	Semester-I			
		L	T	P	C
		5	1	-	6

COURSE OBJECTIVES

- Ability to design different types of Electronic Circuits such as Amplifiers and Oscillators.
- To understand and implement the advanced electronic circuits such as amplifiers etc with the help of theoretical and practical problem solving.
- Ability to analyze the different types of configurations and applications of Transistor.
- Ability to determine the stability of feedback amplifiers and their steady state performance.
- To analyze the Circuits in time and frequency domain
- Calculation and measurement of parameters for electronic circuits, to introduce the students to the advanced concepts of electronics.

COURSE OUTCOMES

- Know the characteristics of diodes and transistors
- Design simple circuits and know the benefits of feedback in amplifier
- Apply their knowledge in analyzing Circuits by using network theorems.
- Measure the characteristics of electronic circuits and present experimental results
- Compare and classify oscillators
- Analyze electrical circuits and calculate the main parameters

UNIT I - Passive Circuit Components

Introduction **–** Resistors: Fixed &Variable resistor – Colour coding – Tolerance - Series and Parallel connection. Capacitors: Basic structure and symbol – Fixed & Variable capacitors – Dissipation factor – Series and parallel connection. Inductors**:** Inductance of the coil – Fixed & Variable inductors – Inductive reactance – Energy stored in an inductor – Q factor – Mutual inductance – Series and Parallel connection

UNIT II - Network Theorems

Basics of Ohm's law – Kirchoff's law– Superposition theorem – Thevenin's theorem – Thevenzing a circuit with two Voltage Source – Thevenzing a bridge circuits – Norton theorem – Thevenin's Norton conversion – Conversion of Voltage and Current source – Millman's theorem – Maximum Power transfer theorem

UNIT III - Semiconductor Devices and Special Diodes

Introduction **-** Atom- electron-orbit – Energy level -Conductor – Semiconductor – Insulator– Intrinsic semiconductor – Extrinsic semiconductor – P type and N type semiconductor– PN junction diode –V-I characteristics - Zener diode - V-I characteristics- Schottky diode-Tunnel diode-Varactor diode- UJT- Photo diode- Construction and Operation of transistors – Characteristics of CE , CB,CE .

UNIT IV - Wave Shaping and Switching Circuits

Introduction and Design of Wave shaping and Switching Circuits - Clipping, Clamping circuits – Half wave, full wave and bridge rectifiers – Average value – RMS value – Ripple factor – Rectification efficiency. Filters: Capacitors, Inductors, LC and PI filter Transformers - Types–Zener as Voltage Regulator - Regulated Power Supplies using Zener Diode.

UNIT V- Amplifiers and Oscillators

Introduction– Transistor as an Amplifier -Single Stage- RC coupled amplifiers- Power amplifiers: Class A, B& AB power amplifiers-Push pull amplifiers- Oscillators – RC phase shift-Hartley Oscillator- Colpitts Oscillator-Wein Bridge Oscillator.

TEXT BOOKS

1. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar & A.Vallavaraj, Tata Mc Graw-Hill publishing Company Limited,Third Edition, 2012.
2. Electronic Devices and Circuits, David.A. Bell, Oxford University Press Fifth Edition, 2008.

REFERENCES

1. Electronic Devices and Circuits, Jacob Millman,Christos.C.Halkias&Satyabrata Jit,Tata Mc Graw–Hill Edition ,Third Edition, 2010.
2. Electronic Devices and Circuits I.U.A.Bakshi.A.P.Godse,Technical Publications, 2010.

15ECU102	ALLIED MATHEMATICS – I	Semester-I			
		L	T	P	C
		4	2	-	4

OBJECTIVE

- This course provides a deep knowledge to the learners to understand the basic concepts of Matrices, Sequences, Complex Variable, Complex Function, First Order Ordinary Differential Equations, Power series method
- To provide students with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.
- To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.
- To build the strong foundation in Mathematics of students needed for the field of electronics and Telecommunication Engineering
- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Vector differentiation and integration required in Electro-Magnetics and Wave theory.

COURSE OUTCOMES

- Able to solve qualitative problems based on vector analysis and matrix analysis such as linear independence and dependence of vectors, rank etc
- Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
- Able to solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables
- Come to know the applications of double and triple integration in finding the area and volume
- Know about qualitative applications of Gauss , Stoke's and Green's theorem
- Use Vector differentiation and integration required in Electro-Magnetics and Wave theory

UNIT I

Complex Numbers: Definition of complex number – Argand Diagram –rectangular form-polar form-Conversion of rectangular form into polar form and vice versa- Addition, subtraction, Multiplication and Division by using polar and Rectangular forms- Applications of Demoivre's theorem – Cos nθ , Sin nθ, tan nθ- Expansions of cos nθ, sin nθ – Expressions of Sinθ, Cosθ, Tanθ in powers of θ(simple problems only)

UNIT II

Vector Calculus :Concepts of vector and scalar fields- the Del operator – Divergence of a vector – Curl of a vector- Laplacian Operator – Gauss' s theorem , Green's theorem.(statements & simple problems only).

UNIT III

Matrices : Different types of matrices – Inverse of a matrix – Solution of simultaneous equations by Inverse matrix method- Unitary and Orthogonal matrices –Its properties. Cayley-Hamilton theorem (Statement only)-Verification.

UNIT IV

Differential Equations: Types of Linear Linear differential equations with constant coefficients – Simultaneous differential equations with constant coefficient .

UNIT V

Numerical Methods: Solving simultaneous equations.-Gauss Elimination method, Gauss Jordan method, Gauss – Seidel Process. Numerical Integration – Trapezoidal Rule, Simpson's

Rule.

TEXT BOOKS

1. A.Singaravelu, 2001, “Engineering Mathematics”, Meenakshi Agency, Chennai.(Unit I – IV)
2.Venkataraman M.K., 2001. Numerical methods in science & Engineering, National Publication co. Chennai. (Unit V)

REFERENCES

1. Venkataraman.M.K, 1998. “Engineering Mathematics”. The National Publications & Co. Chennai.
2. Veerarajan , T.Ramachandran “ Numerical methods with programs in C”, Tata McGraw-Hill publishing Ltd , New Delhi.
3. S. Narayanan and T.K. Manicavachagam Pillai. 2002. “ Calculus”, S.V Publications. Chennai.
4. Kandasamy, K. Thilagavathy, K.Gunavathy, 2000, “Numerical Methods”, S.Chand and Company LTD, New Delhi.

15ECU111	PRACTICAL -I ELECTRONIC DEVICES AND CIRCUITS LAB	Semester-I			
		L	T	P	C
		-	-	5	3

COURSE OBJECTIVES

- To identify and test various electronic components
- To use DSO for various measurements
- To plot the characteristics of diode and transistor
- To design and implement feedback amplifier circuits
- To measure the frequency of oscillators.
- To design and test regulated power supplies

COURSE OUTCOMES

- Verify the rectifier circuits using diodes and implement them using hardware
- Design the biasing circuits like self biasing
- Understand the construction, operation and characteristics of FET which can be used in the design of amplifiers
- Design simple circuits
- Know the benefits of feedback in amplifier
- Compare and classify oscillators.

(Any 12 Experiments)

1. Study of CRO and Colour coding of Resistors.
2. Verification of Ohms law
3. Verification of Kirchoffs Law
4. Verification of Thevenins Theorem
5. Verification of Superposition Theorem
6. Verification of Maximum Power transfer Theorem
7. VI Characteristics of Junction diode
8. VI Characteristics of Zener diode
9. Clipping and Clamping circuits
10. Half wave rectifier and Full wave rectifier.
11. Zener diode as Voltage regulator
12. RC coupled Amplifier
13. Phase shift Oscillator
14. Transistor characteristics of CE
15. Transistor characteristics of CB

15FCA101	FOUNDATION COURSE – A VALUE EDUCATION	Semester-I			
		L	T	P	C
		2	-	-	1

Instruction Hours/week: L: 2 T: 0 P: 0 Marks: Internal: 100 External: Nil Total: 100

COURSE OBJECTIVES

- To improve the integral development of human begins
- To train the students towards sustainable lifestyle
- To create awareness about the values and their significance and role
- To imbibe the concept of discipline and freedom
- To provide a backdrop for the development of their creative talents
- To give students a deeper understanding about

COURSE OUTCOMES

- Students will understand the importance of value based living
- Students will gain deeper understanding about the purpose of their life
- Students will understand and start applying the essential steps to become good leaders.
- Know about philosophy of life and individual qualities
- To learn and practice social values and responsibilities
- The students fit for the future time and to develop a sense of competitive spirit, co-operation, leadership, diligence, punctuality, and team-spirit

UNIT – I

Concept of Self, self-esteem and self-confidence. Concept of personality, determinants and disorgiansation of it. Personality development – meaning.

UNIT – II

Goal setting – meaning and importance; steps in goal setting Manners and Etiquette – meaning need and importance; means to improve. Positive thinking.

UNIT – III

Discipline – meaning. Concept of Roles and Responsibility Time Management – Meaning and steps for effective time management.

UNIT – IV

Interpersonal relationship – meaning and importance; means to improve it. Healthy friendship.

UNIT – V

Family Relationship importance of it; Means to improve. Spirituality – meaning. Its relationship with Altruism, sacrifice, self control, tolerance and truthfulness.

TEXT BOOKS

1. Karpagam Academy of Higher Education, Study Material, 2015.

15SSD101	SOFT SKILL DEVELOPMENT - I	Semester-I			
		L	T	P	C
		2	-	-	-

Instruction Hours / week: L: 2 T: 0 P: 0 Marks: Internal: 100 External: Nil Total: 100

COURSE OBJECTIVES

- To improve the integral development of human begins
- To train the students towards sustainable lifestyle
- To create awareness about the values and their significance and role
- To imbibe the concept of discipline and freedom
- To provide a backdrop for the development of their creative talents
- To give students a deeper understanding about

COURSE OUTCOMES

- Effectively communicate through verbal oral communication
- Improve the listening skills
- Write precise briefs or reports and technical documents
- Actively participate in group discussion, meetings and presentations
- Become more effective individual through goal target setting , self motivation and practicing creative thinking
- To impact knowledge on both Aptitude and Soft skills to the students

UNIT - I

Introduction to Quantitative Aptitude, Speed Maths, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT - II

Number Series, Blood Relation, Image Analysis, Direction Sense, Syllogism, Coding and Decoding

UNIT – III

Percentages, Data Interpretation, Profit and Loss, Simple Interest and Compound Interest

UNIT – IV

Parts of Speech, Tense, Subject Verb Agreement, Active and Passive Voice, Articles, Prepositions

UNIT - V

Conditional Clause, Degrees of Comparison, Goal Setting, Interpersonal Skills

15LSU201	தமிழ் இரண்டாம் தாள்	Semester-I			
		L	T	P	C
		5	-	-	5

கற்பகம்உயர்கல்விகலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2015 - 2016)

இரண்டாம்பருவம்

(இளநிலை அறிவியல் பட்டவகுப்புகளுக்குரியது)

(For I-UG Science Degree Classes) 15LSU201

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக்கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத்துறை சார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

அலகு - I : பக்தி இலக்கியம்

1. சைவம் - மூவர் தேவாரத்திலிருந்து தேர்ந்தெடுக்கப்பெற்ற15 பாடல்கள்
2. வைணவம் – ஆண்டாள் நாச்சியாரின் திருப்பாவையிலிருந்து 11 பாடல்கள்

அலகு – II : சங்கஇலக்கியம்

அ). எட்டுத்தொகை

நற்றிணை: 1. இலை இல பிடவம், திணை – முல்லை,
ஆசிரியர் – விழிக்கட் பேதைப் பெருங்கண்ணனார்.
2. மடல் மா ஊர்ந்து, திணை – குறிஞ்சி, ஆசிரியர் – மடல் பாடிய மாதங்கீரனார்.

குறுந்தொகை : 1. உள்ளார் கொல்லோ, திணை – பாலை, ஆசிரியர் – பெருங்கடுங்கோ.
2. யாரிலும் இனியன், திணை – மருதம், ஆசிரியர் – வடமவண்ணக்கள் தாமோதரனார்.

ஐங்குறுநூறு : 1. நுண்ணோர் புருவத்த, திணை – குறிஞ்சி, ஆசிரியர் – கபிலர்.
2. அவறொறுந் தேரை, திணை – முல்லை, ஆசிரியர் - பேயனார்.

பதிற்றுப்பத்து – தைதந்த காஞ்சி, ஆசிரியர் - பாலைக் கௌதமனார்.

பரிபாடல் - வையை - திரை இரும் பனிப் பௌவம், ஆசிரியர் - மையோடக் கோவனார்.

கலித்தொகை – கடும் புனல் கால் பட்டு, திணை – பாலை, ஆசிரியர் - பெருங்கடுங்கோ.

அகநானூறு - 1. ஆடு அமைக் குயின்ற, திணை – குறிஞ்சி, ஆசிரியர் – கபிலர்.
2.யாள் எவன் செய்கோ தோழி, திணை – பாலை, ஆசிரியர் – நோய்பாடியார்.

புறநானூறு - 1. சிறப்பில் சிதடு முறுப்பில், திணை – பொதுவியல்,
ஆசிரியர் – உறையூர் முதுகண்ணன் சாத்தனார்.
2.இளையரு முதியரும் வேறுபுலம் படா – ஆசிரியர் – கயமனார்.

ஆ). பத்துப்பாட்டு - சிறுபாண் ஆற்றுப்படை – கடையெழு வள்ளல்களின் சிறப்பு,
நல்லியக்கோடனின் சிறப்பு, ஈகைத் திறம்.

அலகு - III : காப்பியங்கள்

1.மணிமேகலை –பாத்திரம் பெற்ற காதை – தீவதிலகை, மணிமேகலைக்குச் சொல்லியது,
சிறைக்கோட்டம் அறக்கோட்டமாக்கிய காதை – மணிமேகலை வேண்ட,
மாவண்கிள்ளி, சிறைக்கோட்டத்தை அறக்கோட்டமாக்கியது.

2. கம்பராமாயணம் - இலக்கியநயம் மிக்க, தேர்ந்தெடுக்கப்பெற்ற 41 பாடல்கள்.

அலகு - IV : கட்டுரைகள்

1.திருக்குறளில் மனிதவள மேலாண்மைக் கருத்துக்கள் - திருமிகு ஹரி விஜயலட்சுமி.

2. தமிழர் வளர்த்த நுண்கலைகள்: சிற்பமும் ஓவியமும் – தொ.மு. பாஸ்கரத் தொண்டைமான்.

3. சமயமும் தமிழும் – பேராசிரியர் அ.ச.ஞானசம்பந்தன்.

4.தமிழில் அறிவியல் – ஒரு பார்வை - பேராசிரியர் சிவகுமார்.

5. இன்றைய நெருக்கடிப் பிரச்சனைகள் - நீர்வளம் - முனைவர் ச. முத்துக்குமரன்.

அலகு - V : இலக்கணமும் மொழிப்பயிற்சியும்

1.எழுத்து, சொல், பொருள் இலக்கண எழுத்துப்பயிற்சிகள்

2.பொதுக் கட்டுரைகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

15ENU201	ENGLISH - II	Semester-II			
		L	T	P	C
		4	-	-	4

Course Objectives:

- To enable the learners to acquire English language skills through literature.
- To familiarize them with English literature.
- To acquire Grammar knowledge.
- To help learners imbibe cultural values.
- To acquire skill of making correct sentences.
- To reflect originality on the application of soft skills and express in writing their views.

Course Outcomes:

- Learn to enjoy the ecstasy of literature.
- The select literary pieces will develop the confidence level of the learners.
- To get the social values.
- To know the importance of communication
- Get sound knowledge in English
- Trained to communicate well for business purpose.

UNIT I:

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verbs

UNIT II:

Prose: Travel by Train – J. B. Priestly
Poetry: The Gift of India **–** Sarojini Naidu
Grammar: Sentence patterns
Composition: Reading Comprehension

UNIT III:

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant
One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers
Composition: Report Writing

UNIT IV:

Poetry: Ozymandias – P.B. Shelley
One-Act Play: The Pot of Broth- W.B. Yeats
Vocabulary: Collective Nouns
Grammar: Correction of Sentences
Composition: Picture Reading

UNIT V:

Short Story: The Silver Butterfly– Pearl S. Buck

One-Act Play: The Bear – Anton Chekov
Vocabulary: Acronyms
Grammar: Question Tags
Composition: Drafting Advertisement

PRESCRIBED TEXT

1. Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai

REFERENCES

2. Syamala, V. English for Communication. 2006. Emerald Publishers: Chennai.

15ECU201	DIGITAL ELECTRONICS	Semester-II			
		L	T	P	C
		5	1	-	6

COURSE OBJECTIVES

- To enable the students to represent numerical values in various number systems and perform number conversions between different number systems.
- To analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder, multiplier).
- To design sequential digital circuits like flip-flops, registers and counters.
- To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
- To lay the foundation for further studies in areas such as communication, computer, microprocessor.
- To understand number representation and conversion between different representation in digital electronic circuits.

COURSE OUTCOMES

- Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
- Design combinational and sequential circuits.
- Design and implement hardware circuit to test performance and application.
- Implement combinational and sequential circuits
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits

UNIT I -Number Systems & Boolean Algebra

Review of Binary, Octal, & Hexadecimal and Decimal number systems-Representation of Signed Numbers-Floating point number representation-BCD-ASCII-EBCDIC-Excess 3 codes Gray code-Error Detecting & Correcting Codes. Boolean Algebra: Postulates & Theorems of Boolean Algebra –Canonical Forms –Simplification of Logic Functions using Karnaugh map.

UNIT II- Combinational Logic Design

Logic gates –Implementation of Combinational Logic Functions – Encoders & Decoders –Multiplexers & Demultiplexers –Code Converters – Comparator - Half Adder, Full Adder – Parallel Adder – Binary Adder – Parity Generator/Checker – Implementation of Logical Functions using Multiplexers.

UNIT III -Counters &Registers

RS, JK, JK Master–slave, D&T flip flops – Level Triggering and Edge Triggering – excitation tables –Asynchronous & Synchronous Counters – Modulus Counters–Shift Register – Johnson Counter- Ring Counter – State Diagram-State Table

UNIT IV-D/A, D/A Converter and Memories

Digital to Analog Converter: Resistive Divider type and Ladder type – Accuracy and Resolution - Analog to Digital Converter: Counters - Ramp type - Simultaneous Conversion – Dual slope type – Successive Approximation type – Memories and their types.

UNIT V-Logic Families and Programmable Logic Devices

Logic Families: RTL, DTL, TTL families, Schottky– Clamped TTL, Emitter Coupled (ECL), MOS Inverters, CMOS Inverters, Comparison of performance of Various Logic families. Introduction to PLD's – PAL – PLA

TEXT BOOKS

1. Digital Electronics and its principles, Salilvahanan, McGraw Hill Education (India) Private Limited,2014, Tenth Edition.
2. Digital Principles and Application, Albert Paul Malvino, Donald P. Leach and Goutam Saha, Tata McGraw Hill, Seventh Edition 2010.
3. Digital Design: With an Introduction to Verilog HDL, Morris Mano, Pearson Education, Fifth Edition,2013.

REFERENCES

1. Modern Digital Electronics, Jain R.P, Tata McGraw Hill Company, Fourth Edition, 2012.
2. Integrated Circuits, Botkar K.R, Khanna Publications, 2008, Third Edition.

15ECU202	ALLIED MATHEMATICS – II	Semester-I			
		L	T	P	C
		4	2	-	4

- This course provides a deep knowledge to the learners to understand the basic concepts of Matrices, Sequences, Complex Variable, Complex Function, First Order Ordinary Differential Equations, Power series method
- To provide students with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.
- To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.
- To build the strong foundation in Mathematics of students needed for the field of electronics and Telecommunication Engineering
- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Vector differentiation and integration required in Electro-Magnetics and Wave theory.

COURSE OUTCOMES

- Gain a clear knowledge about the necessity , properties and applications of Fourier series , Fourier Transform, Laplace Transform and the concept of Statistics and the usage of them
- Able to solve qualitative problems based on vector analysis and matrix analysis such as linear independence and dependence of vectors, rank etc
- Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
- Able to solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables
- Know about qualitative applications of Gauss , Stoke's and Green's theorem
- Use Vector differentiation and integration required in Electro-Magnetics and Wave theory

UNIT I

Fourier series – Definition – Finding Fourier coefficients for a given periodic function with period 2π – Odd and Even functions – Half Range Series.

UNIT II

Definition of Fourier Transform - Properties of Fourier Transform - Inverse Fourier transform - Convolution theorem - Finite Fourier Sine & Cosine Transform – Parseval's theorem.

UNIT III

Definition of Laplace Transform - Properties of Laplace Transform, Inverse Laplace Transform. Application of Laplace Transform.

UNIT IV

Measures of central tendency – Arithmetic Mean, Median, Mode. Measures of dispersion – Range, Standard deviation and Coefficient of variation.

UNIT V

Probability : Concept of Probability - Addition theorem – Multiplication theorem- Binomial distribution , Poisson Distribution & Normal distribution (No derivations) and simple problems.

TEXT BOOKS

1. T.K.Manicavachagom Pillay, 1996, "Calculus Vol II", S. Viswanathan (Printers and

Publishers), PVT., LTD. (Unit I – III).
2. R.S.N.Pillai, V.Bagavathi, 2002, "Statistics", S. Chand & Company Ltd, New Delhi. (Unit IV and V).

REFERENCES

1. V.Sundaram, R.Balasubramanian, K.A. Lakshminarayanan, 2001, "Engineering Mathematics Vol. III", Vikas publishing house PVT., LTD, New Delhi.
2. M.K.Venkataraman. 2001. "Engineering Mathematics Vol. II". National Publishing Company. Chennai.
3. P.Kandasamy, K.Thilagavathy, K.Gunavathy, 2007, "Engineering Mathematics Vol. III", S. Chand & Company Ltd, New Delhi.

15ECU211	PRACTICAL II - DIGITAL ELECTRONICS LAB	Semester-II			
		L	T	P	C
		-	-	5	3

COURSE OBJECTIVES

- Learn and understand the basics of digital electronics, Boolean algebra, and able to design the simple logic circuits and test/verify the functionality of the logic circuits
- Provide hands-on experience in digital circuits, which can be constructed by using standard integrated circuits (ICs)
- Investigate the operation of several digital circuits combinational and sequential
- To model complex digital systems at several level of abstractions; behavioral and structural, synthesis and rapid system prototyping.
- To develop and simulate register-level models of hierarchical digital systems
- To design and model complex digital system independently or in a team

COURSE OUTCOMES

- Identify the various digital ICs and understand their operation.
- Apply Boolean laws and K-map to simplify the digital circuits
- Understand the function of elementary digital circuits under real and simulated environment
- Describe and explain the operation of fundamental digital gates
- Analyze the operation of a flip-flop and examine relevant timing diagrams
- Analyze the operation of counters and shift registers

(Any 12 Experiments)

1. Realization of logic gates using diodes and transistors
2. Verification of Logic Gates using IC
3. Realization of logic gates using universal gates
4. Code converters
5. Realization of Multiplexer using basic gates
6. Encoder and Decoder
7. Realization Half and Full adders
8. Realization of Subtractor
9. Realization of Parity generator
10. Flip-Flop Circuit
11. 4 bit Binary adder
12. Ring Counters
13. A/D converter
14. D/A converter
15. Comparator

15FCB201	FOUNDATION COURSE – B ENVIRONMENTAL STUDIES	Semester-I			
		L	T	P	C
		2	-	-	1

COURSE OBJECTIVES

- Creating the awareness about environmental problems among people.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and improvement.
- Recognize the interconnectedness of multiple factors in environmental challenges
- Engage constructively with diverse forms of knowledge and experience
- Recognize and apply methodological approaches of the social sciences, natural sciences, and humanities

COURSE OUTCOMES

- Understand key concepts in the life and physical sciences and will apply them to environmental issues
- Apply knowledge of the sciences within an interdisciplinary context in solving environmental issues such as environmental health, food and agriculture, energy, waste and pollution, and loss of biodiversity.
- Possess the intellectual flexibility necessary to view environmental questions from multiple perspectives, prepared to alter their understanding as they learn new ways of understanding.
- Solve problems systematically, creatively, and reflexively, ready to assemble knowledge and formulate strategy
- Identify, interpret, and apply basic measures (metrics and formulae) of social system variables to assess socio-environmental conditions.
- Analyze and evaluate ideological and philosophical approaches used to understand environmental relationships

NIT - I: Eco system and natural resources: Environment – Definition – components - Ecosystem -Definition, Concept, Scope, importance, structure and functions of ecosystem. Energy flow, Ecological succession. Food chains and food webs. Classification of ecosystem. Natural resources: Forest resources; water resources

UNIT - II: Environmental pollution: Cause, effects and control measures of Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards pollution. Solid waste management.

UNIT - III: Biodiversity and its conservation: Introduction- Definition, genetic, species and ecosystem diversity, biogeographical classification of India- Value of biodiversity: Consumptive, productive uses; social, ethical, aesthetic and option values. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

UNIT - IV: Social issues and the environment: Urban problems related to energy- water conservation and management -Rain water harvesting- water shed management. Resettlement and Rehabitilisaion. Natural resources and associated problems and sustainable utilization. Environmental Education.

UNIT - V: Environment ethics: Environmental Ethics - Gender equity, ethical basis of environment education and awareness, conservation ethic and traditional value systems of India. Valuing nature, cultures, social justice, Human heritage, equitable use of resources, preserving resources for future generation, common property resources, Ecology and its uses and its degradation, Introduction to Environmental Protection Act (EPA).

TEXT BOOKS

1. Agarwal, K.M., P.K. Sikdar and S.C. Deb, 2002. A Text Book of Environment, Mac Millan India Ltd, Kolkatta, India.
2. Kotwal, P.C. and S. Banerjee, 2002. Biodiversity Conservation – In Managed forest and protected areas, Agrobios, India.

REFERENCES

1. Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.
2. Uberoi, N.K., 2005. Environmental Studies, Excel Books Publications, New Delhi, India.
3. Shaw, R and Krishnamurthy, R.R. 2009. Disaster management: global challenges and local solutions Universities Press (India) Private Ltd, Hyderabad.
4. Sorokin Pitirim. A, 1942. Man and Society In Calamity. New York: Dutton, 1942

Patrick L.Abbott, 2008. Natural Disasters, Mc Graw Hill, New York. Page: 1-7.

15ENU301	ENGLISH - III	Semester-III			
		L	T	P	C
		4	-	-	4

Course Objectives

- To develop confidence to respond in English during situations where the use of English is imperative.
- To develop fluency in actual conversation in the English language.
- To develop speech skills necessary for confident and intelligent participations in Group Discussions and develop skills related to teamwork in work places.
- To develop confidence to respond in English during situations where the use of English is imperative.
- To develop fluency in actual conversation in the English language.
- To develop knowledge about business communication.

Course Outcomes (COs)

- Students learnt the basics and purposes of listening skill.
- Students understand importance of speaking.
- Students developed the speaking skills on telephone, business and also in travel
- Learnt some effective vocabulary learning strategies.
- Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.

UNIT I

Listening: Listening comprehension – Listening for Specific Information –Note Taking – Interpreting Charts and Diagrams.

UNIT II

Speaking: Essentials of effective communication – Greeting and Introducing – Making requests – Asking for permission – Giving and Denying Permission – Offering and Accepting Help – Asking for and Declining Help – Giving Instructions and Orders - Talking about likes and dislikes.

Telephone Skills – Understanding telephone conversation – handling calls – leaving messages – making requests - giving instructions and orders

Discussion Skills – Giving your opinion – agreeing and disagreeing – Making suggestions – Interrupting – questioning – reporting – Dealing with questions.

(Completing dialogues)

UNIT III

Reading: Reading – Reading with a purpose –Skimming and Scanning – locating main points – reading critically – Sequencing of sentences – Reading comprehension.

UNIT IV

Writing: Paragraph Writing – Descriptive and Narrative. Safety Instructions/ Suggestions. Expansion of Abbreviations – Spellings- Report writing.

Translation- Translating short sentences and passages from English to Tamil and from Tamil to English.

UNIT V

Vocabulary: Improve English vocabulary: Synonyms – Antonyms – Prefixes – Suffixes – Idioms – Collocations – Different types of English – British and American (Choose the best answer type from a database of 50 words each for each topic)

Functional Grammar: Forming questions, getting answers – Articles – Parts of Speech – Punctuation – Common mistakes in English (Homophones)(Exercise based)

REFERENCES

1. Language in Use: Kenneth Anderson, Cambridge University Press.
2. Study Speaking: A course in Spoken English for Academic Purpose: Kenneth Anderson, Joan MacLean and Tony Lynch, Cambridge University Press, 2008.
3. Spoken English Part I & II (for Tamil speakers), Orient Longman Pvt. Ltd.
4. Dr. J. John Love Joy, Dr.Francis M.Peter S.J. "Lets Communicate – Basic English for Everyone", Vaigarai Publications, First Edition, Dindigul 2007.

15ECU301	PRINCIPLES OF COMMUNICATION SYSTEMS	Semester-III			
		L	T	P	C
		3	1	-	4

COURSE OBJECTIVES

- To learn the designing procedure and operation of circuits used for communication.
- To understand the basic concepts of AM, FM, and PM transmission and reception.
- To assess and evaluate different modulation and demodulation techniques.
- To evaluate the influence of noise on communications signals.
- To introduce students to various modulation and demodulation techniques of analog communication
- To analyze different parameters of analog communication techniques

COURSE OUTCOMES

- Apply or a create suitable algorithm to solve a particular problem
- Understand and identify the fundamental concepts and various components of analog communication systems
- Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
- Describe analog pulse modulation techniques and digital modulation technique
- Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
- Use of different modulation and demodulation techniques used in analog communication

UNIT I -Modulation Techniques

Introduction to Communication Systems – Information – Transmitter – Channel – Noise –Receiver –- Need for Modulation Band Width requirement – Amplitude Modulation: AM Theory– Frequency spectrum of AM wave – Representation of AM – Power relations in AM wave –AM Transmitter block diagram – Frequency modulation: System description – Mathematical representation – Frequency Spectrum – Generation of FM – Direct and Indirect methods.

UNIT II - Wave Propagation

EM Waves – Free Space Propagation – Surface Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Trophospheric Scatter Propagation – Structure of Atmosphere – Virtual height – MUF – LUF – Skip Distance – Ionospheric abnormalities- Duct Propagation

UNIT III -Antenna Theory

Electro Magnetic radiations – Elementary doublet – Current and Voltage Distribution – Resonant antennas, Radiation patterns and Length calculations – Non resonant antennas – Antenna gain and Effective radiated power – Antenna resistance – Bandwidth, Beam width and Polarization – Grounded and Ungrounded antennas – Impedance matching – Dipole Arrays - Yagi Uda antenna – Parabolic antenna – Horn and Lens antenna .

UNIT IV- Receiver

Introduction – Super heterodyne Receiver – Choice of IF and Oscillator Frequencies – Image Rejection – Adjacent Channel Selectivity – Spurious Response - Tracking – AGC – Double conversion receiver

UNIT V - Modulation Types Analog & Digital Modulation

Introduction to PAM, PPM, PWM and PCM-Binary Phase Shift Keying - differential phase shift keying – differentially encoded PSK - Quadrature Phase Shift Keying – Quadrature amplitude shift keying – Binary frequency shift keying.

TEXT BOOKS

1. Electronic Communication Systems, Kennedy and Davis,Tata McGraw Hill, Fifth Edition, 2012.
2. Electronic Communications, Dennis Roddy and John Coolen, Pearson Education, Fourth Edition, 2008.
3 Antenna Wave Propagation, K.D. Prasad and Satyaprakahan, Pearson Education, Indian Reprint, Fourth Edition, 2012.

REFERENCES

1. Principles of Communication Engineering, Anok Singh & A K Chhabra, S.Chand Publications, Seventeenth Edition, 2010.

15ECU302	LINEAR INTEGRATED CIRCUITS	Semester-III			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To develop an in-depth knowledge on IC fabrication technology
- To understand the basic concepts of operational amplifier and its various applications
- To understand the basics of PLL and its practical applications
- To know about analog multipliers
- To know about various analog switches and different A/D and D/A convertors
- To understand the concepts of switched capacitor filters,Voltage regulator and various amplifiers

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Develop skills to design simple circuits using OP-AMP
- Gain knowledge about various multiplier circuits, modulators and demodulators
- Gain knowledge about PLL
- Learn about various techniques to develop A/D and D/A convertors
- Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

UNIT I - IC Fabrication Technology

Introduction to Integrated Circuit Fabrication – Classification – Integrated Circuit chip size and circuit complexity - Fundamentals of Monolithic Integrated Circuit technology –Basic planar process –Fabrication of a Typical circuit – Active and Passive Components Integrated Circuits - Thin and Thick film technology – Technology Trends

UNIT II - Operational Amplifier

Introduction to Operational Amplifiers – Parameters of Operational Amplifiers – Inverting and Non-Inverting amplifier– Summing Amplifier – Differential Amplifier – Integrator – Differentiator – Instrumentation Amplifier – Voltage to Current Converter –Current to Voltage Converter – Frequency to Voltage and Voltage to Frequency Converter –Wein bridge and RC Phase Shift Oscillator – Collpitts Oscillator –Triangular and Square waveform Generators - Multivibrators.

UNIT III - Comparators and Filters

Introduction to Comparator – Symbol and Characteristics – Effect of Positive Feedback – Difference between Op-amp and Comparator – Voltage Level Detector – Zero Crossing Detector - Schmitt trigger – Level Detector – Window and Peak Detectors – Sample and Hold Circuits.-Active Filters: LPF, HPF, BPF and BRF using Op-Amp.

UNIT IV - Voltage Regulator

Introduction – Series OP-AMP Regulator – IC voltage regulators – Fixed voltage series regulator – Fixed regulator using as adjustable regulator - Block schematic of regulator IC 723 - Regulated power supply using IC 723 - Switching Regulator – Regulator using 78xx, 79xx, and LM 317.

UNIT V - Timer and PLL

Introduction to Timer- Description of Functional block diagram of 555 timer – Monostable operation – Applications: – Linear ramp generator – Pulse width modulator – Frequency Divider - Astable operation – Applications: Schmitt trigger –Pulse Position Modulator - FSK Generator Introduction to Phase locked loop –Basic Principles –VCO

TEXT BOOKS

1. Linear Integrated Circuits, Roy Choudhury. D, Shail Jain, New Age International Ltd, Fourth Edition, 2014.
2. Linear Integrated Circuits, Salivahanan, Tata Mc-Graw Hill Publications, Fourth Edition, 2008.

REFERENCES

1. Integrated Circuits, Botkar K.R, Khanna Publications, 2008.
2. Linear Integrated Circuits, J.S.Chitode, Pune Technical Publications, Sixth Edition,2010.

15ECU311	PRACTICAL – III COMMUNICATION LAB	Semester-III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Convert analog signals to digital format and describe Pulse and digital Modulation techniques
- To introduce students to various modulation and demodulation techniques of analog communication.
- To analyze different parameters of analog communication techniques
- It also focuses on pulse modulation and demodulation
- To understand the concept in communication system to use it in solving the global complex problems.
- Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.

COURSE OUTCOMES

- Able to identify and describe different analog modulation techniques.
- Able to understand basic theories of Digital communication system in practical
- Able to design and implement different modulation and demodulation techniques
- Able to analyze digital modulation techniques by using various tools.
- Able to identify and describe different techniques in modern digital communications, in particular in source coding using various tools
- Implement different types of Amplitude, Frequency, Phase and Pulse modulation and demodulation schemes

(Any 10 Experiments)

1. AM Modulation and Demodulation
2. FM Modulation and Demodulation
3. Pulse Amplitude Modulation and Detection
4. Pulse Width Modulation and Detection.
5. Pulse Position Modulation and Detection
6. Pulse Code Modulation and Detection
7. Amplitude Shift Keying and Detection
8. Frequency Shift Keying and Detection
9. Audio Amplifier using TBA 810.
10. IF Amplifier
11. Study of Yagi uda Antenna
12. IF amplifier

15ECU312	PRACTICAL – IV LINEAR INTEGRATED CIRCUITS LAB	Semester-III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To Gain the practical hands-on experience on 741 Op-Amp applications
- To understand the basic concepts of operational amplifier and its various applications
- To Gain the practical hands-on experience on 555 Timer applications.
- To Gain the practical hands-on experience on Voltage Regulator and Three terminal voltage regulators
- To know about various analog switches and different A/D and D/A convertors
- To understand the concepts of switched capacitor filters, Voltage regulator and various Amplifiers

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Develop skills to design simple circuits using OP-AMP
- Able to utilize items such as decibels, Bode plots, and negative feedback for circuit analysis.
- Gain knowledge about various multiplier circuits, modulators and demodulators
- Gain knowledge about PL
- Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

(Any 10 Experiments)

1. Op-amp: Adder and Subtractor
2. Op-amp: Integrator and Differentiator
3. Op-amp: Schmitt trigger
4. Voltage to Current Converter and Current to Voltage Converter
5. Instrumentation Amplifier
6. Low Pass and High Pass Filters using Op-amp
7. Square and Triangular wave Generator
8. Astable multivibrator using 555
9. Monostable multivibrator using 555
10. Regulated power supply using IC 723
11. VCO using IC 555.
12. Function Generator using 8038

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15ECU303A	OFFICE AUTOMATION	Semester-III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Amplifiers Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Exchange of Information
- Management of Administrative Documents
- Handling of Numerical Data
- Meeting Planning and Management of Work Schedules
- Introduce the students into the various aspect of office automation from primitive method employed in the office in carrying out daily system of office management to the modern day in- office automated system

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Working with Lists, Databases and Pivot tables
- Creating Worksheet Charts
- Analyze business data
- Formatting Forms and Reports
- Setting-Up and Publishing the slide show

UNIT I

Getting started with MS-Word - Entering and Editing Text in a word document - Formatting a word document - Customizing Styles and Templates - Arranging text in Columns and Lists - Using Word's Proofing tools - Designing pages.

UNIT II

Working with Word in Workgroups - Writing Long Documents - Using word to Automate Mailing. Menus – Tables – Windows.

UNIT III

MS-Excel: Building a Worksheet - Editing a Worksheet - Formatting a Worksheet - Using Workbooks to organize information - Customizing Excel to work the way you do - Using formulas and functions to crunch numbers - Creating Worksheet Charts -Working with Lists, Databases and Pivot tables - Analyzing business data - Using Excel to publish to the Web.

UNIT IV

Getting started using MS-PowerPoint - Entering and Editing Text - Formatting text - Inserting Tables, Graphics, and Drawings - Adding special effects and Internet Links - Perfecting your presentation – Setting-Up and Publishing the slide show -Running the slide show.

UNIT V

MS-Access: Understanding Data basics - Creating tables and relationships - Using datasheets to enter and view data - Using Forms to enter and view data – Using Queries to get answer - Using Wizards to generate reports - Formatting Forms and Reports.

TEXT BOOK

1. Running Microsoft Office2000, Halvorson. M and Young. M. First Edition, Washington: Microsoft Press, 1999.

REFERENCES

1. Taxali. R.K. PC Software for Windows Made Simple. 6th Edition, New Delhi: Tata McGraw Hill, 2000.

15ECU303B	C PROGRAMMING	Semester-III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand various features in C
- To help students to understand the implementation of C language
- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C
- To understand the fundamental algorithms such as searching, and sorting

COURSE OUTCOMES

- Analyze unstructured problems and design computer solutions
- Apply or a create suitable algorithm to solve a particular problem
- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem and identify the computing requirements appropriate for its solution
- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, and use current techniques
- Able to design and analyze the time and space efficiency of the data structure

UNIT-I - Programming and Problem Solving

Introduction to Computer based Problem Solving- Problem definition – Problem Solving- goals and objectives – problem identification and definitions. Algorithms for Problem definition – Program design and Implementation issues. Programming Environment – Computer Programming Languages – Types of Programming Languages – Compilers – interpreters.

Construct algorithms for the following: Addition and Multiplication of Two numbers – Check for Odd or Even numbers – Check for Prime numbers – Summation of Set of Numbers.

UNIT-II - Introduction to C

Introduction - An Overview of C – Keywords and Identifier – Variables - Declarations of Variables - User Defined Type Declarations - Typedef – Enum - Constants – Data Types – Operators – Expressions - C Formatted I/O Operations. Decision Making and Branching Statements – Decision Making and Looping Statements - Arrays-Strings - String Handling Functions.

UNIT-III - Functions, Structures and Union

Functions - Introduction - Definition of Functions - Function Declaration - Category of Functions - Nesting of Functions – Recursion - Passing Arrays to Function. Structures and Unions – Introduction - Defining a Structure - Declaring Structure Variables - Accessing Structure Members - Arrays of Structure – Unions.

UNIT-IV - Pointers

Pointers – Introduction – Declaring Pointer Variables - Pointer and Arrays - Pointers and Strings – Array of Pointers - Functions and Pointers - Function Returning Pointers -Pointers to functions - Pointers and Structures

UNIT-V - File Management

File Management in C – Introduction - 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 BOOKS

1. Balagurusamy .E. 2007. Programming in ANSI C. 4th Edition, Tata McGraw Hill Publishers, New Delhi.[Unit – I (23-81), Unit – II (114-259), Unit – III (262-348), Unit – IV (351-388), Unit – V (389-442)]

REFERENCES

1. Ashok N. Kamthane**.** 2004. Programming with ANSI and Turbo**.** 1st Edition, Pearson education, New Delhi. .[Unit – I (7-60), Unit – II (63-277), Unit – III (318-446), Unit – IV (281-315), Unit – V (451-525)]
2. Yeswanth Kanetkar. 2007. Let Us C. 8th Edition, BPB Publications, New Delhi.[Unit-I (1-39,489-513), Unit – II (49-312,335-362), Unit – III (155-392), Unit – IV (155-198), Unit – V (423-462)]
3. Karthikeyan.E . 2008. Textbook on C: Funbdamentals,data structure & Programming, First Edition , PHI Publications, New Delhi. .[Unit – I (3-31), Unit – II (57-141), Unit – III (147-176,233-254), Unit – IV (191-229), Unit – V (261-287)]

WEB SITES

1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html

15ECU303C	VISUAL PROGRAMMING	Semester-III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To have a fundamental understanding of Language Basics, Programming Fundamental and OOP's Concepts
- Understanding the platform; Determinism and concurrency; Handling input and output securely; Safe error handling and logging; Engineering for security features; Software security in operations.
- Grasp the fundamentals of a programming language
- To know the basic differences between programming languages Program logics and different platforms to build effective software
- To Choose the architecture based on the problem to be solved
- To build, compile, and execute a VB program

COURSE OUTCOMES

- Students list the Visual Progrmming concepts
- Express constraints and arthimetic operations
- Knowledge on program logics and different platforms to build effective software Analyze unstructured problems and design computer solutions
- Apply or a create suitable algorithm to solve a particular problem
- Choose the architecture based on the problem to be solved
- Distinguish and compose events and methods

UNIT I

Introduction to Windows and visual basic - customizing forms - properties window - tool box - creating controls - name property - properties of command button - event procedures for command button - access keys - image controls - text boxes – labels - message boxes - grid.

UNIT II

Statements– variables – data types – strings – operator – constants - determinate & indeterminate loops –conditionals - built in functions - string function - numeric function - date & time function - financial function.

Function procedures - sub procedures – arrays - control arrays- - adding & removing controls in control array-using arrays with function and procedures.

UNIT III

Intrinsic controls : Pointer , Label , Frame , Checkbox, Combo box, Hscroll Bar, Timer, DirListbox , Shape , Image OLE, Picture Box. List box, Text box, Command button, Option button, Vscrollbar, Drive List box, Line controls usage and properties.Tree View Control – List View Controls.

UNIT IV

Project with multiple forms - MDI forms - list box - combo box - option button - check box - scroll bars – timers - menu editor - line & shape control - creating objects - building classes.

UNIT V

DDE – Methods, Properties, Events – Database Programming: Data Tools – DAO, ADO, OLEDB and RDO Data base Connections – ActiveX commands.

TEXT BOOK

1. Gary Cornell. Visual Basic 6 from the ground up. 1st Edition, New Delhi: Tata McGraw Hill Publication, 2005.

REFERENCES

1. Eric A. Smith, Valor Whisher, Hank Marquis. Visual Basic 6 Programming Bible, First Edition USA: Valor Whisler Hank Marguis Inc, 1998.

15ECU313 A	OFFICE AUTOMATION LAB	Semester-III			
		L	T	P	C
		3	-	-	2

COURSE OBJECTIVES

- To have a fundamental understanding of Language Basics, Programming Fundamental and OOP's Concepts
- Understanding the platform; Determinism and concurrency; Handling input and output securely; Safe error handling and logging; Engineering for security features; Software security in operations.
- Grasp the fundamentals of a programming language
- To know the basic differences between programming languages Program logics and different platforms to build effective software
- To Choose the architecture based on the problem to be solved
- To build, compile, and execute a VB program

COURSE OUTCOMES

- Students list the Visual Progrmming concepts
- Express constraints and arthimetic operations
- Knowledge on program logics and different platforms to build effective software Analyze unstructured problems and design computer solutions
- Apply or a create suitable algorithm to solve a particular problem
- Choose the architecture based on the problem to be solved
- Distinguish and compose events and methods

(Any 10 Programs)

MS-WORD

1. Type a paragraph and perform the following.
    - Change the font size
    - Bold, italics, underline
    - Line spacing
    - Changing of background color and text color
    - Inserting footer and header
    - Alignment – left, right, justified, center
2. Type a document and perform the following operations.
    - Change the text into THREE columns
    - Check spelling and grammar
    - Bullets and numbering list items
    - Find and replace
3. Prepare the department timetable using MS-Word.
4. Prepare the job application letter enclosing your Bio-data.
5. Using Mail Merge to prepare an interview calls letter.

MS-EXCEL

6. To link an Excel worksheet into a word document using Object.

7. An excel worksheet contains monthly sales details of five companies. Find the monthly and quarterly average sales of each company.
8. Draw a line chart showing the sales turnover of five different companies over a period of ten years.
9. Draw a pie chart showing particular class student semester result.

MS-ACCESS

10. Create a database and maintain the address of your classmates with the following constraints.
    - Roll number should be the primary key.
    - Names should not be empty
    - Maintain at least 10 records.
    - Recall information according to place, city.
11. Create an item table with the following structure.
    Item number, Item name, Quantity, Net price.
    - Find the net price for all records.
    - Display only the item number, item name for net price > 10000
    - To increase the rate by 10% for all records.
    - Display all the details for item name = “nut” and quantity >10.

POWER POINT

12. Prepare a power point presentation with atleast three slides for Department Inaugural Function.
13. Draw an organization chart with minimum three hierarchical slides.
14. Design an advertisement campaign with minimum three slides.

15ECU313 B	C PROGRAMMING LAB	Semester-III			
		L	T	P	C
		3	-	-	2

COURSE OBJECTIVES

- To make the student learn a programming language and to understand various features in C
- To develop skills to design and analyze simple linear and non linear data structures
- To learn problem solving techniques.
- To write programs in C and to solve the problems.
- Gain knowledge in practical applications of data structures
- Analyze unstructured problems and design computer solutions

COURSE OUTCOMES

- Able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given algorithm
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types.

(Any 10 Programs)

1. Write a program to find factorial of a given number using recursive and non recursive
2. Write a program to generate Fibonacci series.
3. Write a program to print Multiplication table using for and Do While Loops
4. Write a program to find Maximum number without using arrays
5. Write a program to convert a given number into words
6. Write a program
   (i) to find the length of a string
   (ii) concatenation of two strings
7. Write a program to reverse the given string
8. Write a program to count the vowels in a given sentence
9. Write a program to check the given string is palindrome or not
10. Write a program to perform matrix multiplication
11. Using any one sorting method to sort given ‘n’ numbers using pointers.
12. Write a program to prepare an employee pay slip using structures
13. Write a program for Electricity Bill Preparation using files
14. Write a program for the Odd and even numbers are stored in separate files the original files.

15ECU313 C	VISUAL PROGRAMMING LAB	Semester-III			
		L	T	P	C
		3	-	-	2

COURSE OBJECTIVES

- To have a fundamental understanding of Language Basics, Programming Fundamental and OOP's Concepts
- Understanding the platform; Determinism and concurrency; Handling input and output securely; Safe error handling and logging; Engineering for security features; Software security in operations.
- Grasp the fundamentals of a programming language
- To know the basic differences between programming languages Program logics and different platforms to build effective software
- To Choose the architecture based on the problem to be solved
- To build, compile, and execute a VB program

COURSE OUTCOMES

- Students list the Visual Progrmming concepts
- Express constraints and arthimetic operations
- Knowledge on program logics and different platforms to build effective software Analyze unstructured problems and design computer solutions
- Apply or a create suitable algorithm to solve a particular problem
- Choose the architecture based on the problem to be solved
- Distinguish and compose events and methods

(Any 10 Programs)

1. Write a program to convert the number entered by the user to its equivalent decimal, octal, and hexadecimal
2. Write a program to perform arithmetic operations getting input from the user through input box.
3. Write a program to perform geometrical calculations
4. Write a program to accept user name and age .if age is greater than 18 displays “eligible to vote”, else display how many years he has to wait to vote.
5. Write a program to check whether accepted string is palindrome or not.
6. Write a program to calculate the simple interest and compound interest
7. Write a program to calculate the total marks of student and print grade.
8. Write a program to perform string operations.
9. Write a program to add, remove, clear item from the list box.
10. Write a calculator program to perform arithmetic operations.
11. Write a program to create menu bar with title color and size. color menu allows selection of color from menu and fills program with the selected color. color menu has menu items fill color and exit. when fill color menu is clicked another menu should popup with list of colors. size menu contains menu item small and large. when small & large is clicked form should be minimized and maximized.
12. Write a program to illustrate the drag and drop operations of mouse.

15SSD301	SOFT SKILL DEVELOPMENT - II	Semester-III			
		L	T	P	C
		2	-	-	1

Instruction Hours / week: L: 2 T: 0 P: 0 Marks: Internal: 100 External: Nil Total: 100

COURSE OBJECTIVES

- To impact knowledge on both Aptitude and Soft skills to the students
- To critically evaluate and demonstrate various principles involved in solving mathematical problems and to adopt new and faster methods of calculations.
- Reinforcing competencies in soft skills which are crucial in a social setting
- To train the students towards sustainable lifestyle
- To create awareness about the values and their significance and role
- To achieve the analytical and reasoning competencies and to improve their communication and presentation skills

COURSE OUTCOMES

- Effectively communicate through verbal oral communication
- Improve the listening skills
- Write precise briefs or reports and technical documents
- Actively participate in group discussion, meetings and presentations
- Become more effective individual through goal target setting , self motivation and practicing creative thinking
- To impact knowledge on both Aptitude and Soft skills to the students

UNIT - I

Time, Speed and Distance, Time and Work, Pipes and Cisterns, Geometry, Data Arrangement

UNIT – II

Analogy, Logic based Venn diagram, Probability, Permutation and Combination, Logarithms

UNIT – III

Data Sufficiency, Clocks, Calendar, Reading Comprehension, Sentence Correction, Sentence Completion, Spotting the Errors, Jumbled Sentences

UNIT – IV

Synonyms, Antonyms, Verbal Analogy, Statements and Assumptions, Group Discussion

UNIT - V

Resume Writing, Introduction to HR rounds, Time Management, Attitude and Behaviour

15ENU401	ENGLISH - IV	Semester-IV			
		L	T	P	C
		4	-	-	4

Course Objectives:

- To train the students in understanding the concepts of communication.
- To be familiar with the four basic skills of English.
- To train students in developing their written communication.
- To train students in developing their presentation skills.
- To acquire the skill of making grammatically correct sentences.
- To reflect originality on the application of soft skill views and express in writing their views.

Course Outcome:

- Students have acquired proficiency in communication.
- Students have become adept in written communication and presentation skills.
- Developed the skill of writing in English and that of public speaking.
- Establish and maintain social relationships.
- Develop communication skills in business environment.
- Enhanced communication competency through LSRW skills

UNIT I

Concept of Communication – Barrier to Communication –Body language – Personality Development – Etiquette and Manners- Soft Skills – Emotional Intelligence

UNIT II

Listening Comprehension – Reading Comprehension – Paragraph writing – Precis Writing – Writing Resume and Covering Letter -Speaking – Welcome Address, Vote of Thanks, Compering, Debates, Role Play, Dialogues – Vocal Communication Techniques. Voice, Quality, Volume, Pitch

UNIT III

Dicto Composition – Letter Writing (Informal, Letters to the Editor etc) – Term paper – Book reviews

UNIT IV

Business Correspondence – Layout of Business Letter – Formal Styles of Business Letters – Letters of Acceptance, Appointment, Resignation, Complaint, Sending E-mails.

UNIT V

Effective Presentation – Planning – Audience Analysis –Logical Sequencing – Timing of the Presentation – Conclusion – Answering Queries – Group Discussion – Interview.

PRESCRIBED TEXT

1. Juneja. P. Om and Aarati Mujumdar, *"Business Communication -Techniques and Methods"*, Orient Blackswan Pvt. Ltd., Hyderabad: 2010.

REFERENCES

1. Badi, R.V and K. Aruna. Business Communication, 2008, Vrinda Publications: New Delhi.
2. Balasubramanian M and G Anbalagan. Performance in English. 2007.Anuradha Publications: Kumbakonam

3. Mohan, Krishna and Meenakshi Raman.2008, Effective English Communication, Tata McGraw Hill: New Delhi.
4. Selley, John. Oxford Guide to Effective Writing and Speaking. 2005. OUP: New Delhi.

15ECU401	INDUSTRIAL AND POWER ELECTRONICS	Semester-IV			
		L	T	P	C
		5	1	-	6

COURSE OBJECTIVES

- To know the fundamental concept of Power Electronics and its Applications
- To teach fundamental principles of thyristor family.
- To become familiar with power devices and their application in various fields
- Learners are expected to understand various controllers , converters , inverters and choppers
- To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications
- To provide strong foundation for further study of power electronic circuits and systems

COURSE OUTCOMES

- Apply basic concept of digital fundamentals to Microprocessor based personal computer system
- Demonstrate an understanding of fundamentals of thyristor family.
- Analyze the various applications and circuits based on thyristor .
- Build and test circuits using power devices such as SCR, IGBT and MOSFET.
- Analyze and design controlled rectifier, DC to DC converters, DC to AC
- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices

UNIT I - Thyristors and UJT

Principles, Construction & characteristics of SCR – Two transistor model – Rectifier circuits using SCR – Operation and Characteristics of TRIAC – DIAC – GTO – SCS – LASCR. UJT & PUT– UJT as Relaxation Oscillators.

UNIT II - Turn On/Off Mechanisms

Types of turn on methods: AC gate triggering – R triggering – RC triggering – DC gate triggering – Pulse triggering – Types of turn off methods: Natural commutation – Forced commutation: Self commutation – Complimentary commutation – Auxiliary commutation – External pulse commutation—Line commutation.

UNIT III - Controlled Rectifiers & Inverters

Half wave controlled rectifiers with resistive load – HWCR with inductive load – HWCR with Freewheeling Diode – Full wave controlled rectifiers with resistive, inductive loads – FWCR with freewheeling diode. INVERTERS: Single phase half & full bridge voltage inverters—– Step-Up & Step-Down choppers.

UNIT IV - Convertors and Power MOSFET

Introduction – Single phase centre tapped step-up Cycloconverter – Single phase Bridge type step-up Cyclo-converter – Single phase centre tapped step-down Cycloconverter –N-channel planner Enhancement MOSFET – N- channel VDMOS Power MOSFET—Features and Characteristics of VDMOSFET.

UNIT V - Applications

Introduction – Electric resistance welding & types –Electric Arc welding – Sequence timer – Synchronous weld control.— SMPS & UPS – Static switches – Time delay & Fan regulator using TRIAC - Burglar alarm-Automatic lamp dimmer.

TEXT BOOKS

1. Power Electronics –Circuit, Device and application, Muhammed H.Rashid Pearson Education, Third Edition, 2014.
2. Industrial and Power Electronics, Harish C. Rai, Umesh Publications, Millennium Edition, 2013.

REFERENCES

1. Power Electronics, J.S.Chitode, Technical Publications, Fourth Edition, 2009.
2. Power Electronics, Dr.P.S.Bimbhra, Khanna Publications, Third Edition, 2012.

15ECU402	MICROWAVE AND SATELLITE COMMUNICATION	Semester-IV			
		L	T	P	C
		5	1	-	6

COURSE OBJECTIVES

- To know the fundamental concept of Power Electronics and its Applications
- To know the fundamental concepts of Microwave Waveguides.
- To Learn the Microwave Standards and RADAR Technology
- To provide a strong knowledge about of Spread Spectrum and Communication in Space.
- To represent a digital signal using several modulation methods
- Draw signal space diagrams compute spectra of modulated signals and apply redundancy for reliable communication.

COURSE OUTCOMES

- Understand the basics of information theory, source coding techniques and calculate Entropy of source
- To know the various types of noises in communication systems and reduction techniques
- Describe and determine the performance of line codes and methods to mitigate inter symbol interference
- Learn the generation and detection of base band system
- Understand the generation, detection signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of different band pass modulation techniques
- Describe and determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel.

UNIT I – Electro-magnetics and Waveguides

Introduction to microwaves and electromagnetic – Maxwell's equation – wave equations – TEM/TE/TM/HE – Wave definitions: Waveguides: Types of Waveguides – Propagation of wave in rectangular waveguides – Propagation of TEM waves – TE and TM modes – Propagation of TM waves in rectangular waveguides – TM mode in rectangular waveguide.

UNIT II - Microwave Tube Circuits and Antennas

Microwave Transistors - Klystrons – Traveling Wave Tube (TWT) – Backward wave oscillator – Magnetrons – Microwave Antennas: Horn Antennas – .Parabolic reflectors – Lens Antennas – Slot Antenna – Micro strip Antenna.

UNIT III - Radar

Introduction – Block Diagram of Simple RADAR – Classification – Free space radar range equation – Maximum unambiguous range – Pulsed RADAR system – Target detection – Scanning and Tracking with radars – Frequency diversity - Doppler Effect – CW Doppler radar – MTI Radar – Frequency modulated CW radar

UNIT IV - Orbital Mechanics and Launchers

Introduction: History of satellite communication – Overview of satellite communication – Orbital mechanics – Look angle determination – Orbital perturbations – Orbit determination – Orbital effects in communication systems performance.

UNIT V - Satellite and Link Design

Satellite subsystems – Attitude and orbital control system – Telemetry, Tracking, Command and monitoring – Power systems – Communication subsystems– Equipment

reliability and space communication.-Basic transmission Theory – Design of Downlinks – Uplink design

TEXT BOOKS

1. Microwave and Radar Engineering, M. Kulkarni,Umesh Publications, Fourth Edition, 2008.
2. Satellite Communications, Timothy Pratt, Charles Bostian and Jeremy Allnut, Wiley India Publications, Second Edition, 2012

REFERENCES

1. Fundamentals of Microwave and Radar Engineering, K. K. Sharma, S. Chand Publishers, First Edition, 2011.

15ECU411	PRACTICAL – V POWER ELECTRONICS LAB	Semester-IV			
		L	T	P	C
		-	-	5	3

COURSE OBJECTIVES

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
- To analyze different converters and control with their applications
- To develop an overall approach for students from construction of control rectifier , inverter, choppers, study its specification, the functionality, design and practical applications
- To become familiar with power devices and their application in various fields
- To understand various controllers , converters , inverters and choppers
- To Know the advanced converters and switching techniques implemented in recent technology

COURSE OUTCOMES

- Express the design and control of rectifiers, inverters
- Design of power electronic converters in power control applications.
- Ability to express characteristics of SCR, BJT, MOSFET and IGBT
- Ability to express communication methods
- Ability design AC voltage controller and Cyclo Converter
- Ability to design Chopper circuits

(Any 12 Experiments)

1. Characteristics of SCR
2. Characteristics of TRIAC
3. Characteristics of MOSFET
4. Characteristics of UJT
5. Characteristics of DIAC
6. Commutation of Thyristors
7. Single Phase Inverter
8. Speed Control of DC Motor.
9. Burglar Alarm
10. Automatic Street Light Controller
11. UJT as Relaxation Oscillator
12. TRIAC Flashes
13. Lamp dimmer
14. Thyristor Chopper
15. Automatic battery charger

15ECU403A	WEB TECHNOLOGY	Semester- IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- This course enables students to understand web page site planning, management and maintenance
- To evaluate website quality, learn how to create and maintain quality web pages learn to create and manipulate images.
- To have programming experience in Visual Basic & Relational Database Management System
- To gain the skills and project-based experience needed for entry into web design and development careers.
- Develop awareness and appreciation of the many ways that people access the web,
- To create standards-based websites that can be accessed by the full spectrum of web access technologies.

COURSE OUTCOMES

- Knowledge about history and development of World Wide Web and associated btechologies
- Able to develop a dynamic webpage
- Able to write formats and languages in modern web pages
- Able to write a well framed and valid XML document
- Development of web pages and web applications
- Use of development tools

UNIT – I Introduction to HTML

Introduction-html browsers-history of html and sgml- html command tags-quotation marks-spacing-special symbols-tags with automatic line breaks-urls-understanding domain names-links-defining web page-main body of text- headers-adding paragraph-formatting text-font type, size, predefined fonts, bold, italic-setting colors-text color, superscripts and subscripts-underlining text-preformatted text-blinking text-block quotes-margins-line breaks-ordered and unordered list-links-scaling an image-images alignment

UNIT – II HTML, Forms, Frames

HTML : Working with Forms-Creating Forms-Working with Menus-Working with Radio Buttons-Check Boxes-Text Boxes-Text Areas-Password Boxes-Submit Button-Resetting the Form-Working with Frames-Creating Frameset-Creating Columns-Creating Rows and Columns-Combining Framesets-Giving Colors to the Borders-Space between Frames-Nesting Framesets-Showing or Hiding Scrollbars-Alternatives to Frames

UNIT – III eXtensive Markup Language

Introduction-Features of XML-XML Support and Usage-Compatibility of XML with Others-Structure of XML Document-Common Errors-Structures in XML-Creating Document Type Declarations-Flow Objects-Length-Colour and Background Properties

UNIT – IV ASP

How Active Server Pages Really Work?-Variables-Procedures-ASP Forms-Date Types-Operators. More on ASP: Introduction to Object Hierarchies-Getting Information from the Visitor-Sending Information to Visitors-ASP Applications-Getting in at the Top (Server Object)-Response Object Methods.

UNIT – V Java Script and VB Script

Java Script: Introduction-Operators-Assignments-Comparisons-Reserved Words-Browsers to Use-Software Requirement-Starting with Java Script-Using Quotes, Alert-Functions-Eval Function-Using Statements in Java Script-Working with Objects-Properties-Browser objects-Date object-Math Object-String Object-Defining Objects-Handling Events in Java Script-Event Handling Attributes-Window Events-Working with Forms-Form Elements-User Actions-windows and Frames.

VB Script: Introduction-Adding VB Script code to HTML- Adding VB Script code to Documents-Data Types-Getting the Message Across.

TEXT BOOKS

1. Thomas A.Powell 2010. The Complete Reference HTML and CSS, 5th Edition, Tata MC-Graw Hill Publications, New Delhi.
2. Ramesh Bangia. 2008. Web Technology, 1st Edition, Firewall Media Publications, New Delhi.

REFERENCES

1. Rohit Khurana. 2002.JavaScript, 1st Edition, A.P.H Publishing, New Delhi.
2. Xavier C. 2008. World Wide Web With HTML, 1st Edition, Tata MC-Graw Hill Publications, New Delhi.
3. Danny Goodman. 2003. Javascript Bible 3rd Edition, IDG Books India(p) Ltd. New Delhi.
4. ED Tittle.2004. Theory and Problems of XML, 1st Edition, Tata MC-Graw Hill Publications, New Delhi.
5. Web Technologies by Godbole, Tata Mc Graw .Web programming Building Internet Applications, Chris Bates, Wiley
6. Web Technology & Design - Xavier C., New Age Publication.Java Script,D.Flanagan,O'Reilly,SPD.

WEB SITES

1. www.w3schools.com/
2. www.htmlcodetutorial.com/
3. alexle.net/archives/category/web-technolgy
4. jmarshall.com/easy/

15ECU403B	C++ PROGRAMMING	Semester- IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To make the student learn a programming language and to understand various features in C Language
- The objective of this course is to provide the student with the fundamental knowledge and skills to become a proficient C++ programmer.
- The student will learn to transpose the physical problem domain into a hierarchy of objects.
- To learn problem solving techniques.
- To write programs in C and to solve the problems.
- Analyze unstructured problems and design computer solutions

COURSE OUTCOMES

- Able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given algorithm
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types.

UNIT – I Introductions

Principles of object oriented programming: Basic concepts of object oriented programming – Benefits of OOP – Applications of OOPs – Structure of C++ Program C++ Tokens – Control Statement – Decision Making Statements- Loop Statements - Inline Functions – Function Overloading.

UNIT – II Control Structure, Functions and Constructors

Classes and Objects: Specifying a class – Creating Objects – Accessing Class Members – Defining Member Functions – Static Data Members – Static Member Functions - Array of Objects – Friend Functions. Constructors and Destructors:- Constructors – Parameterized Constructors - Multiple Constructors in a Class – Constructors with Default Arguments - Copy Constructor - Dynamic Constructor – Destructors.

UNIT – III Operator Overloading and Inheritance

Operator overloading: Defining operator overloading – overloading unary operators – overloading binary operators – overloading binary operators using friends.

Inheritance: - Inheritance – defining derived classes – single, multilevel, multiple, hierarchical inheritance- hybrid inheritance – virtual base classes – abstract classes.

UNIT – IV Pointers and I/O Operations

Pointers: Pointers to objects – this pointer – pointers to derived classes – virtual functions- Pure Virtual Functions. Managing console I/O operations :- C++ streams – C++ stream classes – unformatted I/O operations – formatted console I/O operations – Managing output with manipulators.

UNIT – V File Management

Files: Classes for file stream operations – Opening and Closing a file – sequential input and output operations – updating a file random access – Command Line Arguments. Templates :- Templates – class templates – function templates – member function templates

TEXT BOOK

1. Balagurusamy. E. 2007. Object Oriented Programming with C++. 3rd Edition, Tata . McGraw Hill publishing company Ltd, New Delhi. [Unit-I(7-14, 26 – 27, 32-52, 59-82), Unit-II(88-147), Unit-III(151-207), Unit-IV(222-270),Unit V(277-340)].

REFERENCES

1. Yashavant Kanetkar. 2000. Let Us C++, 2nd Edition, BPB Publications. [Unit-I(2-13, 19-80), Unit-II(87-96,177-182), Unit-III(187-197,261-304), Unit-IV(321-360),Unit V(385- 463,540-566,571-586)].
2. Nabajyothi Barkakoti. 2001. OOPS in C++, 2nd Edition, Tata McGraw Hill Publishers. [Unit-I(3-39), Unit-II(161-179,189-206), Unit-III(209-223,231-254), Unit-IV(277-289),Unit V(295-325)].
3. Pearl software.2002, First Edition, OOP in C++,Khanna Book Publishing co(p) Ltd. Delhi. [Unit-I(1-67,83-92), Unit-II(185-220,223-237), Unit-III(241-247,251-265,293-307), Unit-IV(269-289),Unit V(309-319,321-333,337-345,347-369)].

WEB SITES

1. www.daniweb.com
2. www.eships.com
3. www.allexperts.com

15ECU403 C	.NET PROGRAMMING	Semester- IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To have a fundamental understanding of Language Basics, Programming Fundamental and OOP's Concepts
- Understanding the platform; Determinism and concurrency; Handling input and output securely; Safe error handling and logging; Engineering for security features; Software security in operations
- Understanding of Microsoft Windows 2000, XP, or Vista. Students are expected to have basic knowledge in Graphical User Interface and object oriented programming.
- Understand code solutions within .NET framework
- Design and Implement database connectivity using NET in window based application
- Identify industry defined problem and suggesting solutions using .NET application.

COURSE OUTCOMES

- Knowledge about MS.NET framework developed by Microsoft.
- Able to using XML in C#.NET specifically ADO.NET and SQL server 3
- Able to understand use of C# basics, Objects and Types, Inheritance
- Develop, implement and creating Applications
- Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services
- Understand and be able to explain Security in the .NET framework and Deployment in the .NET.

(Any 8 Experiments)

UNIT–I

Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser.
The environment: Editor tab, format tab, general tab, docking tab. visual development & event drive Programming -Methods and events.

UNIT–II

The VB.NET Language- Variables -Declaring variables, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, Passing variable Number of Argument Optional Argument, Returning value from function – Message box – Input box.. Control flow statements: conditional statement, loop statement. Msgbox & Inputbox.

UNIT – III

Working with Forms : Loading, showing and hiding forms, controlling One form within another. GUI Programming with Windows Form: Textbox, Label, Button, Listbox, Combobox, Checkbox, PictureBox, RadioButton, Panel, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar.There Properties, Methods and events. OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog. Link Label. Designing menues : ContextMenu, access & shorcut keys.

UNIT–IV

Object oriented Programming: Classes & objects, fields Properties, Methods & Events, constructor, inheritance. Access Specifiers: Public Private, Projected. Overloading, My Base &

My class keywords. Menus , Dialog box

Files : Introduction – Classification of files – Processing files – handling files and folder using class – Directory class – file class.

UNIT–V

Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid. Generate Reports Using CrystalReportViwer.

TEXT BOOKS

1. Shirish Chavan, " Visual Basic.Net", Pearson education, New Delhi, I Edition, 2007.
2.Duncan Mackenzie, Kent Sharkey**,** " Sams Teach Yourself Visual Basic.Net" , Techmedia, New Delhi, I Edition, 2006.

REFERENCES

1. BurrowssW.E and.Langford. D. Learning programming using Visual Basic .Net. First Edition, New Delhi: McGraw Hill, 2003
2. Bryan Newsome, 2012, Beginning Visual Basic 2012, John Wiley & Sons, Inc.

15ECU412A	WEB TECHNOLOGY LAB	Semester- IV			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- This course enables students to understand web page site planning, management and maintenance
- To evaluate website quality, learn how to create and maintain quality web pages learn to create and manipulate images.
- To have programming experience in Visual Basic & Relational Database Management System
- To gain the skills and project-based experience needed for entry into web design and development careers.
- Develop awareness and appreciation of the many ways that people access the web,
- To create standards-based websites that can be accessed by the full spectrum of web access technologies.

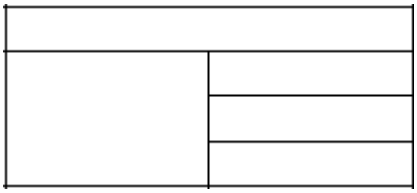
COURSE OUTCOMES

- Knowledge about history and development of World Wide Web and associated btechologies
- Able to develop a dynamic webpage
- Able to write formats and languages in modern web pages
- Able to write a well framed and valid XML document
- Development of web pages and web applications
- Use of development tools

(Any 10 Programs)

1. Create a simple HTML document about yourself or a topic of your choice using the basic tags such as Bold, Italic, Heading, images, horizontal rule and images.
2. Create a HTML document which includes an unordered list, ordered list, definition list to your document and create a link to Yahoo
3. Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com . The website should consist the following pages.
    a. Home page
    b. Registration and user login
    c. User profile page
    d. Items catalog
    e. Shopping cart
    f. Payment by credit card
    g. Order confirmation
4. Create a table in HTML document with following formats
    - table with no borders
    - display table headers
    - to handle cells that have no content

- table cells that span more than one row or one column



- Adding background image to a table

5. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
6. Creation of a XML document of 20 students of III IT. Add their roll numbers, marks obtained in 5 subjects, total and percentage and save this XML document at the server. Write a program that takes students' roll number as an input and returns the students marks, total and percentage by t.aking the students' information from the XML document.
7. Write an XML file which will display the Book information which includes the following:
    a. Title of the book
    b. Author Name
    c. ISBN number
    d. Publisher name
    e. Edition
    f. Price

    Write a Document Type Definition (DTD) to validate the above XML file.
8. Develop a Web page using Java script to perform the following information
    - Input student information.
    - Display student results for a given roll number.
9. Develop a web page for online exam using Java Script
10. Create a web page using two image file which switch between one another as the mouse pointer moves over the image. Use the On Mouse over and On Mouse event handler
11. Using VBScript create a calculator.
12. Create a HTML form that has number of text boxes when the form runs in the browser fill the textboxes with data. Write a Java script that verifies that all text boxes have been filled, if a text box has been left empty pop up an alert message indicating which box has been left empty. When Alerts OK button is clicked, set focus to that specific text box. If all the text boxes are filled, display thank you.

15ECU412 B	C++ PROGRAMMING LAB	Semester-IV			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To make the student learn a programming language and to understand various features in C
- To develop skills to design and analyze simple linear and non linear data structures
- To learn problem solving techniques.
- To write programs in C and to solve the problems.
- Gain knowledge in practical applications of C Langauge
- Analyze unstructured problems and design computer solutions

COURSE OUTCOMES

- Able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given algorithm
- Implement Programs with pointers and arrays, perform pointer arithmetic and use the pre-processor.
- Write programs that perform operations using derived data types.

(Any 10 Programs)

1. Create a class **Patient** with necessary data members. In the main () program, have the facility to
   - Store the details of n inpatients and outpatients
   - Display the details in a neat format
2. Create two classes **British** and **Metric** to store the measurements of distance in the British (feet and inches) and Metric (meters and centimeters) systems respectively.
   In the main () program, perform the following:
   - Get two measurements: one in British and the other in Metric
   - Ask the user in which system (British or Metric) (s) he wants the output.
3. Add two input measurements and print the result according to the user's choice Create a class **Date** whose data members are Day, month, and Year. Write necessary member functions and perform the following operations using overload operator.
   - Increment a date by a day
4. Create a class **Date** whose data members are Day, month, and Year. Write necessary member functions and perform the following operations using overload operator.
   - Compares two dates
5. Create a class **String** that has a character array as a data member and perform the following operations using overloaded operators.
   - '+' To add two strings

- '==' To compare two strings

6. Create a class **Computer** and derive two classes **Client** and **Server** from it. In the main () program, get the data about n clients and servers and print it back in a neat format.
7. Create a class **Shape** that contains two data members of type double to hold the two dimensions of the shape. Derive 3 more classes' **Circle**, **Rectangle** and **Triangle** from the class Shape. Using appropriate member functions, get the values, calculate and print the area of different shapes using dynamic binding.

   Hint:- Write 2 member functions in all the derived classes: one to set the data and the other to calculate and display the area.
8. Create a class **Staff** that contains the name, designation, and years of experience of a staff member of a college. Using containership, create two more classes **TeachingStaff** and **NonTeachingStaff** according to the following specifications.In addition to the properties of the staff class, the TeachingStaff class should contain the highest qualification, the staff member possesses and the departments he belongs to. The NonTeachingStaff class needs to contain the properties of Staff only. In the main (), get data about some of the teaching and NonTeachingStaff members of your college and print the details in neat format.
9. Create a class Address as whose data members are Name, Street, City, Pincode and Phone Number of a person. In the main () program, using array of pointers, get addresses of n persons, sort it in alphabetical order of names and display it back in a neat format.
10. Create a class that copies the content of a text file into another file. Write the program in such a way that the program accepts command line arguments and make the program to execute in a way exactly the copy command in DOS.
11. Create a class **Student** that could have the name, register number and marks in the subjects of the semester. Have the program to perform the following operations:
    - Store the data about n students in a data file.
    - Print the mark list of each student whenever requested.
    - Add details about some more students at any time.
12. Sort an integer and a floating –point array using function template.

15ECU412C	.NET PROGRAMMING LAB	Semester-IV			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To have a fundamental understanding of Language Basics, Programming Fundamental and OOP's Concepts
- Understanding the platform; Determinism and concurrency; Handling input and output securely; Safe error handling and logging; Engineering for security features; Software security in operations
- Understanding of Microsoft Windows 2000, XP, or Vista. Students are expected to have basic knowledge in Graphical User Interface and object oriented programming.
- Understand code solutions within .NET framework
- Design and Implement database connectivity using NET in window based application
- Identify industry defined problem and suggesting solutions using .NET application.

COURSE OUTCOMES

- Knowledge about MS.NET framework developed by Microsoft.
- Able to using XML in C#.NET specifically ADO.NET and SQL server 3
- Able to understand use of C# basics, Objects and Types, Inheritance
- Develop, implement and creating Applications
- Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services, web 6
- Understand and be able to explain Security in the .NET framework and Deployment in the .NET. 7.

(Any 10 programs)

1. Write a VB.NET program to calculate Simple interest and compound Interest
2. Write a VB.NET program to find mouse events and coordinates where the mouse is clicked.
3. Write a VB.NET program to implement Calculator.
4. Write a VB.NET program to implement Notepad
5. Write a VB.NET program to draw several shapes and fill with color.
6. Write a VB.NET program to perform the following in list box
   a) Add an item
   b) Delete an item
   c) List count
   d) Clear the List
7. Write a VB.NET program to calculate the days elapsed between the given two dates.
8. Write a VB.NET program to create Menu and link multiple forms with different colors.
9. Write a VB.NET program to animate the picture using animation control.
10. Write a VB.NET program to check whether given string is a Palindrome or not.
11. Write a VB.NET program to generate Fibonacci series for the input given using Input box.

12. Write a program to calculate the total marks of the student and print the grade
13. Write a VB.NET Program to maintain details of students. Use Crystal Report to generate report.
14. Write a VB.NET Program to implement Employee Payroll.
15. Write a VB.NET program to create and manipulate a File.

15ECU501	MICROPROCESSOR AND MICROCONTROLLER	Semester-V			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To know the fundamental concept of microprocessor 8085 and microcontroller architecture and to program in assembly language.
- To learn the interfacing of different peripherals for various typical applications
- To develop background knowledge and core expertise of microcontroller
- To know the importance of different peripheral devices and their interfacing to microcontrollers
- To know the design aspects of microcontrollers.
- To provide a strong practical knowledge in the application areas.

COURSE OUTCOMES

- Apply basic concept of digital fundamentals to Microprocessor based personal computer system.
- Identify a detailed s/w & h/w structure of the Microprocessor.
- Illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
- Distinguish and analyze the properties of Microprocessors & Microcontrollers.
- Analyze the data transfer information through serial & parallel ports
- Train their practical knowledge through laboratory experiments.

UNIT I – Introduction To 8085

Pin Diagram – Architecture – Instruction set – Addressing modes – Demultiplexing the bus – Generation of control signals – Bus structure – Simple programs.

UNIT II – 8085 Peripheral Devices

Introduction to Programmable Peripheral Interface 8255 —Programmable Interval Timer 8254 -8259 Interrupt Controller – 8237 DMA Controller – 8279 Keyboard Display Interface- 8251 USART.

UNIT III – 8051 Microcontroller

Introduction to microcontrollers – Pin Diagram – Architecture – 8051 Instruction Set - Addressing Modes- Introduction to 8051 Assembly–I/O Port Programming.

UNIT IV - 8051 Interrupts & Peripherals

Basic registers of Timer – Programming 8051 Timer – Counter Programming – Basics of Serial Communication –8051 Serial Communication Programming – 8051 Interrupts – Programming External Hardware Interrupts.

UNIT V – Real World Applications

Interfacing LCD to 8051 – Interfacing ADC to 8051 – Interfacing DAC to the 8051- interfacing sensors to 8051 – interfacing Stepper motor to the 8051 –interfacing keyboard to 8051.

TEXT BOOKS

1.Microprocessor Architecture, Programming &Application, R.Gaonkar, Wiley Publications, Fourth Edition, 2009.
2. The 8051 Microcontroller, Kenneth Ayala, PI Publications, Third Edition, 2007.
3. Microprocessor Architecture, Programming and its Applications with 8085, Ramesh S.

Gaonkar, Penram International Publishing, Fifth Edition Reprint, 2011.

4.The 8051 Microcontroller and Embedded Systems, Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinlay, Third Edition, 2011.

REFERENCES

1. Microprocessors and Microcontrollers,Nagoor Kani.A, Tata Mc Graw Hill Publications, Second Edition, 2012.
2. Advanced Microprocessor & Peripherals, Ray&Bhurchnadi, Tata Mc-Graw Hill Publications, Sixth Edtion, 2008.

15ECU502	DIGITAL AND FIBER OPTIC COMMUNICATION	Semester-V			
		L	T	P	C
		5	-	-	5

COURSE OBJECTIVES

- To enable the students to learn the digital and cellular technology
- To identify the functions of different components
- Learn about theoretical bounds on the rates of digital communication system
- To represent a digital signal using several modulation methods
- To know the fundamental concept of Digital and Fiber Optic Communications and Shift keying operations.
- To learn the operations of the circuits used for Digital and Fiber Optic Communications and Network Protocols.

COURSE OUTCOMES

- Understand the basics of information theory, source coding techniques and calculate Entropy of source
- To know the various types of noises in communication systems and reduction techniques
- Describe and determine the performance of line codes and methods to mitigate inter symbol interference
- Learn the generation and detection of base band system
- Understand the generation, detection signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of different band pass modulation techniques
- Describe and determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel.

UNIT I – Data Communication

Introduction to Networks – Protocol and Standards – Network Models – Layered tasks – The OSI model – Different types of layers – TCP/IP Protocol - Analog and Digital Signals – Transmission Impairments – Data rate limits.

UNIT II – Digital and Analog Transmission

Basics of Digital - to – Digital Conversions – Line Coding – Line coding schemes – Block coding - Scrambling – Analog – to – Digital Conversions – PCM – DM – Transmission Modes - Introduction to Multiplexing – FDM – WDM –TDM.

UNIT III – Wireless LAN's

Introduction to Wireless LAN technology: Overview-Infrared LANs-Spread Spectrum LANs-Narrowband Microwave LANs. IEEE 802.11 Wireless LAN Standard: IEEE 802 Protocol architecture-IEEE 802.11 Architecture and services-IEEE 802.11 Medium Access control-IEEE 802.11 Physical layer-Bluetooth

UNIT IV – Optical Fiber communication

A basic fiber optic system – Frequencies – Fiber optic Cables – Refraction – Numerical Aperture – Graded index cables – Single mode – Multi mode – Cable Constructions – Cable Losses – Connectors – Light Sources – Light Detector – System Components – Advantages and Disadvantages.

UNIT V – Optical Sources and Detectors

Laser –Basic Concepts-Optical Emission from Semiconductors - Semiconductor Injection Laser. LED – LED power and efficiency - LED structures-LED characteristics. Photo

Detectors – Photo Detector Noise – Response Time - Double Hetero Junction Structure - Photo Diodes – Compare of Photo Detectors.

TEXT BOOKS

1. Electronic Communication Systems , Kennedy and Davis, Tata McGraw Hill, Fifth Edition, 2012
2. Wireless Communications and Networks, William Stallings, Pearson Education Singapore Ltd. Second Edition, 2009

REFERENCES

1. Principles of Communication Engineering, Anok Singh & A.K.Chhabra ,S.chand Publications, Seventeenth Edition, 2010
2. Optical Fiber Communication**,** Gerg Keiser, Tata McGraw Hill Publishing Company Ltd, Fourth Edition. 2008**.**

15ECU503	BIOMEDICAL INSTRUMENTATION	Semester-V			
		L	T	P	C
		5	-	-	5

COURSE OBJECTIVES

- To know the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- To learn the various medical equipment used for diagnosis and therapeutic purpose.
- To provide a large number of quality trained Medical Electronics professionals for preventive and maintenance work needed to maintain hi-tech medical equipments in hospitals to ensure good health care.
- To explore the human body parameter measurements setups
- To give basic ideas about how multimedia evidences are useful in crime investigation.
- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation, theoretical and practical preparation enabling students to maintain medical instrumentation.

COURSE OUTCOMES

- Understand the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- Differentiate and analyze the biomedical signal sources.
- Identify common biomedical signals and distinguish characteristic features.
- Ability to study various transducers
- Identify common signal artifacts, their sources and formulate strategies for their suppression.
- Familiarize with patient safety issues related to biomedical instrumentation

UNIT I - Bioelectric Signals

Physiological Systems of the body – Man Instrument System – Bioelectric signals – Cells and their structures - Transport of ions through cell membrane - Resting and Action Potential – Propagation of Action potential – Bioelectric potentials (ECG, EEG, EMG)

UNIT II –Electrodes and Transducers

Basic Electrode Theory – Bio-potential Electrodes – Biochemical Electrodes – Electrical Conductivity of electrode jellies and creams – Transducers and Transduction Principles: Transducers for Biomedical Applications – Biosensors and Smart Sensors

UNIT III - Biomedical Recording and Patient Monitoring System

Electrocardiography (ECG) – ECG Lead Configuration – ECG Amplifiers – ECG Recorder – Electro Encephalo Graphy (EEG) – EEG Recorder – Electro Myo Graph (EMG) – Electro Retino Graphy(ERG) – Electro Oculo Graphy (EOG) Patient Monitoring System Concepts –Measurement of Heart Rate – Blood Pressure Measurement – Respiration Measurement

UNIT IV - Diagnostic and Therapeutic Equipments

X-ray imaging - Radio fluoroscopy - Image Intensifiers - Angiography - Endoscopy – Pacemakers – Energy requirements to excite hear muscle – Methods of stimulation – Different modes of operation – Pacemaker batteries – Defibrillators – Different type of defibrillators. - Anesthesia Machine – Ventilators - Diathermy.

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UNIT V - Advancements in Medical Instrumentation

Lasers in Medicine - Computerized Axial Tomography (CAT) Scanner - Ultrasonic

scanner - Magnetic Resonance Imaging - Computer based Patient Monitoring System. Biotelemetry - Elements of telemetry system - Radio telemetry system.

TEXT BOOKS

1.Introduction to Biomedical Instrumentation, Mandeep Singh, PHI Learning Private Limited, 2010.
2. Electronics and Medicine and Biomedical Instrumentation, Nandini.K.Jog, Prentice Hall of India, Private Limited, First Edition, 2013
3. Biomedical Instrumentation and Measurements**,** Leslie Cromwell, Fred. J. Weibell, Erich A. P. Feiffer, Prentice Hall of India, Second Edition, 2010

REFERENCES

1. Biomedical Instrumentation Application and Design**,** John G Webster, Wiley India Pvt Ltd 2012.
2. Handbook of Biomedical Instrumentation**,** R.S.Khandpur, Tata McGraw Hill, 2004**.**

15ECU504	VHDL Programming	Semester-V			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To learn the basics of language elements.
- To provide a strong knowledge about the VHDL Modeling.
- To introduce a hardware description language (HDL) for the specification, simulation, synthesis
- Implementation of digital logic systems.
- Design practice sessions and implementing digital logic systems with commercial electronic design (EDA) tools
- To know the features of programming and simulation techniques.

COURSE OUTCOMES

- Building simulation module as per system specification for e.g. VHDL model for ASIC design
- Understanding types of design such as high level design, operative part design, control part design, memory design etc
- Functioning and specifying the tools used for design as per requirement
- Creation of code, verification, testing software
- Testing various examples on the system
- Understanding the synthesis and simulation process of code

UNIT I – Introduction And Basic Terminology

VHDL - History-Capabilities-Hardware Abstraction –Basic Terminology-Entity Declaration-Architecture Body-Configuration Declaration-Package Body-Model Analysis-Simulation.

UNIT II –Basic Language Elements

Identifiers-Numbers-Characters-Strings-Bit Strings-Data Objects-Data Types- Integer Types-Physical Types-Floating Point Types-Enumeration Types-Arrays-Operators: Arithmatic Operators-Relational Operators-Logical Operators.

UNIT III – Behavioral Modeling

Entity Declaration-Architecture Body-Process Statements-Variable Assignment Statement-Signal Assignment Statement-Wait Statement-If Statement-Case Statement-Null Statement-Loop Statement-Exit Statement-Assertion Statement-Report Statement.

UNIT IV – Dataflow Modeling

Concurrent Signal Assignment statement-Concurrent Versus sequential Signal Assignment-Delta Delay Revisited-Multiple Drivers-Conditional Signal Assignment Statement-Selected Signal Assignment Statement –The Unaffected Value-Block Statement-Concurrent Assertion Statement-Value of a signal.

UNIT V – Structural Modeling

An Example of Component declaration - Component Instantiation - Other Examples-Resolving Signal Values – Signal Packages.

TEXT BOOKS

1. A VHDL Primer, J.Bhasker , Pearson Education. Third Edition, 2008.
2. Digital Logic Design and VHDL, A.A.Phadke, S.M.Deokar, Tata Mc-Graw Hill Publications, Fourth Edition, 2009.
3. Fundamentals of Digital Logic with VHDL Design, Stephen Brown,Zvonko Vranesic , Tata

Mc-Graw Hill Publications, Fourth Edition,2008.

REFERENCES

1. Principles of VLSI Design, S.Sumathi, Scitech Publications (India) Pvt., Ltd, 2005.
2. VHDL, Douglas L.Perry, Tata McGraw Hill Publications, Fifth Edition, 2011.
3. VLSI Design, K. Lal Kishore, and V. S. V. Prabhakar, I.K. International Publishing House Pvt Ltd, Third Edition, 2008.

15ECU505A	VLSI DESIGN	Semester-V			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To learn the fabrication techniques of Integrated Circuits.
- To know the fundamental rules of layout design.
- To design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout
- Importance of CMOS and Mixed Signal VLSI design in the field of Electronics and Telecommunication
- Underlying methodologies for analysis and design of fundamental CMOS Analog and Mixed signal Circuits like Current and Voltage references, Single stage Amplifiers, Operational Amplifiers, Data Converters
- The issues associated with Mixed Signal VLSI Circuits.

COURSE OUTCOMES

- Realize logic circuits with different design styles.
- Understand working principle of operation of different types of memories.
- Familiarize with the fabrication techniques of Integrated Circuits.
- Design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout.
- Express the layout of simple MOS Circuit using Lambda based design rules.
- Design an application using Verilog HDL

UNIT I - Introduction to MOS Technology

MOS technology & VLSI – Basic MOS transistor – Depletion & enhancement type – NMOS & CMOS Transistors fabrications – Electrical properties of MOS circuits – characteristics – Threshold voltage – transconductance – Pass transistors – NMOS Inverter – pull-up pull-down ratio for NMOS Inverter driven by NMOS Inverter & through one or more pass transistors – CMOS Inverter.

UNIT II -Layout Design

Mos & cmos layers – stick diagram – design rules & layout – subsystems design: switch logic – gate logic – other forms of logic – combinational logic design example: passing generator – bus arbitration logic multiplexers – gray to binary code converter –sequential circuit example: two phase clocking – dynamic shift register – pre charged bus concept .

UNIT III -Design of System

PLA – Finite state machine – PLA based finite state machine design – design of 4-bitshifter – design of ALU subsystem: adders – multiplexers – memory: dynamic shift register – dynamic RAM cells – one transistor dynamic memory cell – 4*4 bit register array – RAM array.

UNIT IV -Tools for Design

Grounds rules for successful design – design styles & philosophy – CAD tools for design & simulation: textual entry layout language – graphical entry layout – design verification – design rule checkers – simulators – tests & testability.

UNIT V -CMOS Design Projects & Fast VLSI Circuits

Incremental/decremental – left/right – serial/parallel shift register – comparator – GaAs device – layout design for GaAs devices.

TEXT BOOKS

1. Basic VLSI Design, Pucknell D.A., & Eshraghian K., PHI, Third Edition, 2009.
2. Principles of VLSI Design, S.Sumathi, ScitechPublications,2011.

REFERENCES

1. VLSI Design, K. Lal Kishore, and V. S. V. Prabhakar, I.K. International Publishing House Pvt Ltd, Third Edition, 2008.
2. Digital Logic Design and VHDL, A.A.Phadke, S.M.Deokar, Tata Mc-Graw Hill Publications, Fourth Edition, 2009.

15ECU505B	PCB DESIGN AND FABRICATION	Semester-V			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards.
- To gain knowledge on PCB fabrication process and factors affecting PCB performance
- Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
- Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools
- Recognize the technologies used in electronic industry through the practical experience gained in the course

COURSE OUTCOMES

- Students can explore different aspect of Printed Circuit Board Design and fabrication
- Students can learn various types of PCBs. Schematic Design. entry Rules for Schematic Entry, Component Layout methods
- Placement Rules, Routing Techniques for Single Sided Board.
- Post Processing of design and Fabrication documents.
- After completing this course students can design and fabricate their own PCB for their Project and can also work in PCB Designing and Fabrication area
- Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design

UNIT I - Types of PCB

Single sided board – double sided – Multilayer boards – Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.

UNIT II - Layout and Artwork

Layout Planning – General rules of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and Mounting – Cooling requirement and Package Density – Layout check - Basic artwork approaches – Artwork taping guidelines – General artwork rules –Artwork check and Inspection.

UNIT III -Laminates and Photo Printing

Manufacture of copper clad laminates – Properties of laminates – Types of Laminates – Manual cleaning process – Basic printing process for double sided PCB's – Photo resists – wet film resists – Coating process for wet film resists – Exposure and further process for wet film resists – Dry film resists.

UNIT IV - Etching and Soldering

Introduction – Etching machine – Etchant system. Soldering: Principles of Solder connection – Solder joints – Solder alloys – Soldering fluxes. Soldering Tools: Soldering, De soldering tools and Techniques – Man Soldering – Solder mask – Safety, health and medical aspects in Soldering practice.

UNIT V - Design Rules and Automation

Reflection – Crosstalk – Ground and Supply line noise – Electromagnetic interference from pulse type EM fields and automation – Automated artwork drafting – CAD.

TEXT BOOKS

1. PCB Design and Technology, Walter C.Bosshart, Tata McGraw Hill Publications, 2007
2. Printed circuits Handbook, Clyde F.Coombs, Tata McGraw Hill Publications, Sixth Edition, 2008

REFERENCES

1. Printed Circuit Board, Lambert M. Surhone, Miriam T. Timpledon, Susan F. Marseken, Vdm Verlag Dr. Mller Ag & Co. Kg, 2010.

15ECU505C	PSPICE PROGRAMMING	Semester-V			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To gain familiarity with PSPICE, and to review in greater detail.
- To investigate the use of the industry-standard circuit simulation tool PSpice.
- To impart practical working knowledge of Electrical and Electronics Simulation and Analysis
- To Solve, Simulate and Analyze basic Electrical and Electronics Circuits and Applications by writing Ohm's law, KCL and KVL Mathematical Equations and Programs
- To develop hands on working experience with reference to Solve, Simulate and Analyze Electrical & Electronics Circuits
- Recognize the technologies used in electronic industry through the practical experience gained in the course

COURSE OUTCOMES

- Understand the main features and importance of the PSpice Programming environment
- Apply working knowledge of PSpice package to simulate and solve Electrical, Electronics circuits and Applications
- Solve, Simulate and Analyze various DC circuits
- Solve, Simulate and Analyze various Analog and Digital Electronics circuits.
- Solve, Simulate and Analyze simple Transformer and DC Generator circuits
- Design and Simulate circuits

UNIT I - Introduction

Introduction – Descriptions of Spice – Types of Spice – Types of Analysis – Simulation softwaretools – Pspice Platform – Pspice schematic Vs OrCAD Capture – Limitations of PSpice. – Circuit Description: Input files –Element values – Nodes – Circuit Elements – Sources

UNIT II - DC Circuit Analysis

Output Variables – PSpice Output Commands – Format of Output Files – Examples of Spice Simulation – OrCAD Capture – Layout – PSpice A/D – Probe – Importing – DC Circuit Analysis: Resistors – Modeling of Elements – Operating Temperature – Independent DC Sources – Dependent Sources – DC Output Variables – Types of Output – Types of DC Analysis

UNIT III - Transient Analysis

Capacitors and Inductors – Modeling of Transient Sources - Transient Sources – Transient Output Variable – Commands – Transient Analysis – Switches - AC Circuit Analysis: AC Output Variables – Independent AC Sources – AC Analysis.

UNIT IV - Semiconductor Devices

Diode Characteristics in SPICE – BJT Characteristics in SPICE – JFET Characteristics in SPICE - MOSFET Characteristics in SPICE.

UNIT V - Operational Amplifier

Inverting and Non-inverting Amplifier – Active Filters: Low Pass Filters - High Pass Filters – Band Pass Filters – Band Reject Filters.

TEXT BOOKS

1. Introduction to PSpice using OrCAD for Circuits and Electronics, Muhammad H. Rashid, Prentice Hall of India Private Limited, New Delhi, Third Edition, 2005.
2. PSpice: Introduction with Applications, Amos Gilat, Siversio(WSE Series), Fourth Edition,

2012.

REFERENCES

1. Fundamentals of Electric Circuits with Pspice, Dr. A.S Aravina murthy, Pearson Education, 2011.
2. Introduction to PSpice and its Applications, M.S.Tyagi, Third Edition, 2008.

15ECU511	PRACTICAL – VI MICROPROCESSOR AND MICROCONTROLLER LAB	Semester-V			
		L	T	P	C
		-	-	5	3

COURSE OBJECTIVES

- To expose students to the operation of typical microprocessor and microcontroller.
- To prepare the students to be able to solve different problems by developing different programs
- To develop the quality of assessing and analyzing the obtained data
- To illustrate the architecture of 8085 a microprocessors.
- To understand the interfacing circuits for various applications of 8051 microcontroller
- To introduce the architecture of advanced microprocessors and microcontrollers

COURSE OUTCOMES

- Identify relevant information to supplement to the Microprocessor and Microcontroller course
- Set up programming strategies and select proper mnemonics and run their program on the training boards
- Practice different types of programming keeping in mind technical issues
- Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases
- Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation software, and word-processing tools
- Illustrate the organization of registers and memory in microprocessors

(Any 12 Experiments)

Microprocessor Lab

1. Addition of 8/16-bit and array of data.
2. Multiplication and Division.
3. Fill and transfer an array of data.
4. Ascending/Descending of an array.
5. Data Transfer using Parallel Ports.
6. DC Motor Controller.
7. Counter using Seven Segment Display.
8. Digital to Analog Converter Interface.

Microcontroller Lab

9. Digital Clock.
10. LCD Interfacing.
11. A/D converter interface.
12. Stepper motor interface.
13. Traffic light controller.
14. Wave Generation.
15. Lamp Dimmer.

15OEU501	BASIC ELECTRONICS	Semester-IV			
		L	T	P	C
		-	-	-	3

COURSE OBJECTIVES

- To learn the fundamentals of operation of the basic electronic devices.
- To understand the basic parameters of electronic devices, their performance, and limiting factors.
- To understand the basic principles of electronic device operation with emphasis on bipolar transistors, and unipolar microwave devices.
- Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their applications.
- To give knowledge about semiconductor and discus working and applications of basic devices, including p-n junctions, BJTs and FETs
- Introduce students to the physics of semiconductors and the inner working of semiconductor devices.

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
- Demonstrate the switching and amplification application of the semiconductor devices.
- Demonstrate the control applications using electronic devices.
- Apply concepts of semiconductor devices to design and analyze circuits.
- Ability to understand and analyze the inner working of semiconductor p-n diodes

UNIT I – Passive Components

Introduction – Resistors: Fixed & Variable resistor – Colour coding – Tolerance - Series and Parallel connection. Capacitors: Basic structure and symbol – Fixed & Variable capacitors – Dissipation factor – Series and parallel connection. Inductors: Inductance of the coil – Fixed & Variable inductors

UNIT II - Semiconductor Devices and Special Diodes

Introduction – Atom - Electron - orbit – Energy level - Conductor – Semiconductor – Insulator – Intrinsic semiconductor – Extrinsic semiconductor – P type and N type semiconductor – PN junction diode –V-I characteristics - Zener diode - V-I characteristics- Schottky diode -Tunnel diode - Varactor diode- UJT- Photo diode

UNIT III - Digital Electronics

Review of binary, octal, & hexadecimal and decimal number systems - Representation of signed numbers - Floating point number representation – BCD – ASCII – EBCDIC - Excess 3 codes gray code - Error detecting & Correcting codes. Boolean Algebra –Simplification of logic functions using Karnaugh map.

UNIT IV - Amplifiers & Oscillators

Classification of amplifiers- Single stage RC coupled amplifier - Oscillators –Types of oscillators: Hartley oscillator, Colpitts Oscillator & RC Phase shift oscillator.

UNIT V -.Operational Amplifiers

Introduction to Op-amp- Inverting and Non-Inverting configuration - Applications – Adder – Subtractor – Integrator - Differentiator and Comparator.

TEXT BOOKS

1. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar & A.Vallavaraj, Tata Mc Graw-Hill publishing Company Limited,Third Edition,2012.
2. Electronic Devices and Circuits, David.A. Bell, Oxford University Press Fifth Edition, 2008.
3. Digital Electronics and its principles, Salilvahanan, McGraw Hill Education (India) Private Limited, 2014, Tenth Edition.

REFERENCES

1. Electronic Devices and Circuits, Jacob Millman,Christos.C.Halkias&Satyabrata Jit,Tata Mc Graw –Hill Edition ,Third Edition,2010.
2. Electronic Devices and Circuits I.U.A.Bakshi.A.P.Godse,Technical Publications 01-Jan-2010.

15ECU601	EMBEDDED SYSTEMS	Semester-VI			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- Ability to design an Embedded System, component or process to meet desired needs within realistic constraints.
- To develop the next generation technologies, methods and tools for modeling, design, implementation and operation of hardware/software systems embedded in intelligent devices
- To provide a broad overview of both theoretical and practical aspects of a design flow for To understand the need and applications of Microcontrollers n embedded system.
- To understand architecture and features of typical Microcontroller.
- Learn interfacing of real world input and output devices
- To study various hardware and software tools for developing applications embedded systems

COURSE OUTCOMES

- Understand hardware and software design requirements of embedded systems.
- Acquire knowledge about embedded processors and their applications
- Analyze the embedded systems specification and develop software programs.
- Ability to design an Embedded System, component or process to meet desired needs within realistic constraint
- Evaluate the requirements of programming embedded systems and tool chain for embedded systems.
- Explore the features of the microcontroller and provide solutions for embedded applications

UNIT I – PIC 16F87x Microcontrollers

Device overview – architecture – memory organization – status register – option register –INTCON register – PCON register – I/O ports – data EEPROM – instruction set: Byte oriented operations – Bit oriented operations – Literal and Control operations- Addressing Modes.

UNIT II – Peripheral Features of 16F87x Microcontrollers

TIMER0 Module – TIMER1 Module – TIMER2 Module – Capture/Compare/PWM Modules –Protocols: I^2C,SPI , USART – ADC Module - Special features of the CPU : oscillator selection – power on reset – power up timer – oscillator start up timer – brown out reset – interrupts – watchdog timer – SLEEP

UNIT III - Introduction to PIC Peripherals and Interfacing

Introduction to PIC Peripherals and Interfacing: PIC16imer programming in assembly and C - Serial Port programming in assembly and C - Interrupt programming in assembly and C - ADC and DAC interfacing - CCP and ECCP programming - DC Motor interfacing and PWM.

UNIT IV - ARM Processor Fundamentals

ARM Design philosophy - Embedded System Hardware - Embedded System Software - Registers, Program Status Register – Pipeline – Exceptions – Interrupts - and the Vector table - Core Extensions - Architecture revisions - ARM Processor families.

UNIT V – Real Time Operating Systems

Survey of Software Architecture: Round Robin- Round Robin with Interrupts-Function –

Queue Scheduling Architecture-Introduction of RTOS-RTOS Architecture-Task and Task States – Task and Data – Semaphores and Shared Data – Message Queues, Mailboxes and Pipes-Timer Function-Events-Memory Management-Device Management-System Organization & Implementation.

TEXT BOOKS

1 Programming and Customizing the PIC Microcontroller, Myke Predko, Tata McGraw - Hill Education,Third Edition,2010.

2. Arm Microcontroller Interfacing: Hardware and Software, Warwick A Smith, Gazelle Book Services, 2010.

REFERENCES

1. 123 PIC Microcontroller Experiments for the Evil Genius, Myke Predko, Tata McGraw - Hill Education, First Edition, 2005.
2. ARM System Developer's Guide –Designing and Optimizing System Software, Andrew N. Sloss, Dominic Symes & Chris Wright, Morgan – Kaufmann Publishers, First Edition, 2011.

15ECU602	MOBILE COMMUNICATION	Semester-VI			
		L	T	P	C
		5	-	-	5

COURSE OBJECTIVES

- To know the fundamental concept of Mobile Communication.
- To understand the concept of Protocol standards and security tasks.
- Provides the concept of Cellular Networks, GPRS, Wi-Fi, WiMax Systems
- Encompasses the various Mobile Communication Technologies and the Structure of Protocols
- To make students familier with fundamentals of mobile communication systems 2. To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc
- To identify the requirements of mobile communication as compared to static communication

COURSE OUTCOMES

- Understand hardware and software design requirements of embedded systems
- To make students familiar with various generations of mobile communications
- To understand the concept of cellular communication
- To understand the basics of wireless communication
- Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations
- Acquire knowledge about embedded processors and their applications

UNIT I – Cellular Networks

Cellular systems -Frequency Management and Channel Assignment - Types of handoff and their characteristics - FDMA – TDMA – CDMA –Cellular Wireless Networks.

UNIT II - GPRS

Introduction-GPRS and Packet-Data Network - GPRS Network Architecture - GPRS Network operations – Data Service in GPRS - Applications for GPRS - Limitations of GPRS - Billing and Charging in GPRS.

UNIT III - WiFi and WLL

Introduction WiFi-802.11b-802.11g-802.11a-802.16-WLL –overview –WLL Configurations-Benefits-Highlights-Progpagation Considerations-Standards of IEEE 802.16.

UNIT IV - WiMAx

Introduction-WiMax Architecture-MAC layer-IEEE 802.16 Protocol –channel Acquisition –IP Connectivity –Radio Link Control (RLC) –Interferences –Security in WiMax Networks-PKM Protocol.

UNIT V - Data Services

SMS: Strength of SMS –SMS Architecture:SMMT-SMMO –SMS as an information bearer-Operator –Centric full-Operator Independent pull-Value added service through SMS.

MMS: MMs Architecture – MMS Transaction flows-SMIL –MMS Inter connection.Interoperability and Roaming-MMs device management and configurations-GPRS application.

TEXT BOOKS

1. Mobile Communications, Jochen Schiller, Second Edition, Pearson Education, 2010.
2. Wireless Communications and Networks, William Stallings, Pearson Education, 2002.

REFERENCES

1. Principles of Wireless Networks, Kaveh Pahlavan, Prasanth Krishnamoorthy, First Edition, Pearson Education, 2009
2. Principles of Mobile Computing,Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Springer, 2010
3. AdHoc Mobile Wireless Networks, C.K.Toh, First Edition, Pearson Education, 2002.
4. Mobile Computing ,Asoke K.Talukder and Roopa R Yavagal, 2005, Tat McGraw –Hill Publishing Company Ltd.New Delhi.
5. Mobil Computing and Wireless Communications ,Amjad Umar , ,NGS Solutions.
6. 3G Wireless Networks ,Clint Smith ,P.E Daniel Collins, ,Second Edition,McGraw Hill International Edition.

15ECU603A	ROBOTICS AND AUTOMATION	Semester-VI			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To learn the basic configuration of Robotics
- To understand the various types of Robots.
- To get an exposure in Robot control systems
- To acquire the knowledge on advanced algebraic tools for the description of motion
- To develop the ability to analyze and design the motion for articulated systems.
- To develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOMES

- Understand the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- Illustrate the kinematics and dynamics of robotics.
- Implementation of related instrumentation and control in robotics
- Ability to solve inverse kinematics of simple robot manipulators
- Able to do the path planning for a robotic system
- Identify a Robot for a specific application.

UNIT I - Fundamentals of Robotic Technology

Robot Anatomy – Work Volume – Robot drive System – Control System and dynamic performance – Precision of Movement – end effectors – Robotic Sensors – Robot Programming and work cell control

UNIT II – Control System and Components

Basic control system concept and models – Controllers – Robot activation and feedback components – Position Sensor – Velocity Sensor – actuators – Power transmission System.

UNIT III - Robot Effectors

Types of end effectors – Mechanical grippers – Tools as End effectors – The Robot / End effectors interface.

UNIT IV – Sensors and Vision Systems

Sensors – Transducers and Sensors – Sensors in Robotics – Tactile Sensor – Proximity Sensor and sensor based system – Use of sensor in robotics – Introduction to Vision system - The sensing and digitizing function in machine vision.

UNIT V - Robot Motion Analysis and Control

Introduction to manipulator kinematics – Robot dynamics configuration of a robot controller – Flexible Manufacturing System Concept – Transfer system – Processing operation – Assembly and inspection

TEXT BOOKS

1. Industrial Robotics: Technology, Programming, and Applications, Mikell P Groover, Tata McGraw Hill Publishing Company Limited. Second Edition, 2012.
2.Introduction to Robotics Mechanics and Control, John J. Craig, Tata McGraw Hill Publishing Company Limited. Third Edition, 2008.

REFERENCES

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, Wiley India Pvt Ltd, Second Edition, 2012.

15ECU603B	INSTRUMENTATION AND CONTROL SYSTEMS	Semester-VI			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To know the fundamental concept of signals and production for controlling equipment or machines.
- To learn the various closed loop control systems current output is taken into consideration and corrections are made based on feedback
- To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system

COURSE OUTCOMES

- Understand the concept of time response and frequency response of the system.
- Analyze feedback characteristics of linear control systems to reduced the disturbance.
- Analyze time response of first and second order control systems for different standard test signals.
- Perform frequency domain analysis of linear control system using nyquist stability criterion.
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
- Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

UNIT I - Transducers and Measurements

Transducer**:** Resistive transducer- Inductive transducer –Capacitive transducer – Load cell-Piezoelectric – Photo electric transducers – Temperature Transducer. Measurement**:** Measurement standards-Measurement of Linear Displacement using LVDT –Measurement of rotary displacement using RVDT – Hall Effect Principle, Operation and Application.

UNIT II - Digital Instruments

Performance Characteristics of instruments- Digital Multi meter – Digital frequency meter – Digital measurement of time - Digital measurement of mains frequency – Digital taco meter – Digital phase meter – Digital capacitance meter- Storage Oscilloscope.

UNIT III - Concepts of Control Systems

Introduction to Control Systems-Human elements in control systems-block diagram fundamentals -open loop control system-closed loop control systems- Linear and Nonlinear Systems- Effect of feedback on Overall gain, Stability, Sensitivity and Noise.

UNIT IV - Introduction to Block diagrams

Block diagram reduction-Signal flow graph-Signal flow graph algebra-construction of signal flow graph from block diagram- Mason's gain formula-Time Response Analysis of First and second order systems-Steady state Error.

UNIT-V - Stability Analysis of Control System

Bode plot- Routh Hurwitz criterion-Root Locus-Nyquist Criterion- Principles of P – PI – PD - PID Controllers - Cascade and feedback compensation, lag, lead, lag-lead Compensation.

TEXT BOOKS

1. Electronic Instrumentation, H.S.Kalsi, Tata McGraw Hill, Third Edition, 2010.
2. A Course in Electrical and Electronic Measurements & Instrumentation, A.K.Sawhney, Dhanpat Rai Publication, 2013.
3. Control Systems Engineering, R.Ananada Natrajan, P. Ramesh Babu, SCITECH Publications, Fourth Edition, 2010

REFERENCES

1. Automatic Control Systems**,** Anoop K.JaiRath,ANE Publications, 2013.
2. Control Systems Engineering, R.Ananada Natrajan, P. Ramesh Babu, SCITECH Publications, Fourth Edition, 2010

15ECU603C	MATLAB PROGRAMMING	Semester-VI			
		L	T	P	C
		4	1	-	5

COURSE OBJECTIVES

- To introduce the MATLAB for numerical computations to know the basic concepts.
- To familiarize basic commands through the Command window and output through the Graph window
- Introduce the MATLAB software environment
- Apply a variety of common numeric techniques to solve and visualize engineering-related computational problems
- To program scripts and functions using the Matlab development environment.
- To use basic flow controls (if-else, for, while).

COURSE OUTCOMES

- Understand the concept of time response and frequency response of the system
- Use MATLAB effectively to analyze and visualize data
- Apply numeric techniques and computer simulations to solve engineering-related problems
- Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives
- Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results,
- Demonstrate understanding and use of fundamental data structures (classes). 6. Create and control simple plot and user-interface graphics objects in MATLAB.

UNIT I - Introduction

Matlab environment – Help future – Types of files – Platform – Search path – Matlab commands – Constants, Variables and Expressions: Character set – Data types – Constants and Variables – Operators – Hierarchy of operators – Built-in functions – Assignment statement.

UNIT II - Vectors and Matrices

Scalars and vectors – Entering data in matrices – Line continuation – matrix subscripts/indices –Multidimensional matrices and arrays – Matrix manipulation – Generation of special matrices –Matrix and array operations – Functions with array inputs – Structure arrays – Cell arrays.

UNIT III - I/O Statements and Graphics

Data input – Interactive inputs – Reading/Storing file data – Output commands – Low level input-output functions - Mat lab Graphics: Two dimensional plots – Multiple plots – Style options – Sub plots – Specialized two dimensional plots – Three dimensional plots.

UNIT IV - Control Structures and MAT LAB Programming

Loops – Branches control structures – Matlab Programming: Matlab Editor – Matlab Programming – Function Subprograms – Types of functions – Function handling – Errors and Warnings – Matlab debugger.

UNIT V - Simulink

Introduction – Starting simulink – Simulink modelling – Solvers – Simulating a model – Using variables from matlab – Data import/export – State space modelling and simulation – Simulation of non-linear systems – obtaining state space model – Creating subsystems – Masked subsystems.

TEXT BOOKS

1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, Pearson Education, First Edition, 2009.
2. Technology and Engineering Applications Simulink, Subhas Chakravarty, Intech, Third Edition, 2012.
3. MATLAB Programming for Engineers, Chapman, Ceneage Learning India PVT Ltd, Fourth Edition, 2011.

REFERENCES

1. Matlab Applications for the Practical Engineer, Kelly Bennett, InTech, Tenth Edition, 2014.
2. Matlab: An Introduction with Applications, Amos Gilat, Siversio(WSE Series), Fourth Edition, 2012.

15ECU611	PRACTICAL – VII EMBEDDED SYSTEMS LAB	Semester-VI			
		L	T	P	C
		-	-	5	3

COURSE OBJECTIVES

- Demonstrate the sensing of different physical parameters
- Explain the calibration of parameters measured and displayed
- Evaluate the data transfer
- To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
- To understand architecture and features of typical Microcontroller
- To learn interfacing of real world input and output devices

COURSE OUTCOMES

- Define the arithmetical and logical assembly language for microcontroller
- Know the downloading procedure on hardware into flash ROM and show the testing data on defined port wish board
- Competent to evaluate the data transfer response
- Able to describe the microcontroller and ARM Processor Architecture and its Features
- Learn importance of microcontroller and ARM Processor in designing embedded applications
- Learn use of hardware and software tools. 4. Develop interfacing to real world devices.

(Any 12 Experiments)

1. Writing and testing programs involving arithmetic, logical and BIT oriented instructions
2. LED interfacing
3. Data transfer program with parallel port
4. Key interfacing and Seven segment display interface
5. Stepper motor controller interface
6. Speed control of DC motor
7. PWM generation
8. Waveform generation
9. A/D converter interface
10. D/A converter
11. LCD interface
12. Programming using interrupts
13. Solid State Relay
14. I2C Interface
15. Serial Communication Interface

15ECU506	ELECTRONIC INSTRUMENTATION	Semester-VI			
		L	T	P	C
		-	-	-	4

COURSE OBJECTIVES

- To understand operation of different instruments
- To provide basic knowledge about the various sensors. and data acquisition systems applied in Wireless sensor network
- To provide fundamental concepts of control system.2 such as mathematical modeling, time response and frequency response
- To develop concepts of stability and its assessment.3 criteria.
- Explain basic concepts and definitions in measurement
- to find transfer functions for given system

COURSE OUTCOMES

- Able to understand operation of different instruments.
- Understand the principles of various types of transducers and sensors
- Able to calculate time domain and frequency domain parameter for given system
- Able to predict stability of given system using appropriate criteria
- Identify the various parameters that are measurable in electronic instrumentation
- Practice the construction of testing and measuring set up for electronic systems.

UNIT I - Electronic Test Instruments

Analog Meters D.C and A.C Voltmeters – Ammeters – Multimeter - Power meter - Q-meter -True RMS meter, Vector Impedance Meter, Vector Voltmeter, Component Measuring Instrument.

UNIT II - Signal Sources Sine wave generator-Frequency synthesized sine wave generator-Sweep frequency generator, pulse and square wave generator-Function generator-Wave analyzer-Applications - Harmonic distortion analyzer-Spectrum analyzer-Applications-Audio Frequency generator-Noise generator.

UNIT III - Oscilloscopes

General purpose oscilloscope-Screens for CRT graticules-Vertical & horizontal deflection systems- Time base operation, triggers – sweep control, z axis input - Delay lineMultiple trace-Dual beam & dual trace-Probes-Oscilloscope techniques-special oscilloscopes - Storage oscilloscope-sampling oscilloscope-digital CRO.

UNIT IV - Digital Instruments

Digital method for measuring frequency, period, phase difference, pulse width, time interval, total count-Digital voltmeter-Types-Automatic polarity indication, automatic ranging, and auto zeroing-DMM-Microprocessor based DMM-DPM-swept – spectrum analyzer-network analyzer-discharge analyzer- logic probes-logic analyzer.

UNIT V - DISPLAY AND RECORDING DEVICES

Bar graph display-Segmental and dot matrix display-X-Y recorders, magnetic tape recorders-Digital recording-Data loggers-Interference and screening-Electrostatic and electromagnetic interference & earth loops.

TEXT BOOKS

1. Modern Electronic Instrumentation & Measurement Techniques, Albert D. Helfrick &

William D. Cooper, Prentice Hall of India, 2002.
2. A Course in Electrical and Electronic Measurements & Instrumentation, A.K.Sawhney, Dhanpat Rai Publication, 2013
3. Digital Instrumentation, A.J.Bouwens, Tata Mc Graw Hill, 1997.
4. Electronic Test Instruments,Theory and applications, Robert A.Witte, Prentice Hall, 1993.

REFERENCES

1. Electronic Measurements & Instrumentation, B.M.Oliver and J.M.Cage,Mc Graw Hill International Edition, 1975.
2. Elements of Electronic Instrumentation & Measurements, Joseph, J.Carr, Third Edition, Pearson Education,2003. Anx.34 F - M.Sc., Elect.& Instrumts (Univ dept) 2008-09
3. Instrumentation Devices & systems, C.S.Rangan, G.R.sarma, V.S.V.Mani, Tata Mc Graw Hill, 2002.
4. Electronic Instrumentation and Measurements, D.A.Bell, Prentice Hall of India,2002.
5. Electronic Measurements and Instrumentation, Rajendra Prasad, Khanna Publishers, Delhi,2003.
6. Electronics and Instrumentation, B.R.Gupta, S.Chand Co. (P)Ltd., Delhi,2003.

15ECU604	PROGRAMMABLE LOGIC AND DISTRIBUTED CONTROL SYSTEMS	Semester-VI			
		L	T	P	C
		-	-	-	4

COURSE OBJECTIVES

- To identify logical process control in automation
- To connect PLC peripherals with PLC for logical functioning.
- To get strong knowledge in the developing of basic PLC programs
- To understand the components of a PLC system To understand how PLCs are used
- To understand the H&S requirements of a PLC- controlled system
- To understand different methods of interfacing with a PLC

COURSE OUTCOMES

- Identify the main parts of programmable logic controller
- Develop logic gate circuits for Boolean expressions
- Able to state basic PLC Terminology
- Identify logical process control, in automation.
- Describe how a programmable logic controller is programmed.
- Describe switching elements on input/output modules**SCOPE**

UNIT I - Review of Computers In Process Control

Data loggers: Data acquisition systems (DAS): alarms, computer control hierarchy levels. Direct Digital control (DDC). Supervisory digital control (SCADA). Characteristics of digital data. Controller software. Linearization. Digital Controller modes, Error, Proportional, Integral, Derivative and Composite Controller Modes.

UNIT II - Programmable Logic Controller (PLC) Basics

Definition- overview of PLC systems - Input/ Output modules - Power supplies –ISO slots. General PLC programming procedures - Programming on-off outputs-Auxiliary commands and functions - Creating Ladder Diagrams from process control descriptions. PLC basic functions - Register basics - Timer functions - Counter functions.

UNIT III - PLC Intermediate Functions

Arithmetic functions - number comparison functions - Skip and MCR functions - Data move systems - PLC Advanced intermediate functions- utilizing digital bits - sequencer functions - PLC Advanced functions: alternate-programming languages - operation. PLC-PID functions - PLC installation - trouble shooting and maintenance

UNIT IV - Interface and Backplane Bus Standards for Instrumentation Systems

Field bus: Introduction - concept - international field bus standards. HART protocol: method of operation - structure - operating conditions and applications.

UNIT V - Distributed Control Systems (DCS)

Evolution of DCS - building blocks - detailed descriptions and functions of field control UNITs- operator stations - data highways - redundancy concepts. DCS - supervisory computer tasks and configuration - DCS- system integration with PLC and computers.

TEXT BOOKS

1. Computer based Industrial Control, Krishna Kant, Prentice Hall India, 2010.
2. Programmable Logic Controllers Principles and Applications, John Webb. W.and Ronald Reis, A. Prentice hall Inc, Fifth Edition 2003.

REFERENCES

1. Programmable Logic Controllers, Frank D. Petruzella, Tata McGraw Hill, Third Edition, 2010.

15ECU507	MEMS AND CONTROL ENGINEERING	Semester-II			
		L	T	P	C
		-	-	-	5

COURSE OBJECTIVES

- To identify logical process control in automation
- To learn the various micro fabrication technologies for MEMS
- Understand unique requirements for MEMS fabrication
- To know about the merging of mechanical devices with circuits
- To know about the current trends and future technology for MEMS
- Identify problems and suggest suitable MEMS material/ Devices/Process to get the Requisite Solution for a given application Fundamental Devices and Processes for MEMS

COURSE OUTCOMES

- Identify the main parts of programmable logic controller
- Develop logic gate circuits for Boolean expressions
- Able to state basic PLC Terminology
- Apply fundamental concepts of MEMS to solve real life engineering problems
- Apply advanced MEMS techniques to solve future engineering problems.
- Know about the merging of mechanical devices with circuits

UNIT I - Overview and Working Principles of MEMS

MEMS and Microsystems – Typical MEMS and Microsystems Products – Microsystems and Microelectronics – Miniaturization – Applications of Microsystems – Micro Sensors, Micro Actuation, Micro Grippers, Micro Motors, Micro Accelerometer.

UNIT II - Fabrication & Microsystems Design

Ions and Ionization – Doping – Diffusion Process – Scaling Laws For Electrical Design – Substrate and Wafers – Silicon as a Substrate – Silicon Compounds – Piezo Resistors – Piezo Crystals - Photolithography – Ion Implantation – Diffusion – Oxidation – PVD – Etching – Surface Micro Matching – LIGA Process – Micro System Design Considerations

UNIT III - Concepts of Control System

Introduction – Open and Closed Loop Systems – Examples – Elements of Closed Loop Systems – Linear and Nonlinear System - Effect of Feedback on Overall Gain, Stability, Sensitivity and Noise – Transfer Function of Closed Loop System – Block Diagram Algebra and Reduction – Mason's Gain Formula.

UNIT IV -Time Response Analysis & Stability in Time and Frequency Domain

First Order System: Impulse and Step Input Analysis – Second Order System Analysis – Steady State Error – Stability Analysis: Routh Hurwitz Criterion – Root Locus Method – Construction and Application - Nyquist Stability Criterion – Bode Diagrams – Polar Plot.

UNIT V - Design of Digital Control System

Z Plane Specifications of Control System Design – Digital Compensator Design – Frequency Response Method - State Feedback – Pole Placement Design – State Observers – Digital Filter Properties – Frequency Response – Kalman's Filter.

TEXT BOOKS

1. MEMS & Microsystems Design & Manufacture and Nano Scale Engineering, Tai-Ran Hsu, Wiley Publications, Second Edition, 2011.

2. Control Systems Engineering, R.Ananada Natrajan, P. Ramesh Babu, SCITECH Publications, Fifth Edition, 2012

REFERENCES

1. Digital Control Engineering, M.Gopal, New age International (p) Ltd, Fifth Edition, 2012.

15ECU605	DIGITAL SIGNAL PROCESSING	Semester-III			
		L	T	P	C
		-	-	-	5

COURSE OBJECTIVES

- To understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
- To get an exposure on Discrete Fourier Transforms (DFT), its applications and implementation by FFT techniques.
- To apply design technique for FIR type digital filters
- Understand fundamentals of Digital Signal Processing
- Analyze & compare different signal processing strategies.
- Become aware of some applications of DSP.

COURSE OUTCOMES

- Understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform
- Ability to compute various transform analysis of Linear Time Invariant Systems.
- Implement problem solving strategies to DSP Problems.
- Able to test signal processing algorithms for various applications
- Ability to understand Various applications of DSP such as signal processing and telecommunication.
- Apply design techniques for FIR type digital filters

UNIT I - Structures For Discrete Time Systems

Introduction – Block Diagram and Signal Flow Graph Representation of Linear Co-Efficient Difference Equation – Basic Structures for IIR Systems – Basic Network Structures for FIR Systems – Lattice Structures – Zero Input Cycles in Fixed Point Realization of IIR Digital Filters.

UNIT II - Filter Design Techniques

Introduction – Design of Discrete Time IIR Filters from Continuous Time Filters – Frequency Transformation of Low Pass IIR Filters – Design of FIR Filters by Windowing - Comments on IIR and FIR Digital Filters.

UNIT III - Computation of Discrete Fourier Transform

Introduction – Efficient Computation of DFT – Decimation in Time FFT Algorithms – Decimation in Frequency Algorithms – Implementations of FFT Algorithms – FFT Algorithms for Composite N.

UNIT IV TMS 320 C 6713 Overview

Introduction – TMS320C6713 Overview – Key Features – Architectural Overview – Functional Block Diagram - Internal Memory Organization – CALU – System Control – PLU – Interrupts – Addressing Modes – Instruction Set.

UNIT V -Introduction to MATLAB

Introduction To M-Files – Inline Functions – Control Flow – Relations & Logical Operators – Strings – Cell Arrays – Functions – MATLAB Graphics: - 2d Graphics – 3d Graphics – Animations.

TEXT BOOKS

1. Discrete Time Signal Processing, Oppenheim A.V and Schaffer RW, Buck .C, Prentice Hall

India, Second Edition, 2013.
2. Digital Signal Processing – A computer Based Approach, Sanjith K.Mitra, McGraw Hill, Fourth Edition, 2013.
3. TMS 320 C 671x users guide, Texas instruments, 1993.

REFERENCES

1. Digital Signal Processing, Nagoor Kani.A, Tata McGraw Hill Pvt Ltd, Second Edition, 2012.