



R.K.D.F. UNIVERSITY, BHOPAL

B.Tech. (Electronic and Communication)

SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E. Common	Environmental Engineering	BE - 3011	4L-0T-0P	4

Course Outcomes: After studying this course, students will be able to,

CO1-Convey a clear idea of use of renewable and non-renewable energy sources, its impact on environment. The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk and its effect on ecosystem.

CO2-Ability to understand environmental laws and regulations to develop guidelines, procedures and processes for health and safety issues due to air pollution and sound pollution.

CO3-Ability to understand environmental laws and regulations to develop guidelines, procedures and processes for health and safety issues due to water pollution

CO4-Understand what are professional ethics and how do ethics affect the outcomes of environmental laws and regulations.

CO5-Understanding the basic and causes of climate and weather change, global warming, climate variability

Unit –I

Energy- Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

Ecosystem – Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation,

Unit –II

Air Pollution & Sound Pollution - Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

Unit –III

Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent.

Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

Unit –IV

Society, Ethics & Human values– Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

Unit –V

Basics of climate and weather, global warming, climate variability;

Causes of climate change – natural and anthropogenic, greenhouse gases, carbon cycle;

Mitigation strategies – renewable energy, energy efficiency, afforestation and reforestation, carbon capture



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utilization and storage (CCUS), sustainable practices;

Adaptation strategies – climate-resilient infrastructure, agriculture adaptation, water management, disaster risk reduction;

Policies and global efforts – UNFCCC, IPCC, COP summits, Paris Agreement, Kyoto Protocol;

India's initiatives – National Action Plan on Climate Change (NAPCC), State Action Plans on Climate Change (SAPCC), green economy measures;

Sustainable Development Goals (SDGs) and climate action.

References:-

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Miller GT JR; living in the Environment Thomson/cengage
10. Cunningham WP and MA; principles of Environment Sc; TMH
11. Pandey, S.N. & Mishra, S.P. Environment & Ecology, 2011, Ane Books , Pvt. Ltd, New Delhi
12. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.
13. Gour R.R, Sangal, R & Bagaria, G.P. , Excel Books, A-45, Naraina Pilovepdf_merged.pdfPage 118hase-I ,New Delhi.- 110028



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New Scheme Based On AICTE Flexible Curricula
Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Engineering Mathematics-III	EC - 3021	4L-0T-0P	4

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage themselves in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

The Mission of the Department of Electronics and Communication Engineering is:

PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations



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PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of "Incubation Centre" established within college premises and will be able to participate in National/ International level project (Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Course Outcomes for B.Tech. (ECE)

B.Tech. III Semester (Electronics and Communication Engineering)

Course Outcomes:

CO1 Find Laplace Transform of periodic functions, Dirac delta function and solve differential equations, integral equations and integro- differential equations and can analyze the solution. Expand the function in Fourier series and half range. Also Find Fourier transform and Fourier Integral and solve Integral equations. CO2 Analyse solutions of partial differential equations and solve the initial value and boundary value problems. Extremis the functional and also solve Isoperimetric problems.

CO3 Understand Principle of operation and characteristics, biasing arrangements of Field effect transistors and MOSFETs and types of oscillator.

CO4 Evaluate conversion of numbers from one code to other code, logic gates and truth table of digital circuits.

Course Contents:

Unit-I

Fourier series: Introduction of Fourier series, Fourier series for Discontinuous functions, and Fourier series for even and odd function. Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations.

Unit- II



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Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit –III

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi, Newton Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods.

Unit –IV

Solution of Ordinary Differential Equations (Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit –V

Concept of Probability: Probability: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Testing of Hypothesis |: Students t-test, Fisher's z-test, Chi-Square Method.

Reference Books:

- (i) Higher Engineering Mathematics by BS Grewal, Khanna Publication
- (ii) Advance Engineering Mathematics by D.G.Guffy
- (iii) Mathematics for Engineers by S.Arumungam, SCITECH Publication
- (iv) Engineering Mathematics by S S Sastri. P.H.I.
- (v) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
- (vi) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publication
- (vii) Probability and Statistics by Ravichandran, Wiley India
- (viii) Mathematical Statistics by George R., Springer



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Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Digital Electronics	EC - 3031	3L-1T-2P	6

Program Output (PO) of Engineering Stream

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PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D,



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consultancy and higher learning. Students shall participate and succeed in competitive examinations such as GATE, GRE and TOEFL, PSUs and may admit to various programs like Master of Science (Abroad/India), Master of Technology (India) and Doctor of Philosophy (India/Abroad).

PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of "Incubation Centre" established within college premises and will be able to participate in National/ International level project (Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Subject code:- EC 3031

Subject Name: - Digital Electronics

Course Outcomes:

The purpose of this course is to develop a strong base in design and analysis of digital systems. Students will learn to

1. Understand the concepts of Boolean algebra and Logic gates and realize logic functions by utilizing these fundamentals.
2. Design complex digital systems and apply them in real world scenario.
3. Understand the concepts of combinational and sequential circuits and implement them using the minimization techniques (K-Map, Quine-McCluskey algorithm).
4. Identify and analyze the synchronous and asynchronous logic circuits
5. Understand concepts of memory, programmable logic and digital integrated circuits
6. Get Thorough knowledge of registers and counters and apply them in logic circuits.

UNIT-I

NUMBER SYSTEMS - BOOLEAN ALGEBRA AND LOGIC GATES

Decimal, Binary, Octal and Hexadecimal systems, conversion from one base to another, Codes-BCD, Excess-3, Gray Reflected ASCII, EBCDIC. Logic gates and binary operations-AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR Implementations of Logic Functions using gates,



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NAND–NOR implementations –Multi level gate implementations–Multi output gate implementations.

Number Systems - Boolean algebra – Canonical and standard forms. Digital logic gates – Integrated circuits. Map method – four and five variable map methods –Products of Sums Simplification - Don't care conditions Quine -McCluskey Method.

UNIT-II

GATE LEVEL MINIMIZATION & COMBINATIONAL LOGIC CIRCUITS

Half adder –Full Adder –Half subtractor -Full subtractor, Parallel binary adder, parallel binary Subtractor –Fast Adder - Carry Look Ahead adder–Serial. Adder/Subtractor -BCD adder –Binary Multiplier –Binary Divider -Multiplexer/Demultiplexer –decoder -encoder –parity checker –parity generators –code converters -Magnitude Comparator.

UNIT-III

SYNCHRONOUS SEQUENTIAL LOGIC DESIGN

Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.

UNIT-IV

REGISTERS AND COUNTERS

Asynchronous Ripple or serial counter. Asynchronous Up/Down counter -Synchronous counters – Synchronous Up/Down counters – Programmable counters –Design of Synchronous counters: state diagram-State table –State minimization –State assignment - Excitation table and maps-Circuit. Implementation -Modulo–n counter, Registers –shift registers -Universal shift registers. Shift register counters –Ring counter –Shift counters -Sequence generators.

UNIT-V

LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES

TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.

TEXT BOOKS



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1. Morris Mano. M, “Digital Design “, Pearson education, Third Edition 2002.
2. Ronald J. Tocci, “Digital System Principles and Applications” , PHI ,Sixth Edition, 1997.

REFERENCE BOOKS

1. Floyd, “Digital Fundamentals” , Universal Book Stall, New Delhi,1986.
2. Morris Mano. M, “Digital Design “, PHI, Second Edition.
3. Ronald J. Tocci, “Digital System Principles and Applications”, Pearson education 9th edition.

Digital System Lab

INSTRUCTIONAL OBJECTIVES

1. To verify operation of logic gates and flip-flops.
2. To design and construct digital circuits

LIST OF EXPERIMENTS

1. Study of Gates & Flip-flops.
2. Half Adder and Full Adder.
3. Magnitude Comparator (2-Bit).
4. Encoders and Decoders.
5. Multiplexer and Demultiplexer.
6. Code Converter.
7. Synchronous Counters.
8. Ripple Counter.
9. Mod – N Counter.
10. Shift Register – SISO & SIPO.



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Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Network Analysis	EC - 3041	3L-1T-2P	6

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Subject code:- EC 3041

Subject Name: - Network Analysis

Course Outcomes:

Students will

1. Understand basics of electrical circuits with nodal and mesh analysis. Understand network laws like KCL and KVL
2. Learn the concept of electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Get knowledge of Network Graph theory and determine different network functions.
5. Realize the frequency domain techniques and understand relationship of two port networks.
6. Get a comprehensive knowledge of linear network theory, frequency response and steady state analysis.

UNIT-I

Introduction to circuit theory: basic circuit element R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources, controlled & uncontrolled sources KCL and KVL analysis, Steady state sinusoidal analysis using phasors . Concept of phasor & vector, impedance & admittance, Nodal & mesh analysis, analysis of magnetically coupled circuits. Dot convention, coupling coefficient, tuned circuits, Series & parallel resonance.



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UNIT-II

Network Graph theory: Concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual network .

UNIT-III

Kirchoff's voltage law, Kirchoff's current law, Voltage division and current division, Series parallel Network reduction, Superposition theorem and its application, Thevenin's and Norton's theorem and its application, Maximum power transfer theorem, Tellegen's theorem, Conservation of power, Tellegen's quasi theorem, Application of Tellegen's theorem, Millman's theorem, Substitution theorem with proof, Compensation theorem.

Network Graph Theory: Concept of a network graph terminology used in network graph relation between twigs and links, Properties of a tree in a graph, Formation of incidence matrix, No. of trees in a graph, Cut set matrix and tie set matrix.

UNIT-IV

Transient analysis: Transients in RL, RC&RLC Circuits, initial & final conditions, time constants. Steady state analysis, Laplace transform: solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain.

Sinusoidal Steady state Analysis: Introduction, Sinusoidal voltage and current, Element responses, The sinusoidal steady state, The sinusoidal and ejwt, Solution using ejwt, Solution using Re ejwt or Im ejwt, Phasors and phasor diagrams.

UNIT-V

Two port Networks: Relationship of two port variables, Short circuit admittance parameters, open circuit impedance parameters, Transmission parameters, the hybrid parameters, Relationship between various parameters, Parallel connection of two part networks.

Frequency Response and Resonance: Introduction, Half power frequencies, RLC circuit series resonance, Quality factor, RLC parallel circuit parallel resonance, Practical LC parallel circuits, Series parallel conversions.

Books Recommended

1. Van-Valkenberg M E "Network Analysis", PHI, New Delhi, Third Edition (1999)
2. Van-Valkenberg M E, "Introduction to Modern Network Synthesis", John Wiley & Sons (1999)
3. Nahvi M, Edminister J, "Scaum's Outline of Electric Circuits (Theory and Problems)", TMH Publication, Fourth Edition, (2002)
4. Balabanian N, Bickert Theodore A, "Linear Network Theory: Analysis, Properties, Design and Synthesis", Matrix Publishers, First edition (1985)



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5. DeCalro R A, Lin P M, “Linear Circuit Analysis”, 2nd Ed. Oxford University Press, Indian Edition (2004).

Analysis and Synthesis of Networks Laboratory

1. Verification of Thevenin's theorem, Norton's theorem.
2. Verification of Maximum power transfer theorem, Superposition theorem.
3. Verification of Reciprocity theorem.
4. Design and implementation of T and Π passive filters.
5. Determination of h-parameters of a network.
6. Study of sinusoidal steady state response of a network.
7. Study of transient response of a network.
8. Study of passive integrator and differentiator.
9. Synthesis of RC-network for a given network function.
10. Verification of equivalence of star and delta transformation



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Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Value Education	EC - 3051	4L-2T	6

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Subject code:- EC 3051

Subject Name: - Value Education

Course Outcomes:

Students will

1. Understand the Concepts of Values, need for Education in values for character development and Challenges for Value adoption.
2. Get knowledge of Personal Values, Social Values, Spiritual values and its Benefits for self and society.
3. Learn Business and Professional Ethics and Entrepreneurship and develop Corporate Social Responsibility.
4. Will understand the self anatomy, its cyclic processes within self and learn the states of the awareness.
5. Understand Quality of Life and know self esteem and understand its components.

Chapter 1

Value Education Concepts of Values-Definition and Types of values –The need for Education in values. Challenges for Value adoption-Character development-Vision of a better world

Chapter 2

Inculcation of values Classification of values- Personal Values-Family Values-Social Values-Spiritual values, Benefits of value adoption



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Chapter3

Values for Professional excellence

Definition-Purpose-implementation-situations to adopt-reflection questions, quotable quotes of Active Listening, Decision making-Determination-Perseverance-Discipline Responsibility

Chapter 4

Business ethics

Ethics and Entrepreneurship- Professional Ethics –Ethical choices- Resolving Ethical Dilemmas- Leadership and Social Responsibility- Corporate Social Responsibility.

Chapter 5

Quality of Life

Dealing with change-Trends, Organizations and the Individual-Self and the world-Quality from within-Relating to others-The dynamics of personal powers.

Chapter 6

Exploring the self

True Identity-Anatomy of the self-The cyclic processes within the self-States of the awareness-Innate and Acquired qualities-Empowering the self.

Chapter 7

Understanding Self-Esteem

Know self-esteem-Understanding the self-Components of self-esteem-Association with self-esteem-Levels of self-esteem-Reflection exercises.

Chapter 8

Principles of living

Be introspective-Be an observer-Being optimistic-Appreciate differences-Don't compare yourself with others Live at present

Chapter 9

Practical Meditation

Why meditate?-Soul consciousness-The supreme-Karma-Timeless dimension-The eight powers



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Chapter 10

Exercises for Practice

Quiet reflection- Practice introversion-Being an observer-Stand back and observe -Self awareness (Soul consciousness)-Experiencing Body free stage-Reflect on original qualities-Visualize the Divine-Think attributes of the Supreme-Developing a living relationship-Surrender to God-Create Good wishes for all-Visualization in Meditation: Orbs of Light- The forest-The Balloon



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Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Software Lab -I	EC - 3061	0L-0T-2P	2

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PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations such as GATE,GRE and TOEFL,PSUs and may admit to various programs like Master of Science (Abroad/India),Master of Technology (India) and Doctor of Philosophy (India/Abroad).



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PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of "Incubation Centre" established within college premises and will be able to participate in National/ International level project (Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Subject code:- EC 3061

Subject Name: - Software Lab-I

Course Outcomes:

Students will

1. Get familiar with circuit simulation/ PCB designing software
2. Study and learn circuit simulation software's
3. Get Knowledge of the software applications of the software in the field of Electronic Devices, Electronic Instrumentation and Network Analysis.
4. Will understand Designing and simulation of Basic Electronics.
5. Get Understanding of software in optimization, designing and fabrication of PCBs of different circuits.

CIRCUIT SIMULATION/ PCB DESIGNING SOFTWARE

Study of circuit simulation software (any one- TINA-PRO/ PSPICE/ CIRCUIT MAKER/ GPSIM/ SAPWIN etc).

Overview and Study of the key features and applications of the software. Application of the software in the field of Electronic Devices, Electronic Instrumentation and Network Analysis. Design, Optimization and simulation of

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics



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etc).

2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.

3. Use of virtual instruments built in the software.

Study of PCB layout software

Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software or other available. Students should simulate and design the PCB for at least two circuits they are learning in the current semester.



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Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Electronic Devices	EC - 4011	3L-1T-2P	6

Course Outcomes

Students will

1. Get a comprehensive introduction of electronic properties of semiconductors,
2. Be familiar with electronic devices, and their applications to circuits.
3. Will get knowledge of biasing and other characteristics with circuit operation.
4. Helps to understand the basics of solid state devices.
5. Be able to analyze performance of various types of amplifiers.
6. Get Thorough Knowledge of Power Supplies.

Unit-I

Semiconductor intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, V-I characteristics, cut in voltages of Si and Ge diode, transition and diffusion capacitance, power dissipation.

Unit-II

Diode Family and Applications: Diodes Family: Characteristics and application of p-n junction diode, Zener diode, avalanche diode, Varactor diode, Schottky diode, Tunnel Diode, PIN diode, LED, photodiodes, phototransistors, p-n junction. **Applications:** diode as rectifier, clipper and clamper, The diode as a circuit element, The Load line concept, The Pieces wise linear diode modal, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diodes circuits.

Unit-III

Bipolar junction transistor - Construction, basic operation, current components and equations,. CB, CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor (P_{dmax} rating), Photo transistor, Uni-junction Transistor (UJT) : Principle of operation, characteristics.



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Unit-IV

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor.
Transistor at low frequency: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier.
Transistor at high frequency, high frequency model (hybrid- π), Parameters and their definition, Miller capacitance and its effect on voltage gain.

Unit-V

FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

TEXT BOOKS:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education
2. Millman and Halkias: Integrated electronics, TMH
3. Graham Bell: Electronic Devices and Circuits, PHI
4. Sendra and Smith: Microelectronics, Oxford Press.
5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

NOTE:-

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed / drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

List of Experiments (Expandable):

Course Number and Title	
ELECTRON DEVICES LAB	
Instructional Objectives	
1.	To study experimentally the characteristics of diodes, BJT's and FET's.
2.	To verify practically the response of various special purpose electron devices.
3.	To construct and simulate various semiconductor devices using tools such as PSPICE/multisim..

Student Outcomes from Criterion 3 covered by this Course

List of Topics Covered



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LIST OF RECOMMENDED EXPERIMENTS

1. Characteristics of PN junction and Zener diode.
2. Input, Output and Transfer characteristics of CE and CC Amplifier.
3. Characteristics of LDR, Photo-diode and Photo transistor.
4. Transfer characteristics of JFET.
5. Transfer characteristics of MOSFET (with depletion and enhancement mode)
6. Characteristics of LED with three different wavelengths.
7. Half wave rectifier.
8. Full wave rectifier with 2 diodes.
9. Full wave rectifier with 4 diodes (Bridge rectifier).
10. Series voltage Regulator.
11. Shunt voltage Regulator.
12. Characteristics of Thermistor.
13. Simulation experiments using PSPICE or Multisim.



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Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Electronic Instrumentation and Measurement	EC - 4021	3L-1T-2P	6

Program Output (PO) of Engineering Stream

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B.Tech. IV Semester (Electronics and Communication Engineering)

Subject code: - EC 4021

Subject Name: - Electronic Instrumentation and Measurement

Course Outcomes:

1. Understand the errors in measurements and their rectification.
2. Understand working of CRO and apply the knowledge to select and identify specific sensors (or complete instruments) for controlling machines and processes.
3. Designing and validation of DC and AC bridges, get knowledge of various transducers, thermocouples, etc and learn their concepts in designing measurement systems.
4. Understand the operating principles of a range of DAC and ADC instruments and study the dynamic response and the calibration of the instruments.
5. Designing and Analysis of signal and sweep generator systems.
6. Learn about various measurement devices, their characteristics, their operation and their limitations

Unit-I

Measurement and Error: Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysteresis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC Voltmeter, Chopper type and solid-state, AC voltmeter using Rectifier, Average, RMS, Peak Responding voltmeters, Multimeter, Power meter, Bolometer and Calorimeter.



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Unit-II

Cathode Ray Oscilloscope (CRO): Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration, Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital), Oscilloscope.

Unit-III

AC Bridges: Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge, Wagner earth detector, Impedance measurement by Q-meter.

Non-Electrical Quantities (Transducer): Classification of Transducers, Strain gauge, Displacement Transducer- Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezoelectric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor, Nuclear Radiation Detector.

Unit-IV

Signal generator & Display: Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices, Light Emitting diodes(LED), Liquid Crystal Display(LCD).

Unit-V

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to-digital Conversion (ADC) –Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, principle of operation, response time and application.

References :

1. H. S. Kalsi: Electronics Instrumentation, TMH.
2. K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.
3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques; Pearson.

List of Experiments:

All experiments (wherever applicable) should be performed through the following steps.



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Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Study of CRO and Function Generator.
2. Displacement measurement by LVDT.
3. Force measurement by strain gauge.
4. Measurement of Capacitor, Self-induction using Q-meter.
5. Temperature measurement by thermistor, RTD and thermocouple.
6. Optical Transducer- Photo conductive, Photo voltaic, Photo-diode, PhotoTransistor
7. Design of digital to analog converter.
8. PLC operation and applications (for example: relay, timer, level, traffic light etc.)



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Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Analog Communication	EC - 4031	3L-1T-2P	6

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Subject code: - EC 4031

Subject Name: - Analog Communication

Course Outcomes:

Students will

1. Understand Signal Analysis. spectral density and types of systems
2. Get Knowledge of modulation Techniques and their analysis.
3. Get in-depth knowledge of modulation and different types of detectors.
4. Learn about various transmitters and receivers.
5. Learn and Understand various sources of noise and its types

Unit-I

Frequency domain representation of signal: Fourier transform and its properties, condition of existence, Fourier transform of impulse, step, signum, cosine, sine, gate pulse, constant, properties of impulse function. Convolution theorem (time & frequency), correlation(auto & cross), energy & power spectral density.

Unit-2

Introduction: Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, DSB-C, SSB-SC, Generation of AM, DSB-SC, SSB-SC, VSB-SC & its detection, Vestigial Side Band (VSB).



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Unit-3

Types of angle modulation, narrowband FM, wideband FM, its frequency spectrum, transmission BW, methods of generation (Direct & Indirect), detection of FM (discriminators: balanced, phase shift and PLL detector), pre emphasis and de-emphasis. FM transmitter & receiver: Block diagram of FM transmitter & receiver, AGC, AVC, AFC,

Unit-4

AM transmitter & receiver: Tuned radio receiver & super heterodyne, limitation of TRF, IF frequency, image signal rejection, selectivity, sensitivity and fidelity, Noise in AM, FM

Unit-5

Noise: Classification of noise, Sources of noise, Noise figure and Noise temperature, Noise bandwidth, Noise figure measurement, Noise in analog modulation, Figure of merit for various AM and FM, effect of noise on AM & FM receivers.

REFERENCES

1. Simon Haykins, Communication System, John Wiley
2. Singh & Sapre, Communication System, TMH
3. B.P. Lathi, Modern Digital and analog communication system; TMH
4. Singhal, analog and Digital communication, TMH
5. Rao, Analog communication, TMH
6. P K Ghose, principal of communication of analog and digital, universities press.
7. Taub & Shilling, Communication System, TMH
8. Hsu; Analog and digital communication (Schaum); TMH
9. Proakis fundamental of communication system. (Pearson edition).

List of Experiments:

1. To analyze characteristics of AM modulator & Demodulators.



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2. To analyze characteristics of FM modulators& Demodulators.
3. To analyze characteristics of super heterodyne receivers
- .
4. To analyze characteristics of FM receivers.
5. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
6. To analyze characteristics of Automatic volume control and Automatic frequency control.
7. To construct frequency multiplier circuit and to observe the waveform.
8. To design and analyze characteristics of FM modulator and AM Demodulator using PLL



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Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Analog Circuits	EC - 4041	4L-0T-2P	6

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Subject code: - EC 4041

Subject Name: - Analog Circuits

Course Outcomes:

1. Understand the basic principles and operations of amplifiers at low and high frequencies.
2. Understand the nature and characteristics of devices such as Operational Amplifiers and Oscillators.
3. Analysis and modeling of amplifiers such as Power amplifier and Tuned Amplifiers along with their applications.
4. Learn about various cascade and cascade amplifiers with their characteristics.
5. Study and analyze the differential amplifiers with its characteristics and its analysis.

UNIT-I

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor. **Transistor at low frequency:** frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier. **Transistor at high frequency**, high frequency model (hybrid- π), Parameters and their definition, Miller capacitance and its effect on voltage gain

UNIT-II

Feedback amplifier: positive and negative feedback loop gain, effect of negative feedback on gain stability, distortion, bandwidth, input and output impedance of amplifier, types of feedback (voltage,



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current, series and shunt) and their analysis. **Oscillators:** condition of sustained oscillation, RC phase shift, LC (Hartley and Collpit) Oscillators, Wein Bridge, Negative resistance (Tunnel diode and UJT) oscillators, crystal oscillators.

UNIT-III

Power amplifier, classification, operation, analysis and design of Class A, Class B, Class-AB, Class C, transformer coupled, push pull and complementary symmetry amplifiers, power dissipation in transistors (P_{dmax} rating) and efficiency calculations. **Tuned amplifier** and its applications, Q factor, selectivity and bandwidth, effect of loading, double tuning (synchronous and stagger)

UNIT-IV

Operational Amplifier: Differential amplifier and analysis, Configurations-Dual input balanced output differential amplifier, Dual input Unbalanced output differential amplifier, Single input balanced output differential amplifier, Single input Unbalanced output differential amplifier Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an ideal opamp, Power supply configurations for OP-AMP.

Characteristics of op-amp: Ideal and Practical, Input offset voltage, offset current, Input bias current, Output offset voltage, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio(CMRR), Slew rate and its Effect, PSRR and gain bandwidth product, frequency limitations and compensations, transient response, analysis of TL082 datasheet.

OP-AMP applications: Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO, Comparator, Zero Crossing Detector. OP-AMP AS FILTERS: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter; all pass filters, self-tuned filters, AGC,AVC using opAMP.

UNIT-V

TIMER: IC-555 Timer concept, Block pin configuration of timer. Monostable, Bistable and Astable Multivibrator using timer 555-IC, Schmitt Trigger, Voltage limiters, Clipper and clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage convertor.

Voltage Regulator: Simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs such as linear regulator, Switching regulator and low-drop out regulator. Study of LM317, TPS40200 and TPS7250

Differential amplifier - configuration, transfer characteristics, DC analysis, h-parameter analysis, differential and common mode gain, CMRR, constant current source and current mirror, level shift.



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References:

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List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.

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1. Characteristics of Op-Amp (input offset voltage, slew rate, CMRR, BW, input bias current.
2. Linear application of Op-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response, adder, subtractor, differential amplifier, integrator and differential frequency response)
3. To design and construct a shunt and series regulator and find line and load regulation.
4. Design and performance evaluation of transistor amplifiers in CE, CB and CC configuration
5. Design and performance evaluation of FET amplifiers



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Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Control Systems	EC - 4051	3L-1T-2P	6

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Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

The Mission of the Department of Electronics and Communication Engineering is:

PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations



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SECOND YEAR

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such as GATE, GRE and TOEFL, PSUs and may admit to various programs like Master of Science (Abroad/India), Master of Technology (India) and Doctor of Philosophy (India/Abroad).

PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of "Incubation Centre" established within college premises and will be able to participate in National/ International level project (Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Subject code: - EC 4051

Subject Name: - Control Systems

Course Outcomes:

1. Study about the modeling, characteristics and classification of types of control systems.
2. Understand about the concept of stability of time domain and time response of the systems.
3. Analyze the systems in time and frequency domains and use the concept of feedback to improve the system performance.
4. Study about the different approaches of system designs
5. Learn about state space modeling of system and its analysis and understand about the concept of state, state variables and state model.

Unit-1

Introduction to Control system: Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques.

Feedback characteristics of control systems Open loop and closed loop systems, effect of feedback on control system and on external disturbances, linearization effect of feedback, regenerative feedback

Unit-2



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Time response analysis Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.

Time domain stability analysis Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit-3

Frequency response analysis Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots, closed-loop frequency response.

Frequency domain stability analysis : Nyquist stability criterion, assessment of relative stability using Nyquist plot and Bode plot (phase margin, gain margin and stability).

Unit-4

Approaches to system design Design problem, types of compensation techniques, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and Composite Controllers.

Unit-5

State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

Text/Reference Books:

1. Albert D. Helfrick, William David Cooper, "Modern electronic instrumentation and measurement techniques", TMH 2008.
2. Oliver Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
3. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann), 2008.
4. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI, New Delhi 2008.
5. H.S. Kalsi, "Electronics Instrumentation", TMH Ed. 2004
6. A.K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai.



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7. MMS Anand, "Electronic Instruments & Instrumentation Technology", PHI Pvt. Ltd., New Delhi Ed. 2005

CONTROL SYSTEM LAB

Control System performance analysis and applications of MATLAB in Control system performance analysis



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Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Software Lab -II	EC - 4061	0L-0T-2P	2

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage themselves in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

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Subject code: - EC 4061

Subject Name: - Software Lab -II

Course Outcomes:

Students will

1. Learn Advanced Simulation Software's and its analysis package.
2. Study of the key features and applications of the software.
3. Learn about the applications of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication.
4. Designing, Optimization, simulation and verification of digital electronic systems.
5. Realization of various signals and communication link etc.

Course Contents

ADVANCED SIMULATION/ VERIFICATION SOFTWARE

Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT

ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc).

Overview and Study of the key features and applications of the software. Application of the software



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in the field of Electronic Circuits, Digital Electronics and Analog Communication. Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).
2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractors etc).
3. Realization of various signals and communication link etc. Students should simulate and verify at least six circuits they are learning in the current semester



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THIRD YEAR
New Scheme Based On AICTE Flexible Curriculum
Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Digital Communication	EC - 5011	4L-0T-2P	6

Program Output (PO) of Engineering Stream

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Program Specific Outcomes (PSOs) for B.E. (ECE)

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Subject code: - EC 5011

Subject Name: - Digital Communication

Course Outcomes:

Students will

1. Understand basics of Digital Communication and Information Theory.
2. Learn the concept of Sampling Theory.
3. Understand the concept of Quantization, Quantization Noise, A-Law, etc
4. Get knowledge of various Digital Modulation Techniques
5. Learn about Digital Multiplexing Schemes and its concepts
6. Get a comprehensive knowledge of Polar, Bipolar Codings, ISI, Nyquist Criterion, etc.

UNIT-I

Elements of Digital Communication and Information Theory: Model of a digital communication system; Mutual information and channel capacity of a discrete memory less channel, Calculation of channel capacity of a discrete memory less channel, of a BSC, of a continuous AWGN Channel, Hartely- Shannon law, Bandwidth-S/N tradeoff.

Sampling Theory: Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Bandpass Signal.

UNIT-II

Waveform Coding Techniques: Discretization in time and amplitude, Linear quantizer, Quantization noise power calculation, Signal to Quantization noise ratio, Non-uniform quantizer, A law & Mu- law, companding, encoding and Pulse Code Modulation, Bandwidth of PCM, Differential pulse code modulation, Multiplexing PCM signals, Delta modulation, Idling noise and slope overload, Adaptive delta modulation, Adaptive DPCM, Comparison of PCM and DM,

UNIT-III

Digital Base Band Transmission: Line Coding & its properties. NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra (No derivation), HDB and B8ZS signaling, ISI, Nyquist criterion for zero ISI & raised cosine spectrum, Matched filter receiver, Derivation of its impulse response and peak pulse signal to noise ratio, Correlation detector decision threshold and error probability for binary unipolar (on-off) signaling.

UNIT-IV

Digital Modulation Techniques: Types of digital modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of generation and detection of coherent & noncoherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques, M-ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques. A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non- Coherent reception of ASK, FSK, PSK and QPSK, Calculation of error probability of BPSK and BFSK, Error probability for QPSK.

UNIT-V

Digital Multiplexing: Fundamentals of time division multiplexing, electronic commutator, bit, byte interleaving T1 Carrier system, Synchronization and Signaling of T1, TDM, PCM hierarchy, North- America CCITT standards, T1 to T4 PCM TDM system (DS1 to DS4 signals), Signal format of M12 Mux for AT & T (Bell) system, bit rate calculation for DS1 to DS4 signals. Simulation of Digital Communication Systems like PCM, DPCM, ADM, DM, ASK, FSK, PSK, QPSK and Multiplexers using ComSim and Matlab.

Books Recommended

1. Haykin Simon, “Communication Systems”, 4th Edition, Wiley publication.
2. Tomasi, “Electronic Communication Systems”, 4th edition, Pearson Publications.
3. Miller Gary M, “Modern Electronic Communication”, 6th edition, Prentice-Hall, (1999).
4. Nicolaos S Tzannes, “Communication and Radar Systems”, Prentice-Hall Inc, (1985).
5. Proakis J J, “Digital Communications”, 2nd Edition, Mc Graw -Hill.

Laboratory

1. Study of analog time division multiplexer.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for NRZ formats.
5. Data decoding techniques for NRZ formats.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Simple fiber optic link fabrication using discrete components with available digital data input.
10. Digital link simulation, error introduction & error estimation in a digital link using MATLAB(SIMULINK)/Com Sim.



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SEMESTER-V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Electromagnetic Theory	EC - 5021	3L-1T-2P	6

Program Output (PO) of Engineering Stream

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Subject code: - EC 5021

Subject Name: - Electromagnetic Theory

Course Outcomes:

The purpose of this course is to develop a strong base in electromagnetism. Students will learn to

1. Learn about different waveguides.
2. Understand about the concept of electromagnetism.
3. Analyze the systems and need for impedance matching and different impedance matching techniques.
4. Study and learn about the various concepts of electric and magnetic fields.
5. Understand about field and circuit theory and understand about the concept of Maxwell's equations and time varying fields.

UNIT-I

STATIC ELECTRIC FIELDS

Introduction to co-ordinate system-**Coulomb's law:** Electric field intensity-Field due to different types of charges-Electric Flux density. **Gauss law:** It's applications to symmetrical charge distributions- Concept of divergence. **Electric potential:** Potential field due to different types of charges-Potential gradient-The dipolefield due to dipole-Energy density in electrostatic field.

UNIT-II

STEADY MAGNETIC FIELDS

Biot Savart Law: Its applications. **Ampere's circuital law:** Its applications-Curl of magnetic field intensity-Magnetic flux and magnetic flux density-The scalar and vector magnetic potentials-Steady magnetic field laws.

UNIT-III

MAXWELLS EQUATIONS AND TIME VARYING FIELDS

Maxwell's Equations: For steady fields in point form and integral form-Faraday's law- displacement current- Maxwell's equations in point form and integral form for time-varying fields-Comparison of field and circuit theory. **Poynting Theorem:** Poynting vector

UNIT-IV

GUIDED WAVES

Waves between parallel planes: Transverse electric waves-Transverse magnetic waves-characteristic of TE and TM waves-TEM waves. Velocity of propagation-Attenuation in parallel plane guides-Wave impedance.

UNIT-V

WAVEGUIDE THEORY

Rectangular wave guides: TE waves and TM waves in Rectangular waveguides-Dominant mode-cutoff frequency in wave guides-Impossibility of TEM waves in waveguides. **Circular waveguides:** Wave impedance and characteristic impedance-Power flow in wave guides-Attenuation factor and Q of wave guides- Transmissionline analogy for waveguides.

TEXT BOOKS

1. William H. Hayt, Jr and John A. Buck., "Engineering Electromagnetics", Tata McGraw-Hill Publishing Ltd, 7th edition 2006
2. G.S.N. Raju., "Electromagnetic Field Theory and Transmission Lines" Pearson Education, First Indian print 2005

REFERENCE BOOKS

1. Matthew N. O. Sadiku., "Elements of Electromagnetics", Oxford University Press, 3rd edition, First Indian edition 2006
2. Gangadhar K.A., "Field Theory", Khanna Publications, 2000
3. Muthusubramanian R and Senthil Kumar N, "Electromagnetic field theory", Anuradha publications, 1999
4. Edward Jordan and KG Balmain, "Electromagnetic Waves and Radiation Systems", Pearson education, 2nd edition.



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B.Tech. (Electronics & Communication Engineering)
THIRD YEAR
Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Micro Processor and Micro Controller (μ P and μ C)	EC – 5031(A)	4L-0T-0P	4
	Voice Communication (VC)	EC – 5031(B)		
	Communication Networks and Transmission Lines (CNTL)	EC – 5031(C)		
	ELECTRIC VEHICLE	EC – 5031(D)		
	SWAYAM COURSE-MOOC- I	EC – 5031(E)		

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Subject code: - EC 5031(A)

Subject Name: - Microprocessor and Controller (μ P and μ C)

Course Outcomes:

Students will

1. Understand the concept of 8086/8088 μ Processor and its Architecture.
2. Get Introduction to the idea of instruction set and programming of 8086/8088 μ Processor.
3. Knowledge of segmentation of memory and Interfacing peripherals
4. Knowledge of interfacing devices like DMA Controller, PCI, etc.
5. Familiarity with Multimedia Extension (MMX) and Knowledge of 8051 Microcontroller and its Programming.

Unit I

Architecture of 8086 Microprocessor BIU and EU, register organization, pin diagram, memory organization, clock generator 8284, buffers and latches, 8288 bus controller, maximum and minimum modes.

Unit II

Assembly Language Programming of 8086 Instruction formats, addressing modes, instruction set, assembly language programming, ALP tools- editor, assembler, linker, locator, debugger, emulator. 8086 based multiprocessor systems Interconnection topologies, coprocessors 8087 NDP, I/O processors 8089 IOP, bus arbitration and control, lightly and tightly coupled systems.

Unit III

Peripheral devices and their interfacing Memory interfacing, Programmable input/output ports 8255, Programmable interval timer 8253, keyboard/ display controller 8279, CRT controller 8275, Programmable communication interface 8251 USART.

Unit IV

Interrupts of 8086 Interrupts and interrupt service routine, interrupt cycle, maskable and non-maskable interrupts, interrupt programming. Programmable interrupt controller 8259. DMA in 8086 Basic DMA operation, modes of DMA transfer, DMA controller 8257.

Unit V

8051 Microcontroller Features, architecture, Pin Diagram, memory organization, external memory interfacing, instruction syntax, data types, subroutines, addressing Modes, instruction set, ALP of 8051. Applications of 8051.

Reference Books:-

1. John P. Hayes. Computer Architecture and Organization. 3rd ed. Singapore: McGrawHill International Edition, 1998
2. K.M. Bhurchandi and A.K. Ray, ADVANCED MICROPROCESSORS AND PERIPHERALS, 3rd ed. Tata McGraw-Hill, New Delhi, 2013.
3. M. Ali Mazidi, J. Gillispie Mazidi, Rolin D. McKinlay. The 8051 Microcontrollers and Embedded System. 2nd ed. New Jersey, Pearson Prentice Hall, 2006.
4. Ramesh Gaonkar. Microprocessor Architecture, Programming, and Applications with the 8085. Fifth Edition: Peram International Publishing (India) Private Ltd. 2012.
5. Manish Patel "Question Paper with Solution the 8051 Microcontroller Based Embedded Systems, www.slideshare.net, 1 Mar. 2001.
6. Barry B. Brey. The Intel Microprocessors, Architecture, Programming and Interfacing. PHI, 2004, 6th Edition, Copyright 2003.
7. Kenneth J. Ayala. The 8051 Microcontroller. St. Paul, MN, WEST PUBLISHING COMPANY, 1991
8. Santanu Chattopadhyay. Embedded System Design. 2nd ed. PHI Learning Private Ltd. New Delhi, 2016

Subject code: - EC 5031(B)

Subject Name: - Voice Communication

Course Outcomes:

Students will

1. Understand the concept of Basic Telephony, Modes of Data Transmission
2. Get Introduction to the idea of Line Coding, PSTN Network.
3. Knowledge of different types of Digital Telephony.
4. Knowledge of various sorts of Digital Communication.
5. Familiarity with Digital Switching and its protocols.

Unit I

Basic Telephony : Introduction, standard telephone set, function, local loop, block diagram, basic call procedure, call progress tones and signals, cordless telephones, caller identification, electronic telephones, telephone circuit - local subscriber loop, channel noise and units of power measurements, transmission parameters, voice frequency circuit arrangements, crosstalk.

Unit II

Public telephone network: Introduction, transmission system environment, public telephone network, instruments, local loops, trunk circuits, telephone exchanges - local exchanges, automated central office switches and exchanges, telephone numbering plan, telephone services, telephone switching hierarchy, common channel signaling system, evolution of SS7, signaling points, call setup, Multiplexing of telephone channels - frequency division multiplexing, FDM hierarchy, composite base-band signals, formation of groups, super groups, master groups and radio channel, wavelength division multiplexing. Traffic analysis: traffic characterization and measurement, arrival and holding time distributions, loss systems, lost call estimation, network blocking probabilities.

Unit III

Digital telephony: Introduction, advantages and disadvantages of digital voice network, voice digitization, time division multiplexing of PCM signals, digital carrier, Super-frame TDM format, Fractional T Carrier Service, Digital hierarchy, Master Group and Commercial TV, Picture Phone Terminal, Data Terminal, Digital Carrier Line Encoding, Duty Cycle, Bandwidth Requirement, Clock and Framing Bit Recovery, Error Detection, T Carrier System, T-1 Carrier System, , Statistical TDM, Codec and Combo Chips.

Unit IV

Digital transmission: Introduction, digital data and digital signal, pulse transmission, inter-symbol, interference, synchronous and asynchronous transmission, line coding – level encoding, bipolar coding, Code Space redundancy, N zero substitution, Pair Selected ternary, Ternary coding, digital bi-phase, differential encoding, coded mark inversion, multilevel signaling, partial response signaling, error performance, performance monitoring, time division multiplexing - Bit vs Word Interleaving, framing, TDM loops and rings.

Unit V

Digital switching: Switching function, space division switching, multistage switching, non-blocking switches, blocking probabilities, four wire switches, switch matrix control, time division switching – analog and digital, two dimensional switching, multi stage time and space switching, STS and TST switching, digital cross connect systems, digital switching in analog environment.

Reference Books:

1. W. Tomasi: Advanced Electronic Communication Systems, 6th Edition, PHI
2. W. Tomasi: Electronic Communication Systems, Pearson Education
3. John C. Bellamy: Digital Telephony, 3rd Edition, Wiley India Pvt. Limited
4. T. Vishwanathan: Telecommunication Switching Systems and Networks, PHI.
5. James Martin: Telecommunication and Computers, PHI
6. G. F. Snyder: Introduction to Telecommunication Networks, Vikas Publishing House.
7. Cole Marion: Introduction to Telecommunication, Pearson Education.
- 8.

Subject code: - EC 5031(C)

Subject Name: - Communication Networks and Transmission Lines (CNTL)

Course Outcomes: Students will

1. Understand the concept of Two Ports Networks
2. Get Introduction of various types of filters.
3. Knowledge of different types Real Functions.
4. Knowledge of various sorts of Transmission Line Fundamentals.
5. Familiarity with Radio frequencies and its basics.

UNIT- I

Characteristic Parameters of symmetrical and asymmetrical two port networks and their design Image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient, iterative transfer coefficient, Lattice and Bridged T networks, reactive matching networks, matching techniques, insertion loss, symmetrical and asymmetrical attenuators and their design.

UNIT- II

Passive LC Filters Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

UNIT-III

Positive real function LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune's method, Bott-Duffin method, Synthesis-Coefficient.

UNIT- IV

Transmission line fundamentals, Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, distortion-less line, loading, line reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and π equivalents of a line, location of line fault, construction and design of two wire line and coaxial cable.

UNIT-V

Line at radio frequencies: Parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching, introduction to micro-strip lines and its analysis.

Reference Books:-

1. Ryder: Networks and Transmission Lines, PHI Learning.
2. Valkenberg:- Introduction to Modern Network synthesis, Wiley India.
3. Suresh: Electric Circuits and Networks, Pearson Education.
4. Raju:- Electromagnetic field theory and Transmission Lines, Pearson Education.
5. Ganesan:- Transmission Lines and Waveguides, TMH.
6. Rao:- Electromagnetic Waves and Transmission Lines, PHI learning.

Subject code: - EC 5031(D)

Subject Name: - ELECTRIC VEHICLE

Course Outcomes:

- 1 Identify EV concepts, EV configurations and various EV parameters for better understanding of the EV technology
- 2 Analyze the EV propulsion system and electric motors for vehicular applications & power electronics converters required for their control.
- 3 Analyze DC motor & induction motor drives and discuss methods for controlling them.
- 4 Elaborate various hybrid electric vehicle configurations and explain the power flow control in all HEV configurations
- 5 Identify different energy sources used in EV and analyse the various methods used in charging these energy sources

UNIT-I

INTRODUCTION TO EV & HEV:-

Introduction: Past, Present & Future of EV, Current Major Issues, Recent Development Trends, EV Concept, Key EV Technology, State-of-the Art EVs & HEVs, Comparison of EV Vs IC Engine.

EV System: EV Configuration: Fixed & variable gearing, single & multiple motor drive, In-wheel drives

EV Parameters: Weight, size, force, energy & performance parameters.

UNIT-II

EV PROPULSION- ELECTRIC MOTOR:-

Choice of electric propulsion system, block diagram of EV propulsion system, concept of EV Motors, single motor and multi-motor configurations, fixed & variable geared transmission, In wheel motor configuration, classification of EV motors, Electric motors used in current vehicle applications, Recent EV Motors, Comparison of Electric Motors for EV applications

REQUIRED POWER ELECTRONICS & CONTROL:

Comparison of EV power devices, introduction to power electronics converter, four quadrant DC chopper, three-phase full bridge voltage-fed inverter, soft-switching EV converters, comparison of hard-switching and soft-switching converter, three-phase voltage-fed resonance dc link inverter, Basics of Microcontroller & Control Strategies

UNIT-III

EV MOTOR DRIVES

Types of Excitation system-Characteristics of excitation systems-block diagram of excitation system Static and Dynamic analysis- Methods of voltage control: OLTC, synchronous condenser, SVC, Shunt

Capacitor- Power system level voltage control using tap changing transformer (simple problems)

UNIT IV

HEV (HYBRID ELECTRIC VEHICLE):-

Configuration of HEV (Series, Parallel, Series-parallel &Complex), Power Flow control, Examples. Power flow control in all HEV configurations, Examples of HEV system performance

UNIT-V

ENERGY SOURCES & CHARGING:-

Different Batteries and Ultra-capacitors, Battery characteristics (Discharging &Charging) Battery Chargers: Conductive (Basic charger circuits, microprocessor based charger circuit. Arrangement of an off-board conductive charger, Standard power levels of conductive chargers, Inductive (Principle of inductive charging, Soft-switching power converter for inductive charging), Battery indication Methods Charging Infrastructure: Domestic Charging Infrastructure, Public Charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Moveand-charge zone.

Reference Books:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
3. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
4. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
5. Ms.Priyanka Maheshwari,Dr.Shewta Chourasiya Hybrid Electrical Vehicles Charging Infrastructure IIP Publication 2021.

List of experiments:

Subject code: - EC 5031(E)

Subject Name: - SWAYAM/NPTEL-MOOC-I

Guideline

SWAYAM/NPTEL-MOOC-I courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

Courses delivered through SWAYAM/NPTEL-MOOC courses are available free of cost to the learners, however learners wanting SWAYAM/NPTEL-MOOC courses Certificate should register for the final proctoral exams that come at a fee and attend in-person at designated center on specified dates.

In perspective of the need to create synergist between the salient features of 'anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery mechanism which is responsive to learners' needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
2. He/She can opt from only courses which are not available from University.
3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.
4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be bearded by Student only.
5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.

6. The NPTEL recommended that an additional 1 credit may be awarded given by University. This credited can be given based on attendances, assignment and tutorial work submitted by the students.
7. All students would be motivated to take courses online with SWAYAM/NPTEL every semester to better prepared for the future so that they can cultivate the habit of self-study online. The University propose to implement MOOC courses under Department. The University also made provision if student unable to get certificate He/She still be able to appear in the department elective courses and complete there degree



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
THIRD YEAR
Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Industrial Electronics (IE)	EC-5041(A)	4L-0T-0P	4
	Computer Organization(CO)	EC-5041(B)		
	Data Communication (DC)	EC-5041(C)		
	SWAYAM/NPTEL-MOOC-II	EC- 5041(D)		

Subject code:- EC 5041(A)

Subject Name: - Industrial Electronics

Course Outcomes:

Students will

1. Know concepts of power electronic devices as switches
2. Understand operation and applications of converters
3. Comprehend operation of inverters and commutation methods
4. Learn techniques of PWM inverters
5. Understand operation of choppers
6. Understand the working of Electronic Control of AC and DC motors.

UNIT-I

Semiconductor Switching Devices

Review of Thyristor, two transistor Model of SCR, classification and V-I characteristics, junction temperature, gate circuit ratings, triggering process, UJT and characteristics, UJT as a relaxation oscillator, turn off methods, fast recovery diodes, schottky diodes, Series and parallel connections of SCR, DIAC, TRIAC, Power MOSFETS.

UNIT-II

Power Rectification

Classification of rectifiers, half, full, three-phase rectifier, semi converters, full converters, free wheeling diodes, circuits using SCR, voltage multiplying rectifier circuits, transformer utility factor.

Regulated Power Supplies

Classification of voltage regulators, short period and long period accuracy of voltage regulator, D.C. voltage regulators, complete series voltage regulator circuit with ICs, SMPS basic principles, step up and step down circuits

UNIT-III

Inverters

Introduction, simple Inverters and Power Inverter using SCR, output voltage control in inverter waveform control, PWM inverters, reduction of harmonics with the help of PWM inverters.

Industrial Timing Circuits

Constituents of industrial timers, classifications, thermal timers, Electronic timers, SCR delay timer, I.C. electronic timers.

UNIT-IV

Electronic Control of D.C. Motors

Introduction, control of D.C. shunt motor, full wave D.C. shunt motor control overload protection, universal motor control, electronic control for reversing motor control using SCR, choppers, their classifications and applications.

UNIT-V

Electronic Control of A.C. Motors

Instability of D.C. motors, variable speed induction motor drives, T.N. characteristics of I.M. invertors for driving the motor, speed control of I.M. using various methods, cyclo-converters, their classifications and applications.

Books Recommended

1. Rashid M H, "Power electronics", 2nd Ed., PHI, N.Delhi (1998).
2. Mithal G K, "Industrial electronics", 18th Ed., Khanna Publishers, Delhi (1998).
3. Biswas S N, "Industrial electronics", 3rd Ed., Dhanpat Rai and Company, Delhi (2000).
4. Bhimbra P S, "Power electronics", 3rd Ed., Khanna Publishers, Delhi (2002).
5. Singh M D, Khanchandani K B, "Power electronics", 6th reprint TMH, New Delhi (2001).

Subject code: - EC 5041(B)

Subject Name: - Computer Organization

Course Outcomes:

Students will

1. Understand Computer Basics and its Fundamentals.
2. Get Knowledge of Control Unit Organization.
3. Get in-depth knowledge of different types of I/O Organization.
4. Learn about various memory organizations their specifications.
5. Learn and Understand about multiprocessors and their various parameters.

Unit-I

COMPUTER BASICS AND CPU : Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer.

Unit-II

CONTROL UNIT ORGANIZATION : Hardwired control unit, Micro and nano programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming, **ARITHMETIC AND LOGIC UNIT** Arithmetic Processor, Addition, subtraction, multiplication and division, Floatingpoint and decimal arithmetic and arithmetic units, design of arithmetic unit.

Unit-III

INPUT OUTPUT ORGANIZATION: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor. Data transfer – Serial / parallel, synchronous/asynchronous, simplex/half duplex and full duplex.

Unit-IV

MEMORY ORGANIZATION: Memory Maps, Memory Hierarchy, Cache Memory -Organization and mappings. Associative memory, Virtual memory, Memory Management Hardware.

Unit-V

MULTIPROCESSORS: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

Reference Books:

1. Morris Mano: Computer System Architecture, Pearson Education.
2. William Stallings: Computer Organization and Architecture, PHI
3. Carl Hamacher: Computer Organization, TMH
4. Tanenbaum: Structured Computer Organization, Pearson Education

Subject code: - EC 5041(C)

Subject Name: - Data Communication

Course Outcomes:

Students will

1. Understand the concept of Basic Telephony, Modes of Data Transmission
2. Get Introduction to the idea of Line Coding, PSTN Network and OSI Models.
3. Knowledge of different types of LAN and WAN protocols.
4. Knowledge of various sorts of errors of Data Communication.
5. Familiarity with Networking Devices and its protocols.

UNIT I

Basic Telephony : Introduction, standard telephone set, function, local loop, block diagram, basic call procedure, call progress tones and signals, cordless telephones, caller identification, electronic telephones, telephone circuit - local subscriber loop, channel noise and units of power measurements, transmission parameters, voice frequency circuit arrangements, crosstalk.

UNIT II

Data Communication: Introduction, Components, data representation Serial & Parallel transmission , Modes of data transmission, Line Encoding: Unipolar, Polar, Bipolar, Networks – Protocols and standards – Standards organizations –Line configurations – Topology – Transmission mode – Categories of networks – Inter networks.

UNIT III

Public telephone network: Introduction, transmission system environment, public telephone network, instruments, local loops, trunk circuits, telephone exchanges - local exchanges, automated central office switches and exchanges, telephonenumbering plan, telephone services, telephone switching hierarchy, common channel signaling system evolution of SS7, signaling points, call setup, Multiplexing of telephone channels - frequency division multiplexing, FDM hierarchy, composite base-band signals, formation of groups, super groups, master groups and radio channel, wavelength division multiplexing. Traffic analysis: traffic characterization and measurement, arrival and holding time distributions, loss systems, lost call estimation, network blocking probabilities.

UNIT IV

OSI model: Functions of the layers. Transmission media: Guided media – Unguided media – Transmission impairment – Performance. Switching Circuit switching , packet switching (virtual circuit and datagram approach), message switching, Error detection and correction: Types of errors – Detection – Vertical Redundancy Check (VRC) – Longitudinal Redundancy Check (LRC) – Cyclic Redundancy Check (CRC) – Check sum – Error Correction. Data Link Layer Protocols: Framing , HDLC, ARQ: Stop and Wait, Sliding Window. Efficiency, LAN: Project 802 – Ethernet – Token bus – Token ring – FDDI. MAN: IEEE 802.6 (DQDB) – SMDS. X.25, FRAME RELAY, ATM AND SONET/, SDH.

Unit-V

NETWORKING DEVICES AND TCP / IP PROTOCOL SUITE Networking and internetworking devices: Repeaters – Bridges – Gateways – Other devices – Routing algorithms – Distance vector routing – Link state routing. TCP / IP protocol suite: Overview of TCP/IP.

REFERENCE BOOKS

1. Data and Computer Communication – W. Stallings, Pearson
2. LANs – Keiser, Tata Mc-Graw Hill
3. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
4. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
5. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stallings, Pearson

TEXTBOOKS:

1. Computer Networks by Tanenbum/PHI.
2. Data Networks: Bertsekas & Gallager.
3. Shay, William A : “Understanding Data communications & Networks” / Vikas Publishing House Pvt. Ltd.

Subject code: - EC 5041(D)

Subject Name: - SWAYAM/NPTEL-MOOC-II

Guideline

SWAYAM/NPTEL-MOOC-II courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

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In perspective of the need to create synergist between the salient features of 'anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery mechanism which is responsive to learners' needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
2. He/She can opt from only courses which are not available from University.
3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.
4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be bearded by Student only.
5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.
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R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
THIRD YEAR
Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	MicroprocessorLab	EC – 5051	0L-0T-2P	2

Subject code: - EC 5051

Subject Name: - Microprocessor Lab

Course Outcomes:

1. Study of standing waves formation on a transmission line
2. Learn to measure various parameters of transmission line.
3. Get Knowledge of reactive loads and physical dimensions of Transmission line.
4. Get Knowledge of Balun Transformer and various filters.
5. Learn to measure input and output impedance of any RF circuits.

LIST OF EXPERIMENTS:-

- 1- To study external architecture of 8086.
- 2- Add/subtract/multiply and division of data byte located at offset 0500H in 2000H segment to another data byte stored at 0600H in same segment.
- 3- Add data byte located at offset 1000H in 5000H segment to another data byte stored at 2000H in same segment and store the result in 3000H in same segment.
- 4- Write a program to add digits between 0 to 10.
- 5- Write a program to transfer data byte from location 3000H: 1000H, 1001H, 1002H to location 5000H: 1000H, 1001H, 1002H.
- 6- Write a program to find a maximum number in a given string (16 bytes long) and store it in location 0510H.
- 7- Write a program to display a message “GOOD 51” on pc screen using 8051 trainer kit.
- 8- Write a program to control the motor in clockwise direction using IC-14 DC controller interfacing device.
- 9- Write a program to move data string from the offset add. 0200H to 0300H in the segment 7000H. Length of the string is 10.



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
THIRD YEAR
Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Software Lab-III	EC - 5061	0L-0T-2P	2

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage them in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

The Mission of the Department of Electronics and Communication Engineering is:

PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations such as GATE,GRE and TOEFL,PSUs and may admit to various programs like Master of Science (Abroad/India),Master of Technology (India) and Doctor of Philosophy (India/Abroad).

PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of "Incubation Centre" established within college premises and will be able to participate in National/ International level project(Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Subject code: - EC 5061

Subject Name: - Software Lab-III

Course Outcomes:

1. Study of simulation softwares like MATLAB.
2. Introduction to MATLAB and its basics.
3. Modeling, Designing and development of Programs in MATLAB
4. Application of the software in the field of Control Systems, Data Communications and Communication Systems.
5. Developing Programs related to simulations of CRC, LRC, VRC, hamming codes, line encoding techniques.

Study of simulation software (any one Scilab/ MatLab etc.)

Introduction to Scilab / Matab, Study of Scilab / Matlab programming environment, Modeling, Design and development of Programs.

Overview and Study of the key features and applications of the software.

Application of the software in the field of Control Systems, Data Communications and Communication Systems.

1. Programs Related to Control System- open-loop and closed loop control system, frequency response plots, determining transient response, specifications of second order system, effect of PID controller on control system, Bode plot, Nyquist plot and Root Locus plot, state space analysis.
2. Programs Related to Communication Systems--Simulation of a Communication System (Generation, addition of noise and Detection), AM, FM, PM, PAM, PCM, PSK, FSK etc.
3. Programs related to Data Communications- simulations of CRC, LRC, VRC, hamming codes, line encoding techniques.

References:

1. Rudra Pratap: Getting Started with MATLAB, Oxford University Press.
2. <http://www.scilab.in>
3. <http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab>
4. Vinu V. Das: Programming in Scilab, New Age Publisher.
5. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
6. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
7. Kuo: Automatic Control Systems, PHI Learning.
8. Singh and Chaudhari: Matlab Programming, PHI Learning



R.K.D.F. UNIVERSITY, BHOPAL

B.Tech. (ELECTRONICS AND COMMUNICATION ENGINEERING)

New Scheme Based On AICTE Flexible Curriculum

THIRD YEAR

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Wireless Communication	EC-6011	4L-0T-2P	6

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage them in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

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and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Course Outcomes:

Students will

1. Understand generations of wireless mobile communication technologies
2. Be conversant with how various decisions were made while evolving the mobile Communication system standards and get Knowledge of Handoff's and Channel Assignments.
3. Get the Knowledge of functioning of mobile communication network
4. Understand the concept of Digital Modulation Techniques for Mobile Communications.
5. To Understand features of wireless LAN technologies
6. Learn principles of Communication Protocols and its specifications.

UNIT-I

STANDARDS AND CELLULAR CONCEPT

Introduction - Standards: AMPS, GSM, CDMA (IS-95). Cellular Concept and Frequency Reuse, Overview of Multiple Access Schemes, Channel Assignment and Hand off, Interference and system capacity, Trunking and Erlang capacity calculations.

UNIT-II

MOBILE RADIO PROPAGATION

Radio wave propagation issues in Personal wireless systems, Elementary treatment of Propagation Models, Multipath fading and base band impulse response models, Parameters of mobile multipath channels

UNIT-III

MODULATION AND SIGNAL CESSING

Digital modulation techniques for mobile communications: BPSK, DPSK - $\pi/4$ QPSK - OQPSK - GMSK. Equalization, Diversity - Rake receiver concepts - Speech coding (LPC, CELP).

UNIT-IV

WIRELESS STANDARD

IEEE 802.11 Architecture and Services - IEEE 802.11 Medium Access Control- IEEE 802.11 Physical layer

UNIT-V

BLUETOOTH

Overview-Radio specifications-Base band specifications-Link Manager Specification-Logical Link Control and Adaptation Protocol.

TEXT BOOKS

1. Rappaport T.S, “Wireless Communications: Principles and Practice”, 2nd edition, Pearson education.
2. William Stallings, “ Wireless Communication & Networking”, Pearson Education Asia, 2004

REFERENCE BOOKS

1. Feher K. “Wireless Digital Communications”, Pearson education.
2. Lee W.C.Y, “Mobile Communications Engineering: Theory & Applications”, McGraw Hill, New York 2nd Edition, 1998.
3. Schiller, “Mobile Communication”, Pearson Education Asia Ltd., 2000



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (ELECTRONICS AND COMMUNICATION ENGINEERING)

New Scheme Based On AICTE Flexible Curriculum

Third Year

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Antenna & Wave Propagation	EC-6021	3L-1T-2P	6

Program Output (PO) of Engineering Stream

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PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations such as GATE, GRE and TOEFL, PSUs and may admit to various programs like Master of Science (Abroad/India), Master of Technology (India) and Doctor of Philosophy (India/Abroad).

PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of “Incubation Centre” established within college premises and will be able to participate in National/ International level project(Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Course Outcomes:

Students will

1. Understand Antenna Fundamentals and Vector Potentials.
2. Get Knowledge of various forms of Antenna Arrays.
3. Get in-depth knowledge of different types of Antennas and their features.
4. Learn about various antenna measurements and their specifications.
5. Learn and Understand about modes of propagation and their various parameters.

UNIT-I

ANTENNA FUNDAMENTALS AND VECTOR POTENTIALS

Isotropic Radiation, Power density and Intensity, Gain, Directive gain, Directivity, Effective area, Reciprocity theorem, Antenna efficiency, Radiation resistance, Terminal impedance, Beam width and Bandwidth. Radiation from a small current element, Power radiated by a small current element and its radiation resistance, Half wave dipole, Radiation field of current distribution of center fed Dipole.

UNIT-II

ANTENNA ARRAYS

Various forms of antenna arrays – Broadside, End fire, Collinear, Parasitic arrays, Array of two point sources, Pattern Multiplication, Array of “N” sources – analysis of End fire and Broadside case, phased arrays, Binomial arrays.

UNIT-III

SPECIAL PURPOSE ANTENNAS

Traveling wave, Loop, Dipole and Folded dipole antennas, Horn antenna, Reflector antenna, Yagi- Uda antenna, Log periodic antenna, Helical and Micro strip antenna and applications of all types of antennas.

UNIT-IV

ANTENNA MEASUREMENTS

Impedance, Gain, Radiation pattern, Beam width, Radiation resistance, Antenna efficiency, Directivity, Polarization and phase Measurements.

UNIT-V

RADIO WAVE PROPAGATION

Modes of propagation, Structure of atmosphere, Ionosphere layers, Mechanism of bending of waves, Effect of earth's Magnetic field on Radio wave propagation. Virtual height, MUF, Skip distance, OMF, Ionosphere abnormalities, Multi-hop propagations, Space wave propagation, Super refraction.

TEXT BOOKS

1. Constantine A. Balanis, "Antenna Theory analysis and Design", II Edition, John Wiley and Sons.
2. R.E. Collin, "Antennas and Radio Wave Propagation", McGraw Hill International Editions, 1985.

REFERENCE BOOKS

1. Robert S. Elliott, "Antenna Hand Book", Joseph J. Carr, Galgotia Publication, New Delhi, 1995.
2. K.D. Prasad, "Antenna and Wave Propagation", Tech India Publications, New Delhi, 1996.
3. John. D. Kraus, "Antennas", McGraw Hill International Editions, 1988

List of Experiments:

1. To Plot the Radiation Pattern of an Omni Directional Antenna.
2. To Plot the Radiation Pattern of a Directional Antenna.
3. To Plot the Radiation Pattern of a Parabolic Reflector Antenna.
4. To Plot the Radiation Pattern of a Log Periodic Antenna.
5. To Plot the Radiation Pattern of a Patch Antenna.
6. To Plot the Radiation Pattern of a Dipole/ Folded Dipole Antenna.
7. To Plot the Radiation Pattern of a Yagi (3-EL/4EL) Antenna.
8. To Plot the Radiation Pattern of a Monopole/ WHIP/ Collinear Antenna.
9. To Plot the Radiation Pattern of a Broad side Antenna.
10. To Plot the Radiation Pattern of a Square Loop Antenna.



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (ELECTRONICS AND COMMUNICATION ENGINEERING)
New Scheme Based On AICTE Flexible Curriculum
Third Year
Semester – VI
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Departmental Elective-II	EC – 6031	4L-0T-0P	4
	VLSI Fabrication and Technology (VLSI)	EC – 6031(A)		
	Digital Signal Processing(DSP)	EC – 6031(B)		
	Digital Image Processing(DIP)	EC – 6031(C)		
	Electrical Vehicle	EC-6031(D)		
	SWAYAM COURSE III	EC-6031(E)		

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage them in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

The Mission of the Department of Electronics and Communication Engineering is:

PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations such as

GATE, GRE and TOEFL, PSUs and may admit to various programs like Master of Science (Abroad/India), Master of Technology (India) and Doctor of Philosophy (India/Abroad).

PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of “Incubation Centre” established within college premises and will be able to participate in National/ International level project (Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Subject code: - EC 6031(A)

Subject Name: - VLSI Fabrication and Technology

Course Outcomes:

Students will

1. Get Knowledge of fundamental principles of VLSI (Very Large Scale Integrated) Circuit Design and Layout.
2. Have an overview of CMOS fabrication technologies, physical VLSI design issues (bottom-up design), Thin Film Fabrication.
3. Learn about Lithography and Different Types of Lithography.
4. Learn basic concepts of VLSI process techniques and Integration.
5. Get Knowledge of building blocks of large-scale CMOS digital integrated circuits
6. Have hands-on design experience using a professional IC design platform

Unit-I

Crystal Growth and Wafer preparation: Wafer terminology, Different crystalline orientations, CZ method, CMOS IC Design flow, Crystal Defects. Fabrication processes of FETs, MOSFETs, and BIMOS etc.

Unit-II

Layering: Epitaxial growth methods, Oxidation; Kinetics of oxidation, Thin film fabrication, Metallization; Physical Vapor Deposition, Sputtering.

Unit-III

Patterning: Lithography; Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography. Photo masking steps, Resists. Doping: Diffusion; Diffusion Models, Ion Implantation; Implantation Equipment, Channeling.

Unit-IV

VLSI process techniques and Integration: Floor planning, layout, Design rules, stick diagrams, Test generation, Logic simulation, Introduction to EDA tools. Contamination Control; Clean rooms, HEPA, ULPA Filters and Class numbers.

Unit-V

Subsystem Design: Data-paths; adder, Shift registers ALU, Memory; NVRWM, Flash memories, 6-TransistorRAMs. Latch up in CMOS Circuits.

Text/ References:

1. S.K.Gandhi, VLSI Fabrication principles, Wiley.
2. S.M. Sze, VLSI Technology, II edition, McGraw Hill.
3. P.Van Zant, Microchip Fabrication, A Practical Guide to Semiconductor Processing, Third Edition, McGraw Hill.

Subject code: - EC 6031(B)

Subject Name: - Digital Signal Processing

Course Outcomes:

1. To learn and implement basic digital signal processing techniques like convolution, correlation and Fourier transform.
2. To learn and understand realization of Discrete Time Systems.
3. To design and implement different FIR filters.
4. To design and implement different IIR filters.
5. To characterize stochastic process.
6. To implement basic digital processing algorithms in dedicated DSP platforms.

UNIT-I

Sampling Of Continuous Time Signals: Frequency Domain Representation of Uniform sampling, Reconstruction of a continuous time signal from its samples; Discrete Time Processing of Continuous time signals and vice-versa. Decimation & Interpolation; changing the sampling rate by integer and non-integer factors using discrete time processing.

UNIT-II

The Z Transform: Z-Transform, Region of convergence; Properties of the Z-transform; convolution theorem; Parseval's relation; Unilateral Z-transform and its application to difference equations with non-zero initial condition.

Discrete Fourier Transform: DFT and its properties; Linear Periodic and Circular convolution; Linear Filtering Methods based on DFI; Filtering of long data sequences; Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques; Linear filtering approaches to computation of DFT.

UNIT-III

REVIEW OF DISCRETE TIME SIGNALS AND SYSTEMS

Overview of signals and systems- DFT-FFT using DIT and DIF algorithms - Realization of structures for discrete time systems – Direct form I & II, Cascade, Parallel forms – MATLAB programs for DFT and FFT.

UNIT-IV

DESIGN AND IMPLEMENTATION OF IIR FILTERS

Design of analog filters using Butterworth and Chebyshev approximations – IIR digital filter design from analog filter using impulse invariance technique and bilinear transformations – Matlab programs IIR filters.

UNIT-V

DESIGN AND IMPLEMENTATION OF FIR FILTERS

Linear phase response- design techniques for FIR filters- Fourier series method and frequency sampling method
–Design of Linear phase FIR filters using windows: Rectangular, Hanning and Hamming windows-
Matlabprograms FIR filters-FIR filter design using Decimation and Interpolation.

TEXT BOOKS

1. Oppenheim A V & Sehafer R W, “Discrete Time Signal Processing”, Prentice Hall (1989).
2. Proakis J G & Manolakis D G, “Digital Signal Processing”, Pearson Education India.
3. Oppenheim A V, Willsky A S & Young I T, “Signal & Systems”, Prentice Hall, (1983).
4. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.
5. Mitra Sanjit, ” Digital Signal Processing – A Computer Based Approach,” TMH, (1998).
6. John .G. Proakis and Dimitris C. Manolakis , “Digital Signal Processing Principles , Algorithms and Applications , ” Pearson Education, Third edition 2006.
7. Sanjit Mitra, “Digital Signal Processing “– A Computer based approach”, Tata McGraw Hill, New Delhi,2001

REFERENCE BOOKS

1. B.Venkataramani, M.Bhaskar, “Digital Signal Processors, Architecture, Programming and Application“,Tata McGraw Hill, New Delhi, 2003.
2. M.H.Hayes, “Digital Signal Processing”, Tata McGraw Hill, New Delhi, 2003.

List of Experiments:

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT- Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc).

Subject code: - EC 6031(C)

Subject Name: - Digital Image Processing

Course Outcomes:

1. To learn and implement basic digital image processing techniques and understand its fundamentals.
2. To learn and understand realization of 2D Discrete Fourier Transforms.
3. To learn and understand Image Enhancement Spatial domain methods.
4. To understand Image Restoration Image degradation/restoration methods.
5. To Learn Image Compression Fundamentals of data compression.
6. To get knowledge of Digital image watermarking and its parameters.

UNIT-I

Digital Image Processing (DIP) Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system. Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

UNIT-II

Image Transforms Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D

DFT.

Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

UNIT-III

Image Enhancement Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method. Frequency domain methods: basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

UNIT-IV

Image Restoration Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, imagereconstruction from projection.

UNIT-V

Image Compression Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding. Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

Reference Books:-

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

Subject code: - EC 6031(E)

Subject Name: - Electric Vehicle-II

Course Outcomes:

- 1- By completing the EV101 course, students will be introduced to electric vehicles, their Importance and identify various components of an EV.
- 2- By the end of this course, students will:
Get introduced to electric vehicles, understand how are EVs different from ICE Vehicles and identify various parts of an electric vehicle.
- 3- Learn the fundamentals of Lithium-ion cells.
- 4-Analyse EVs based on power sources and calculate range of an EV.
- 5- Perform motor power and torque calculations to select a motor to build their own EV.
- 6- Learn the basics of converting any petrol 2-wheeler into an electric vehicle.

Course Outline:

UNIT- I

Introduction to Electric Vehicles 101 This module introduces the students to the relevance of electric vehicles, current demand in EV industry and opportunities of skilled EV engineers.

UNIT-II

Electric Vehicle Foundations In this module, students will learn the history and evolution of electric vehicles and what goes into building them. Students will be able to appreciate the actual impact of EVs in the world.

UNIT-III

Understanding the Foundations of an Electric Vehicle Here we look into what is considered as an electric vehicle, and what electric vehicles are made up of. This module will cover the necessary components of an electric vehicle.

UNIT-IV

Mathematical Modeling of an electric vehicle In this module, students learn about modelling the conversion of an ICE vehicle to electric.

UNIT-V

They choose a target vehicle in the Indian market, finalize the vehicle specifications and simulate the energy consumption for their electric vehicle conversion using SCILAB.

Subject code: - EC 6031(E)

Subject Name: - SWAYAM/NPTEL-MOOC-III

Guideline

SWAYAM/NPTEL-MOOC-III courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

Courses delivered through SWAYAM/NPTEL-MOOC courses are available free of cost to the learners, however learners wanting SWAYAM/NPTEL-MOOC courses Certificate should register for the final proctoral exams that come at a fee and attend in-person at designated center on specified dates.

In perspective of the need to create synergist between the salient features of ‘anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery mechanism which is responsive to learners’ needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
2. He/She can opt from only courses which are not available from University.
3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.

4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be bearded by Student only.
5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.
6. The NPTEL recommended that an additional 1 credit may be awarded given by University. This credited can be given based on attendances, assignment and tutorial work submitted by the students.
7. All students would be motivated to take courses online with SWAYAM/NPTEL every semester to better prepared for the future so that they can cultivate the habit of self-study online. The University propose to implement MOOC courses under Department. The University also made provision if student unable to get certificate He/She still be able to appear in the department elective courses and complete there degree



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B.Tech. (ELECTRONICS AND COMMUNICATION ENGINEERING)
New Scheme Based On AICTE Flexible Curriculum
Third Year
Semester – VI
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Open Elective-II	EC – 6041	4L-0T-0P	4
	Optical Fiber and Communication	EC – 6041(A)		
	Power Electronics (PE)	EC – 6041(B)		
	BIOMEDICAL ELECTRONICS	EC – 6041(C)		
	DRONE TECHNOLOGY	EC-6041(D)		
	SWAYAM COURSE III	EC-6041(E)		

Subject code: - EC 6041(A)

Subject Name: - Optical Fiber and Communication

Course Outcomes:

Students will

1. Get Practical concepts of different parameters associated with optical communication.
2. Develop ability to know different types of optical fibers and their characteristics
3. Learn about different Optical sources and their features.
4. Get Knowledge of Photo detectors and modeling scheme in optical domain
5. Understand designing an optical communication system.
6. Learn about signal degradation of optical fibers and its causes.
7. Get in depth knowledge of WDM concepts, Analog and Digital links, Optical Receivers, Attenuators and Equalizers.

UNIT-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems.

Optical fibers: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

UNIT-II

Optical sources: Light emitting diodes (LEDs): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes.

UNIT-III

Power launching and coupling: source to fiber power launching, fiber to fiber joints, LED coupling to singlemode fibers, fiber splicing, optical fiber connectors.

Photodetectors: Pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise.

UNIT-IV

Signal degradation in optical fibers: Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

UNIT-V

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers.

Digital links: point to point links, link power budget, rise time budget, power penalties.

Analog links: overview of analog links, carrier to noise ratio, multichannel transmission techniques.

Optical technologies Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, Active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators.

References:

1. G. Keiser: Optical Fiber Communications, 4th Edition, TMH New Delhi.
2. J. M. Senior: Optical Fiber Communication- Principles and Practices, 2nd Edition, Pearson Education.
3. G. P. Agarwal: Fiber Optic Communication Systems, 3rd Edition, Wiley India Pvt. Ltd.
4. J. C. Palais: Fiber Optics Communications, 5th Edition, Pearson Education.
5. R.P. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
6. A. Ghatak and K. Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
7. S. C. Gupta: Optoelectronic Devices and Systems, PHI Learning.
8. Sterling: Introduction to Fiber Optics, Cengage Learning.

List of Experiments:

1. Study of 650 nm Fibre Optic Analog link.
2. Study of 650 nm Fibre Optic Digital Link.
3. To obtain Intensity Modulation of the Analog Signal, transmit it over a fiber optic cable and demodulate the same at the receiver end to retrieve the original signal.
4. To obtain Intensity Modulation of the Digital Signal, transmit it over a fiber optic cable and demodulate the same at the receiver end to retrieve the original signal.
5. Study of Frequency Modulation (FM)
6. Study of Pulse Width Modulation
7. Measurement of Propagation or Attenuation Loss in the optical fibre
8. Study of Bending Loss.
9. Measurement of Optical Power using optical power meter.
10. Measurement of Numerical Aperture (NA) of optical fibre
11. Determination of Bit Rate supported by the fibre optic link.
12. Study of Characteristics of Fibre Optic Communication Link
13. Measurement of Propagation Loss in optical fiber using optical power meter

Subject code: - EC 6041(B)

Subject Name: - Power Electronics (PE)

Course Outcomes:

Students will

1. Get Basic concepts of different parameters associated with Power Semiconductor Switches.
2. Develop ability to know different types of Rectifiers, Thyristors and their characteristics
3. Learn about different Invertors and Cyclo invertors and their features.
4. Get Knowledge of Three Phase Bridge Invertors.
5. Understand concepts of AC Voltage Controllers.
6. Get in depth knowledge of DC-DC Convertors and Choppers, etc.

UNIT-1

Power Semiconductor Switches Power diodes - Basic structure and V-I characteristics - various types - DIACs – Basic structure and V- I characteristics – TRIACs - Basic structure and V-I characteristics Power BJT: Construction and working principle, quasisaturation, primary breakdown, secondary breakdown. IGBTs - Basic structure and V-I characteristics. Power MOSFETs - Basic structure and V-I characteristics Thyristors - basic structure - static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT

UNIT 2

Rectifiers Thyristors- series and parallel operation, methods of turning off - commutation circuits. Line frequency phase controlled rectifiers using SCR Single Phase – Half wave rectifier with R and RL loads – Full wave half controlled and fully controlled converters with continuous and constant currents - Input side harmonics and power factor - Effect of source inductance Three Phase - Half wave rectifier with R and RL loads - Full wave fully controlled converters with continuous and constant currents.

UNIT 3

Inverters & Cycloconverters Inverters – Single phase inverters – series, parallel and bridge inverters. Single Phase Pulse Width Modulated (PWM) inverters – Basic circuit and operation. Single phase series resonant inverter, Single phase bridge inverters, Three phase bridge inverters, Voltage control of inverters, Harmonics reduction techniques, Single phase and three phase current source inverters .

UNIT-IV

AC Voltage Controllers Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads Three phase ac voltage controllers (various configurations and comparison only), Single phase transformer taps changer. Cyclo Converters-Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation .

UNIT V

DC – DC Converters Choppers - Principle of operation - step-up and step-down choppers. Switching regulators - Buck regulators - Boost regulators - Buck-boost regulators - Switched mode power supply - principle of operation and analysis.

Text/Reference Books:

1. Ned Mohan, Power Electronics., John Wiley and Sons, 2nd edition, 1995.
2. Rashid, Power Electronics, Circuits Devices and Applications, Pearson Education, 3rd edition, 2004.
3. G.K.Dubey, Thyristorised Power Controllers, Wiley Eastern Ltd, 1993.
4. Dewan & Straughen, Power Semiconductor Circuits, John Wiley & Sons, 1975.
5. Cyril W Lander, Power Electronics, Mc Graw Hill, 3rd edition, 1993.
6. M.D. Singh and K.B.Khanchandani, "Power Electronics" Tata MC Graw Hill, 2005
7. P.C Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2nd Edition.
8. P.S Bhimbhra , " Power Electronics", Khanna Publishers, 2012

Subject Code: - EC- 6041 (C)

Subject Name:- BIOMEDICAL ELECTRONICS

Course Outcomes:

Students will

1. Get Basic concepts of different Transducers and its characteristics.
2. To know about different types of Electro physiological measurements.
3. Learn about non electrical parameters and their features.
4. Get Knowledge of Medical Imaging.
5. Understand concepts of Medical Imaging.

UNIT I

PHYSIOLOGY AND TRANSDUCERS :- Cell and its structure - Resting and Action Potential - Nervous system: Functional organization of the nervous system - Structure of nervous system, neurons - synapse - transmitters and neural communication - Cardiovascular system - respiratory system - Basic components of a biomedical system - Transducers - selection criteria - Piezo electric, ultrasonic transducers – Temperature measurements - Fiber optic temperature sensors.

UNIT II

ELECTRO - PHYSIOLOGICAL MEASUREMENTS:- Electrodes -Limb electrodes -floating electrodes - propelled disposable electrodes - Micro, needle and surface electrodes - Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers -Isolation amplifier. ECG
- EEG - EMG - ERG - Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards - leakage current Instruments for checking safety parameters of biomedical equipments .

UNIT III

NON-ELECTRICAL PARAMETER MEASUREMENTS:- Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements - Spiro meter - Photo Plethysmography, Body Plethysmography - Blood Gas analyzers : pH of blood -measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements .

UNIT IV

MEDICAL IMAGING :- Radio graphic and fluoroscopic techniques - Computer tomography - MRI - Ultrasonography - Endoscopy - Thermography - Different types of biotelemetry systems and patient monitoring - Introduction to Biometric systems.

UNIT V

ASSISTING AND THERAPEUTIC EQUIPMENTS:- Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy -Heart - Lung machine - Audio meters - Dialysers – Lithotripsy

Text /Reference Books:-

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

SUBJECT CODE:-EC-6041 (D)
SUBJECT NAME: - DRONE TECHNOLOGY

Course Objectives:

The main aim of this course is to understand the basics of Unmanned Aerial Vehicles (Drones) and its various applications. The course will also impart the knowledge of how to fly a drone by considering the rules and regulations to the specific country. Further the students will be introduced to the safety measures to be taken during flight.

Course Outcomes:

- CO-1** To introduce the various types of frame design used for the UAV and to accommodate the electronics over the frame to fly UAV
- CO-2** To make the students understand the basic working principal behind the electronic components used and its specification to build a drone from scratch.
- CO-3** To enable the students to identify and understand various functional modules of the controller using a preprogrammed controller used in the UAV

UNIT-I

Introduction to Drones : Drone Evolution ,Definition and history of drones, Basics (Fundamentals) of drones, Unmanned Aerial Systems (UAS), Types of drones and their applications, Classification of Drones, Laws of Motion, Bernoulli's Principle. Different types of drones, different body materials used for drone,

UNIT-II

Basic Electrical and Electronics

Electrical: - Voltage, Current, Power, Speed, Torque, Series and Parallel connection Source.
Electronics: Basic of Diodes, Transistor and FET's (definition, V-I Characteristics and Switching behaviour), Concept of Relays, LED's.

UNIT-III

Drone components or Major Components of Drones, and Specification /DroneAssembling
Design considerations for drone airframe and propulsion systems, Selecting andassembling

1. **Frame:**
2. **Propellers System:** Propellers, Types of Propellers, Selection of propellers.
3. **Motor:- *Brushless DC Motor (BL DC Motor)*** Principal of Operation, Construction, motor sizing and identification
4. **ESC (Electronic Speed Controller-Motor Driver):-** PWM, Speed Control
5. **Flight Controller (FC):-** Basics of Microcontrollers (definition, Types and Application), Modes of Communication, (IR and RF Transmitter, Receiver)
6. **Radio Transmitter**
7. **Radio Receiver:**
8. **Battery:** Types of Battery, Selection, Charge-Discharge states, diode bridge rectifier (AC-DC)-5V,12V Battery Charger
9. **Sensors:** Sensor & its Classification, Accelerometer, Barometer, Gyro sensor, Magnetometer, Distance Sensor, Thermal Sensor, Time of Flight (ToF) Sensor,GPS
10. **Cameras,**
11. **Thrust to Weight ratio**
12. **GPS. Internal Navigation Systems.**
13. **Basic Wiring**
14. **Soldering Techniques**

UNIT-IV

Applications of Drone

Overview of commercial and industrial drone applications, Case studies and examples of successful drone deployments, GPS based navigation system, Drone Camera Systems, Agro application, Drone Delivery, Future trends and developments in the drone industry.

UNIT-V

Regulations and Guidelines for drone usage /DGCA Regulation

Concept of Flight:- Aerodynamics, Flight Performance, Stability and control Classification, Basic Air Regulations, Salient points, Do's and Don'ts, No Drone Zones operations / Procedural Requirements

Text Books:

1. M. LaFay, Building Drones for Dummies, John Wiley & Sons, Inc., n.d.
2. E. Tooley, Practical Drones: Building, Programming, and Applications, Apress, 2021.
3. D. Levy, Drone Programming: A Guide to Code Your Own Drones, Packt Publishing, n.d.
4. S. K. Koppa, Drone Technology: Theory and Practice, Springer, 2020.
5. P. Horowitz and W. Hill, The Art of Electronics, Cambridge University Press, 2015.
6. K. Sundar and R. V. Rajakumar, Multicopters: Principles and Applications, Springer, 2021.

References:

1. D. Saxby, Drone Aerial Photography and Video: Techniques and Stories from the Field, Cengage Learning, 2018.
2. D. McLeod, Getting Started with Drone: How to Build, Fly, and Program Your Own Drone, Apress, 2019.
3. M. A. Banks, Building and Flying Electric Model Aircraft, O'Reilly Media, Inc., 2014.
4. G. C. Camara Leal, Flying Robots: An Introduction to Autonomous Aerospace Systems, Springer, 2017.

List of Experiments:

1. Study of Drone Frame
2. Study of Motor
3. Study of ESC
4. Study of Flight Controller
5. Learn Soldering Techniques
6. Assembling Drone
7. Drone Flight Control

SUBJECT CODE:-EC-6041 (E)

SUBJECT NAME: - SWAYAM/NPTEL-MOOC-IV

Guideline

SWAYAM/NPTEL-MOOC-IV courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

Courses delivered through SWAYAM/NPTEL-MOOC courses are available free of cost to the learners, however learners wanting SWAYAM/NPTEL-MOOC courses Certificate should register for the final proctoral

exams that come at a fee and attend in-person at designated center on specified dates.

In perspective of the need to create synergist between the salient features of 'anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery mechanism which is responsive to learners' needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
2. He/She can opt from only courses which are not available from University.
3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.
4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be beard by Student only.
5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.
6. The NPTEL recommended that an additional 1 credit may be awarded given by University. This credited can be given based on attendances, assignment and tutorial work submitted by the students.
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R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (ELECTRONICS AND COMMUNICATION ENGINEERING)
New Scheme Based On AICTE Flexible Curriculum
Third Year
Semester – VI
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Software Lab- IV	EC - 6051	0L-0T-2P	2

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage them in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

The Mission of the Department of Electronics and Communication Engineering is:

PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

PSO2: To develop the ability among the students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various reputed organizations in India, students can have up to date knowledge of the specific field and can pursue career in that field.

PSO3: To provide the student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning. Students shall participate and succeed in competitive examinations such as GATE, GRE and TOEFL, PSUs and may admit to various programs like Master of Science (Abroad/India), Master of Technology (India) and Doctor of Philosophy (India/Abroad).

PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of “Incubation Centre” established within college premises and will be able to participate in National/ International level

project(Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Course Outcomes:

Students will

1. Learn VHDL, identifiers, data objects, data types, operators, behavioral modeling, data flow modeling, structural modeling.
2. Get overview of digital design with Verilog, Hierarchical Modeling: basic concepts, models and ports, gate level modeling, data flow modeling and behavioral modeling
3. Learn about Design and simulation of following Logic Gates Verilog/ VHDL .Logic gates: NAND, NOR, XOR, XNOR.
4. Get knowledge of Half adder, full adder, subtractor, latches, multiplexers- 2:1, 4:1, 8:1, comparators, decoders-2:4, 3:8, 4:16.
5. Learn the concept of 4-bit ripple carry full adder, 4-bit Ripple carry counter, parity generator, up/down counters.

VHDL

Hardware abstraction, Basic language elements: identifiers, data objects, data types, operators, behavioral modeling, data flow modeling, structural modeling, simulation and analysis.

VERILOG

Overview of digital design with Verilog, Hierarchical Modeling: basic concepts, models and ports, gate level modeling, data flow modeling, behavioral modeling, logic synthesis with Verilog HDL, simulation.

Experiments:

Design and simulation of following using Verilog/

VHDL .Logic gates: NAND, NOR, XOR, XNOR.

Half adder, full adder, subtractor, latches, multiplexers- 2:1, 4:1, 8:1, comparators, decoders- 2:4, 3:8, 4:16. 4-bit ripple carry full adder, 4-bit Ripple carry counter, parity generator, up/down counters.

References:

1. Samir palnitkar: Verilog HDL- A Guide to Digital Design and Synthesis, Pearson Education.
2. Bhasker: A Verilog HDL Primer –synthesis, Pearson Education
3. Pedroni: Circuit Design with VHDL, PHI Learning.
4. Perry: VHDL- Programming by example, TMH.



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Third Year
Semester – VI
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	DSP and Embedded System Lab	EC - 6061	0L-0T-2P	2

Program Output (PO) of Engineering Stream

Engineering Graduates will successfully engage them in practice of engineering and achieve excellence in their professional career. It will inculcate social and moral values within the students in today's technology driven society. They will pursue wide-spectrum careers with professional and managerial capability. Graduates develop themselves as technologists, innovators, managers & entrepreneurs and will advance in their profession.

Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

The Mission of the Department of Electronics and Communication Engineering is:

PSO1: To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering. The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

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PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Course Outcomes:

Students will

1. Learn designing of different Filters.
2. Get overview of various Transforms of Digital Signal Processing.
3. Learn about Design and simulation of 8051 microcontroller.
4. Get knowledge of 8051 Timers and Counters.
5. Learn the concept of LCD and its parameters.

Experiments:-

1. Designing of FIR filter using Matlab Programming.
2. Designing of IIR filter using Matlab Programming.
3. Study of FFT Transforms .
4. Study of Z Transforms
5. Programming using arithmetic, logical and bit manipulation instructions of 8051.
6. Program and verify Timer/Counter in 8051.
7. Communication between 8051 kit and PC.
8. To study development tools/environment for ATMEL/PIC microcontroller program and Architecture.
9. Write an ALP to generate square of 10Khz using Timer 0.
10. Write an ALP to display a string on LCD.
11. Write an ALP to interface seven segment with 8051 and display 0-9 on it.
12. Write an ALP to interface DC Motor with 8051
13. Write an ALP to transmit the data using P1 of 8051
14. Write an ALP to interface 4x4 keyboard with 8051.
15. Write an ALP to interface temperature sensor using 8051
16. Write an ALP to interface the lcd 16x2 to P16f877A



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
New Scheme Based On AICTE Flexible Curricula
Semester – VII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	VLSI Design	EC - 7011	3L-1T-2P	6

Program Output (PO) of Engineering Stream

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Program Specific Outcomes (PSOs) for B.E. (ECE)

Engineering Graduates will develop an ability to design and analyze different electronic circuits and systems. They will get an exposure to a variety of programming languages and software's. and develop an ability to understand and design different modules of communication systems.

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PSO4: To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership traits. Students will be able to realize their ideas with the help of "Incubation Centre" established within college premises and will be able to participate in National/ International level project (Design/Coding) competitions organized by Industry/Institutes. With the help of technical and entrepreneur skills students will be able to employ

appropriate techniques using hardware and software engineering tools for modern engineering applications and will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

PSO5: To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

Course Outcomes for B.Tech. (ECE)

B.Tech. VII Semester (Electronics and Communication Engineering)

Subject code:- EC 7011

Subject Name: - VLSI Design

Course Outcomes

Students will

1. To understand the fabrication process of CMOS technology.
2. To teach fundamentals of VLSI circuit design and implementation using circuit
3. simulators and layout editors. To study various problems due to VLSI technology advancement.
4. To study digital circuits using various logic methods and their limitations.
5. To highlight the circuit design issues in the context of VLSI technology.
6. Upon successful completion of this course, the student will be able to: Demonstrate a clear understanding of CMOS fabrication flow and technology scaling. □ Design MOSFET based logic circuit □ Draw layout of a given logic circuit □ Demonstrate an understanding of working principle of operation of different types of □ memories Demonstrate an understanding of working principles of clocking, power reduction and □ Distribution

UNIT I

Practical Consideration and Technology in VLSI Design Introduction, Size and complexity of Integrated Circuits, The Microelectronics Field, IC Production Process, Processing Steps, Packaging and Testing, MOS Processes, NMOS Process, CMOS Process, Bipolar Technology, Hybrid Technology, Design Rules and Process Parameters.

UNIT II

Device Modeling Dc Models, Small Signal Models, MOS Models, MOSFET Models in High Frequency and small signal, Short channel devices, Sub threshold Operations, Modeling Noise Sources in MOSFET's, Diode Models, Bipolar Models, Passive component Models.

UNIT III

Circuit Simulation Introduction, Circuit Simulation Using Spice, MOSFET Model, Level 1 Large signal model, Level 2 Large Signal Model, High Frequency Model, Noise Model of MOSFET, Large signal Diode Current, High Frequency BJT Model, BJT Noise Model, temperature Dependence of BJT.

UNIT IV

Structured Digital Circuits and Systems Random Logic and Structured Logic Forms, Register Storage Circuits, Quasi Static Register Cells, A Static Register Cell, Micro coded Controllers, Microprocessor Design, Systolic Arrays, Bit- Serial Processing Elements, Algotronix.

UNIT V

CMOS Processing Technology Basic CMOS Technology, A Basic n-well CMOS Process, Twin Tub Processes, CMOS Process Enhancement, Interconnects and Circuit Elements, Layout Design Rules, Latch up, Physical Origin, Latchup Triggering, Latch up Prevention, Internal Latch up Prevention Techniques.

References:

1. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
2. Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
3. Weste and Eshraghian: Principles of CMOS VLSI design, Addison- Wesley
4. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson-Education.
5. Pucknell and Eshraghian: Basic VLSI Design, PHI Learning.
6. Botkar: Integrated Circuits, Khanna Publishers. 7. Sze: VLSI Technology, TMH.



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Microwave Engineering	EC – 7021(A)	3L-1T-0P	4
	Information Theory & Coding	EC – 7021(B)		
	Nano Electronics	EC – 7021(C)		
	SWAYAM/NPTEL –MOOC-5	EC-7021(D)		

Subject code:- EC 7021(A)

Subject Name: - Microwave Engineering

Course Outcomes:

Students should be able to :

1. Identify of various types of Microwave electronic components and systems.
2. Understand different modes of operation of various RF and Microwave circuits.
3. Design and analyze of high frequency circuits and systems.
4. Solving complex RF & Microwave communication network design problems

UNIT-I

Features and applications of microwaves, Wave propagation in striplines and microstrip lines, Slot lines, Limitations of conventional vacuum tubes, Microwave tubes like Two cavity klystron and Reflex klystron, Magnetron, TWT, Backward wave oscillator etc.

UNIT-II

Solid state microwave sources, transferred electron devices, Tunnel diode Gunn diode and oscillators, IMPATT diode, TRAPATT diode, Pin diode, Varactor diode, Schottky diode, Parametric amplifiers, Crystal diode, Frequency multipliers, Microwave BJT & FET,

UNIT-III

Scattering matrix, S-parameters & its applications in Network analysis, Matching Network, Detector diodes, detector mounts, detector output indicator, slotted line, measurement of power, impedance & S-parameter, measurement of frequency & VSWR.

UNIT-IV

Impedance transformer, Microwave filters, Power dividers and directional couplers, E-plane Tee, H-plane tee, Matched hybrid Tee., Wave propagation in ferrite medium, Isolators, Circulators, YIG resonators, Simulation Techniques for design of Microwave Components.

UNIT-V

Analysis and design of Dielectric resonators; Design of RF and microwave low noise and power amplifiers & oscillators using S-parameter techniques, Mixer and converter design, diode phase shifters, attenuators, Design of hybrid and monolithic, microwave and millimeter wave integrated circuits.

Text Books Recommended:

1. Liao S., Microwave Devices & Circuits'', 2nd ed. 2001, PHI.
2. Gupta K.C., Microwave Engg., 3rd ed. 2004, Wiley Eastern Pub.
3. Watson, Solid State Microwave Devices, 5th ed. 2008, Wiley.
4. David M. Pozar, Microwave Engineering, 3rd edition, 2011 Wiley India. Reference Books Recommended :
1. Gandhi, Microwave Engineering & Application, 2nd ed. 2005, McMillan Int. Ed.
2. Reich, Microwave Principles, 5th ed. 2009, CBS Publ.
3. Collin, Foundations for microwave engineering, 4th ed. 2001, Wiley Publ.

Subject code:- EC 7021(B)

Subject Name: - Information Theory and Coding

Course Outcomes:

Upon completing this course, the student will be able to:

1. Acquire the knowledge in measurement of information and errors.
2. Know the application of coding theorem for efficient utilization of communication resources.
3. Understand the utilization of various communication channels for communication system.
4. Design the block and cyclic codes for error correction and detection in communication systems
5. Know the significance of source and channel codes in various applications.

UNIT-1

Information Theory: Introduction to uncertainty, entropy and its properties, entropy of binary memoryless source and its extension to discrete memory-less source, Measure of information, Information content of message, Average Information content of symbols. Self information, Mutual information and its properties,

UNIT -II

Coding theorem: Source coding theorem, prefix coding, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman coding, Extended Huffman coding, Arithmetic Coding, Lempel-Ziv Coding, Run Length Encoding.

UNIT-III

Information Channels: Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Discrete memory less channels, Binary symmetric channel and its channel capacity, channel coding theorem, and its application to Binary Erasure Channel, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Continuous Channels.

UNIT-IV

Error Control Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Probability of undetected error for linear block code in BSC, hamming Codes and their applications, Cyclic Codes: Cyclic codes and its basic properties, Encoding using an (n-k) Bit Shift register, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation, error detection and correction,

UNIT-V

Introduction to BCH codes, its encoding & decoding, error location & correction. Convolution Codes: Introduction to convolution codes, its construction, Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, Viterbi algorithm: Introduction of theorem for maximum likelihood decoding.

Reference Books:

1. Digital Communication - by Haykins Simon Wiley Publ.
2. Error control Coding: Theory and Application, - by Shu Lin and Costello, PHI
3. Digital Communication - by Sklar, Pearson Education
4. Error Correcting Codes - by Peterson W., MIT Press
5. Digital Communication - by Proakis, TMH
6. Information Theory, Coding and Cryptography – By Ranjan Bose, TMH
7. Communication Systems – By Singh and Sapre, TMH

Subject code:- EC 7021(C)

Subject Name: - Nano Electronics

Course Outcomes:

Upon completing this course, the student will be able to:

1. Acquire the knowledge in Semiconductor physics.
2. Know the application of Lithography.
3. Understand the utilization of various Tunnel Junction and its applications.
4. Understand designing of MOSFETs
5. Know the significance of scaling in various applications.

UNIT-I

Overview of semiconductor physics. Nanoscale band structure and Electron transport, Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, superlattices, band offsets, and electronic density of states, heavily doped semiconductors and low dimensional quantum devices.

UNIT-II

Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, overlay-accuracies, Mask-Error enhancement factor (MEEF), Positive and negative photoresists, Electron Lithography, Projection Printing, Direct writing, Electron resists.

UNIT-III

Tunnel junction and applications of tunneling, Tunneling Through a Potential Barrier, Metal—Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Coulomb blockade in nanocapacitor, Tunnel Junctions, Tunnel Junction Excited by a Current Source.

UNIT-IV

Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode. Nanoscale MOSFET, Finfets, charge and energy quantization in Single electron devices.

UNIT-V

Scaling of physical systems – Geometric scaling & Electrical system scaling, Introduction to MEMS and NEMS, working principles, as micro sensors (acoustic wave sensor, biomedical and biosensor, chemical sensor, optical sensor, capacitive sensor, pressure sensor and thermal sensor), micro actuation (thermal actuation, piezoelectric actuation).

Text Book:

- 1- Nano Technology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springe.
2. Fundamentals of Nano electronics, George W. Hanson, 1/e Pearson Education.
3. Nano: The Essentials – Understanding Nano Science and Nanotechnology by T. Pradeep; Tata Mc.Graw Hill.
4. Nanotubes and nanowires by C.N.R. Rao and A. Govindaraj, RSC Publishing
5. Quantum-Based Electronic Devices and Systems by M. Dutta and M.A. Strosio, World Scientific.

Suggested Reference Books:

Stephen D. Senturia, Microsystem Design, Kluwer Academic Press
Marc Madou, Fundamentals of microfabrication & Nanofabrication.
T. Fukada&W.Mens, Micro Mechanical system Principle & Technology, Elsevier, 1998.
Julian W.Gardnes, Vijay K. Varda, Micro sensors MEMS & Smart Devices, 2001.
James R Sheatsand Bruce w.Smith, “Microlithography Science and Technology”, Marcel Dekker Inc., New York, 1998.

Subject code: - EC 7021(D)

Subject Name: - SWAYAM/NPTEL-MOOC-5

Guideline

SWAYAM/NPTEL-MOOC-I courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

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In perspective of the need to create synergist between the salient features of ‘anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery mechanism which is responsive to learners’ needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
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4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be bearded by Student only.

5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.
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B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	I.O.T	EC – 7031(A)	4L-0T-0P	4
	Operation Research	EC – 7031(B)		
	5G Technology	EC – 7031(C)		
	SWAYAM/NPTEL-MOOC-6	EC – 7031(D)		

Subject code:- EC 7031(A)

Subject Name: - I.O.T.

Course Outcomes :

After completion of the course the students should be able to

1. Understand in depth about Internet of things. 2. Establish secure communication for his network for his devices connected in IOT. 3. Store his data securely on cloud and access it when required 4. Design web based application using various internet protocols and services 5. Use sensor technology and RFID and wireless networking for maintaining privacy and security concern in smart city and housing environmental considerations.

6. The course provides basic knowledge of how to connect various devices through Internet and control them remotely. It will provide methods for different types of networking and data storage. The course aims at providing communication overview and protocols for safe and secure data access and transfer and maintain confidentiality and integrity.

UNIT-I

Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.

UNIT-II

Machine-to-machine (M2M), SDN (software defined networking) and NFV (network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

UNIT-III

Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, MQTT, CoAP, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, MediaAccess control.

UNIT-IV

Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.

UNIT-V

IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view.IOTPrivacy and security solutions, Raspberry Pi & Adriano devices.IOT Case studies: smart city streetlights control & monitoring.

Reference Book:

1. Rajkamal,"Internet of Things", Tata McGraw Hill publication
2. Vijay Madiseti and ArshdeepBahga, "Internet of things(A-Hand-onApproach)" 1st Edition ,Universal Press
3. Charless Bell "MySQL for the Internet of things",Apresspublicatons.
4. Francis dacosta "Rethinking the Internet otthings:A scalable Approach to connectingeverything", 1st edition, Après publications .
5. HakimaChaouchi "The Internet of Things: Connecting Objects", Wiley publication.
6. Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino,Raspberry Pi and BeagleBone Black", McGraw Hill publication.

Subject code:- EC 7031(B)

Subject Name: - Operation Research

Course Outcomes:

Students will

1. Understand basics of Resource Scheduling and Network Analysis.
2. Learn the concept of Replacement and Game Theory.
3. Get knowledge of Inventory Control.
4. Get a comprehensive knowledge of Linear Programming.
5. Learn Advanced Linear Programming Problems.

UNIT-I

RESOURCE SCHEDULING AND NETWORK ANALYSIS Problem of sequencing – Sequencing n jobs through 2 machines and 3 machines, 2 jobs through m machines. PERT and CPM –Critical path calculation – Probability andcost consideration.

UNIT-II

REPLACEMENT AND GAME THEORY Replacement Models – Replacement of items that deteriorate with time – Equipment that fails suddenly. Two person zero sum games – Pure strategies and saddle point – Mixed strategies – $2 \times n$ and $m \times 2$ games – Method of dominance – Numerical and graphical solutions.

UNIT-III

INVENTORY CONTROL Inventory models – Deterministic models – Economic ordering quantity, Reorder level, optimum cost – Instantaneous and Non-instantaneous receipt of goods with or without shortages.

UNIT-IV

LINEAR PROGRAMMING Introduction to Linear Programming – Formulation of the problem – Graphical method – Simplex method – Artificial variable techniques - Primal-dual problems – Dual Simplex method.

UNIT-V

ADVANCED LINEAR PROGRAMMING PROBLEMS Integer programming problem - Cutting plane algorithm – Transportation models - Vogel's Approximation method – MODI method – Unbalanced transportation problem – Degeneracy in transportation models – Assignment models – Traveling salesman problem-Dynamic Programming problem.

TEXT BOOK

1. Kanti Swarup, Gupta P.K., and Man Mohan, "Operations Research" Sultan Chand & Sons, 1994.
- REFERENCE BOOKS 1. Gupta P.K., and Hira D.S., "Operations Research", S.Chand & Sons, 2000.
2. Sundaresan.V, Ganapathy Subramanian.K.S. and Ganesan.K, "Resource Management Techniques", A.R. Publications, 2002
3. Taha H.A., "Operations Research – An introduction", 7th edition, PHI, 2002.
4. Sharma S.D., "Operations Research", Kedarnath Ramnath & Co., Meerut, 1994.
5. Billy B. Gillet, "Introduction to Operations Research – TMH Publishing Co.
6. Gupta P.K., and Manmohan, "Operations Research and Quantitative Analysis" – S.Chand & Co., New Delhi.
7. Hamblin S., and Stevens Jr., "Operations Research", Mc Graw Hill Co.
8. Taha H.A., "Operations Research – An introduction", 8th edition, Taha H.A., "Operations Research – An introduction", 7th edition, PHI, 2002.

Subject code:- EC 7031(C)

Subject Name: - 5G Technology

Course Outcomes

1. Describe 5G Technology advances and their benefits
2. Distinguish the key RF, PHY, MAC and air interface changes required to support 5G
3. Demonstrate Device to device communication and millimeter wave communication
4. Implementation options for 5G
5. Modeling of MIMO system

UNIT-I

Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro) , An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

UNIT-II

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.

UNIT-III

Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques

– Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT-IV

Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

UNIT-V

Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).

Textbooks:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks”, Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Daniels, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

References

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press.

Subject code:- EC 7031(D)

Subject Name: - SWAYAM/NPTEL-MOOC-6

Guideline

SWAYAM/NPTEL-MOOC-I courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

Courses delivered through SWAYAM/NPTEL-MOOC courses are available free of cost to the learners, however learners wanting SWAYAM/NPTEL-MOOC courses Certificate should register for the final proctoral exams that come at a fee and attend in-person at designated center on specified dates.

In perspective of the need to create synergist between the salient features of ‘anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery mechanism which is responsive to learners’ needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
2. He/She can opt from only courses which are not available from University.
3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.
4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be bearded by Student only.
5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.
6. The NPTEL recommended that an additional 1 credit may be awarded given by University. This credited can be given based on attendances, assignment and tutorial work submitted by the students.
7. All students would be motivated to take courses online with SWAYAM/NPTEL every semester to better prepared for the future so that they can cultivate the habit of self-study online. The University propose to implement MOOC courses under Department. The University also made provision if student unable to get certificate He/She still be able to appear in the department elective courses and complete there degree



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Departmental Elective Lab	EC – 7041	0L-0T-2P	2

Subject code:- EC 7041

Subject Name: - Microwave Lab

Course Outcomes:

1. Study of Microwave electronic components and systems.
2. Understand different modes of operation of various RF and Microwave circuits.
3. Get Knowledge of reactive loads.
4. Design and analyze of high frequency circuits and systems.
5. Get understanding of Solving complex RF & Microwave communication network design problems.

List of Experiments:

1. To study wave guide components.
2. To study the characteristics of Gunn oscillator & Gun diode as modulated source.
- 3 Study of wave guide horn and its radiation pattern and determination of the Beam width.
- 4 To study isolation and coupling coefficient of a magic Tee.
- 5 To measure attenuation and insertion loss of a fixed and variable attenuator.
- 6 To measure the standing wave ratio and reflection coefficient in a Microwave Transmission line.
- 7 To measure the frequency of a microwave source and demonstrate relationship among guide dimensions , freespace wavelength and guide wavelength.
- 8 To measure the impedance of unknown load.

9 To Study working of Doppler Radar , and measure the of the velocity of the object moving in the Radar range.

10 Measurement of the resonance characteristics of a microstrip ring resonator.

11 To study Magnetrons.

12 To study the Characteristics of Reflex Klystron tube & to determine its electronic tuning range.

13 To measure the gain of a waveguide horn antenna.

14 To study the phase shifter.

15 To determine the dielectric constant of a material.



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Open Elective Lab	EC – 7051	0L-0T-2P	2

Subject code:-EC7051

Subject Name: - IOT

Lab Course Outcomes:

1. Understand LAB INDEX Design
2. Developed and implement following using Arduino
3. Learn about Raspberry Pi compiler
4. Get knowledge of Python language in Linux/Windows environment.
5. Study applications of IOT

List of Experiments

1. Study and Install IDE of Arduino and different types of Arduino.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.
4. Study the Temperature sensor and Write Program for monitor temperature using Arduino.
5. Study and Implement RFID, NFC using Arduino.
6. Study and Configure Raspberry Pi.
7. WAP for LED blink using Raspberry Pi.
8. Study and Implement Zigbee Protocol using Arduino /
- Raspberry Pi.9 . Study and implement MQTT protocol using Arduino.
10. Study and implement CoAP protocol using Arduino.



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VIII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	TV and Radar	EC –8011	3L-1T-2P	6

Subject code:- EC 8011

Subject Name: - TV and Radar

Course Outcomes

The purpose of this course is to understand the concept of TV and Radar systems. Students will learn to

1. Fundamental principles of TV Transmitter and Receiver.
2. Understand the need and basics of Three colour Theory.
3. Become familiar with types of colour Television Systems.
4. Understand the Utility of Radar Systems and learn Radar Equations and their applications.
5. Understand the concept of MTI and Pulse Doppler Radar.
6. Learn the Utility of Radar Transmitter and Receiver.

UNIT-I

MONOCHROME TELEVISION TRANSMITTER AND RECEIVER TV transmitter – TV signal propagation – Interference – TV transmission Antennas – Monochrome TV receiver – RF tuner – UHF, VHF tuner- Digital tuning techniques- AFT-IF subsystems - AGC – Noise cancellation Video and sound inter carrier detection- vision IF subsystem- video amplifiers requirements and configurations - DC re-insertion - Video amplifier circuits- Sync separation – typical sync processing circuits- Deflection current waveform – Deflection Oscillators – Frame deflection circuits – requirements- Line Deflection circuits – EHT generation – Receiver Antennas.

UNIT-II

ESSENTIALS OF COLOUR TELEVISION Compatibility – colour perception- Three colour theory- luminance, hue and saturation-colour television cameras- values of luminance and colour difference signals- colour television display tubes- delta – gun62 precision – in-line and Trinitron colour picture tubes- purity and convergence- purity and static and dynamic convergence adjustments- pincushion correction techniques- automatic degaussing circuit- grey scale tracking – colour signal transmission- bandwidth- modulation of colour difference signals – weighting factors- Formation of chrominance signal

UNIT-III

COLOUR TELEVISION SYSTEMS: NTSC colour TV system- NTSC colour receiver- limitations of NTSC system – PAL colour TV system – cancellation of phase errors- PAL –D colour system- PAL coder – Pal-Decolour receiver- chromosignal amplifier- separation of U and V signals- colour burst separation – Burst phase Discriminator – ACC amplifierReference Oscillator- Ident and colour killer circuits- U and V demodulators- Colour signal matrixing – merits and demerits of the PAL system – SECAM system – merits and demerits of SECAM system.

UNIT-IV

RADAR EQUATIONS RADAR Block Diagram & operation- RADAR Frequencies- RADAR Equation- Detection of signals in Noise RADAR cross section of targets- RADAR cross section fluctuations- transmitter power- pulse repetition frequency- system losses and propagation effects. MTI AND PULSE DOPPLER RADAR Introduction to Doppler & MTI RADAR- Delay Line canceller- Moving Target Detector- Pulse Doppler RADAR- Non-Coherent MTE-CW RADAR- FMCW RADAR- Tracking RADAR- Monopulse Tracking – Conical Scan and Sequential Lobing.

UNIT-V

RADAR TRANSMITTER AND RECEIVER Linear beam power tubes- Solid state RF power sources- solid state devices used in RADAR Magnetroncrossed field amplifiers- other aspects of radar transmitter- RADAR Receiver- Receiver noise figuresuper heterodyne receiver- dynamic range- RADAR Displays.

TEXT BOOKS

1. R.R.Gulati, “ Monochrome Television Practice, Principles, Technology and servicing ”, Second edition, New age International Publishes, 2004
2. R.R.Gulati “Monochrome and colour television ”, New age International Publisher,2003
3. M.I. Skolnik, “Introduction to RADAR systems”, 3rd edition, McGraw Hill.
4. N.S. Nagaraja “Elements of Electronic Navigation”, Tata McGraw Hill, 1993.

REFERENCES- 1. A.M Dhake, “Television and Video Engineering”, Second edition, TMH, 2003.

2. S.P.Bali, “Colour Television, Theory and Practice”, TMH, 1994

3. Nadav Levanon, “RADAR Principles”, John Wiley and Sons, 1989.

4. Brookner, “ RADAR Technology”, Artech Hons, 1986



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VIII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Satellite Communication	EC – 8021(A)	3L-1T-0P	4
	AI and Signal Processing	EC – 8021(B)		
	Wireless Network	EC – 8021(C)		
	SWAYAM/NPTEL-MOOC-7	EC-8021(D)		

Subject code: - EC 8021(A)

Subject Name: - Satellite Communication

Course Outcomes:

Students will learn the

1. Importance of Satellite Systems and its Functions.
2. Understand the need and basics of Geostationary Orbits.
3. Understand the Utility of the Space Segments.
4. Get Knowledge of Space Links.
5. Understand the concept of Satellite Services

UNIT-I

Overview of satellite systems: Introduction, Frequency allocations for satellite systems. Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

UNIT-II

The Geostationary orbit: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits. Polarization: antenna polarization, polarization of satellite signals, cross polarization discrimination. Depolarization: ionospheric, rain, ice.

UNIT-III

The Space segment: introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem, Morelos and Satmex 5, Anik satellites, Advanced Tiros-N spacecraft. The Earth segment: introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

UNIT-IV

The space link: Introduction, Equivalent isotropic radiated power (EIPR), transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, inter modulation noise, intersatellite links. Interference between satellite circuits.

UNIT-V

Satellite services VSAT (very small aperture terminal) systems: overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for a VSAT star network. Direct broadcast satellite (DBS) Television and radio: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

References:

1. Roddy: Satellite Communications, TMH.
2. Timothy Prattt: Satellite Communications, Wiley India.
3. Pritchard, Suyderhoud and Nelson: Satellite Communication Systems Engineering, Pearson Education.
4. Agarwal: Satellite Communications, Khanna Publishers.
5. Gangliardi: Satellite Communications, CBS Publishers.
6. Chartrand: Satellite Communication, Cengage Learning.
7. Raja Rao: Fundamentals of Satellite communications, PHI Learning

Subject code: - EC 8021(B)

Subject Name: - AI and Signal Processing

Course Outcomes:

1. Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
2. Ability to choose an appropriate problem-solving method and knowledge representation technique.
3. Ability to analyze the strength and weaknesses of AI approaches to knowledge-intensive problem-solving.
4. Understand real time applications of Fourier transform.
5. Describe discrete time systems in terms of difference equations.
6. To impart knowledge about Artificial Intelligence and to give understanding of the main abstractions and reasoning for intelligent systems and signal processing

UNIT-I

Introduction of AI What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies

UNIT-II

Knowledge and Reasoning Knowledge-based Agents, Representation, Reasoning and Logic, Propositional logic, First order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT-III

Learning Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks.

UNIT-IV

Orthogonal transforms DFT, DCT and Haar; Properties of DFT; Computation of DFT: FFT and structures, Decimation in time, Decimation in frequency; Linear convolution using DFT; Digital filter structures: Basic FIR/IIR filter structures, FIR/IIR Cascaded lattice structures, Parallel allpass realization of IIR transfer functions.

UNIT-V

Multirate signal processing Basic structures for sampling rate conversion, Decimators and Interpolators; Multistage design of interpolators and decimators; Polyphase decomposition and FIR structures; Computationally efficient sampling rate converters, Lagrange interpolation, Spline interpolation; Quadrature mirror filter banks; Applications in subband coding.

References:

1. Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach", 2nd Edition, Pearson Education, 2007
2. Artificial Neural Networks B. Yagna Narayana, PHI
- 3- Artificial Intelligence , 2nd Edition, E. Rich and K. Knight (TMH).
4. Artificial Intelligence and Expert Systems – Patterson PHI.
5. S K Mitra: "Digital Signal Processing: A Computer-Based Approach" (McGraw Hill)
6. E C Ifeachor and B W Jervis "Digital Signal Processing A Practical Approach" (Pearson)
7. R. Chassaing and D. Reay, Digital signal processing and applications with TMS320C6713 and TMS320C6416, Wiley, 2008.
8. J. G. Proakis and D. G. Manolakis, Digital Signal Processing:

Subject code: - EC 8021(C)
Subject Name: - Wireless Network

COURSE OUTCOMES:-

1. Review the concepts of wireless and mobile communication
2. Understand LTE and OFDM technologies for mobile telephony
3. Understand the basic concepts of wireless sensor network
4. Understand mobile networking and compare transport layer protocols for mobile and traditional networks
5. Understand the technology and standards of IoT, ZigBee

UNIT-I

Review of Cellular Networks Mobile telephony, GSM, CDMA/CD, Universal Mobile Telecommunication System(UMTS). Advancement and migrations. WLAN- PHY Layer and MAC Layer-IEEE 802.11 (a, b, g, ac), HIPERLAN, Wireless ATM, WiMAX- PHY Layer and MAC LayerIEEE 802.16 (fixed and mobile).

UNIT-II

LTE systems Introduction to 3GPP, LTE & LTE-A standards, LTE uplink/downlink, E-UTRAN architecture-Mobility and resource management, services, UTRAN- Architecture , HSDPA, HSUPA, OFDM, OFDMA, SISO system, MIMOsystem, OFDM-MIMO.

UNIT-III

Wireless Sensor Networks Introduction to wireless sensor network (WSN), WSN-Architecture, Coverage and placement, Topology management in WSN, Applications, Mobile WSN, Technologies for sensor nodes & networks, operating environment, Under water WSN, Security of WSN, MAC, Routing and Transport protocols for WSN

UNIT-IV

Wireless routing Protocols Medium access problems in wireless networks, Traditional routing, Mobile networklayer Mobile IP, Introduction to IPv4 and IPv6, Data forwarding procedure in Mobile IP (IPv4 and IPv6), Mobility management, Protocol trade-offs, Congestion window management, Mobile transport layer- Traditional TCP, mobile TCP, Indirect TCP, Reno, New-Reno, Tahoe, Vegas. UDP.

UNIT-V

Internet of things (IoT) and GPS systems IoT architecture, Main design principles and needed capabilities, IoT Devices and gateways, Case studies: Sensor body area network, Control of a smart home, Smart vehicles, Smart manufacturing and smart factory. Emerging IoT standards, IoT-protocols, IoT Local and wide area networking, IEEE 802.15 WPAN, Bluetooth-pico net, scatter net, Protocol stack, Interface between 802.11 and Bluetooth. Geolocation service techniques and standards. Introduction to GPS-aided GEO augmented navigation (GAGAN),E.911, ZigBee, UWB and RFID.

Text Books:

1. Kaveh Pahlavan, Prashant Krishnamoorthy – Principle of wireless networks- A unitedapproach- PearsonEducation,2002
2. Vijay K. Garg – Wireless communication and networking – Morgan-Kaufmann series in networking- Elsevierpublication
3. Feng Zhao and Leonidas Guibas – Wireless Sensor Networks, An informationprocessing approach - Morgan Kaufmannpublication

Reference Books:

1. Kazem Sohraby, Daniel Minoli and Taieb Znati- Wireless Sensor Networks: Technology, Protocols and Applications -Wiley publication
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
3. Ramji Prasad "OFDM for wireless communication" 4. Steve Rackley "Wireless Networking Technology"

Subject code: - EC 8021(D)

Subject Name: - SWAYAM/NPTEL-MOOC-7

Guideline

SWAYAM/NPTEL-MOOC-7 courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

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1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
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3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.
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R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VIII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Cellular Mobile Communication	EC – 8031(A)	4L-0T-0P	4
	Human Resource Management	EC – 8031(B)		
	Speech Processing	EC – 8031(C)		
	SWAYAM/NPTEL-MOOC-7	EC – 8031(D)		

Subject code:- EC 8031(A)

Subject Name: - Cellular Mobile Communication

Course Outcomes

1. Understand various communication standards and multiple accesses
2. Cellular concepts and basics and design
3. Frequency allocation, Reuse, and antennae for mobile communication
4. Various interferences and reduction techniques
5. Various cellular generation, standards and trends

UNIT-I

Introduction to cellular mobile system A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system Elements of cellular radio system design General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

UNIT-II

Cell coverage for signal and traffic General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation. Cell site antennas and mobile antennas Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

UNIT-III

Cochannel interference reduction Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference. Types of Noncochannel interference Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

UNIT-IV

Frequency management and Channel Assignment Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers Handoffs and dropped calls Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

UNIT-V

Digital Cellular Systems GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme. CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures. Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pears
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

SUBJECT CODE: -EC-8031 (B)

SUBJECT NAME: - Human Resources Management

Course Objectives:

Human resources management (HRM) is the process of organizing, coordinating, and managing an organization's employees to achieve its goals, vision, and mission. This includes recruiting, hiring, training, compensating, retaining, and motivating employees.

Human resource management (HRM) involves coordinating, managing, and allocating human capital, or employees, in ways that move an organisation's goals forward. HRM focuses on investing in employees, ensuring their safety, and managing all aspects of staffing, from hiring to compensation and development.

Basic concepts and techniques of Micro and Macro economic analysis in the business environment, to enable students to understand the significance of Managerial economics w.r.t application & its impact on Nation's Business.

PO1: Define the Concepts and Techniques in Information System Management..

PO2: Articulate appropriate Business Strategies, Practices and Theories

PO3: Identify Technical Proficiency in Business Globally.

PO4: Develop new skills in Accounting, Management, Entrepreneurship and computer.

PO5: Discuss the significance of HRM concepts.

PO6: Design Logical Methods in Computer Programming.

After the Completion of the Program the Students were specifically able to

PSO 1: Execute decision making, Innovation & Problem Solving.

PSO 2: Determine Software Executive and Corporate Personnel.

PSO 3: Acquire Entrepreneurial and Computer Skill for the Society Upliftment.

Course Outcomes:

CO-1 Describe the importance of principles of management..

CO-2 Associate the importance of planning and decision making in an organization

CO-3 Acquire concepts in various authorizes and responsibilities of an organization.

UNIT-I

Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management

UNIT-II

Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

UNIT-III

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

UNIT-IV

Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.

UNIT-V

Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

Text Books:

1. M. LaFay, Building Drones for Dummies, John Wiley & Sons, Inc., n.d.
2. E. Tooley, Practical Drones: Building, Programming, and Applications, Apress, 2021.
3. D. Levy, Drone Programming: A Guide to Code Your Own Drones, Packt Publishing, n.d.
4. S. K. Koppa, Drone Technology: Theory and Practice, Springer, 2020.
5. P. Horowitz and W. Hill, The Art of Electronics, Cambridge University Press, 2015.
6. K. Sundar and R. V. Rajakumar, Multicopters: Principles and Applications, Springer, 2021.

References:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.
8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi.

Subject Code :- EC-8031C

Subject Name: - Speech Processing

Course Outcomes:

1. Model speech production system and describe the fundamentals of speech.
2. Extract and compare different speech parameters.
3. Choose an appropriate statistical speech model for a given application.
4. Design a speech recognition system.
5. Use different speech synthesis techniques.

UNIT-I

Basic Concepts of Speech Processing Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT-II

Speech Analysis Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT-III

Speech Modeling Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence –
Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT-IV

Speech Recognition Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – ngrams, context dependent sub-wordunits; Applications and present status.

UNIT-V

Speech Synthesis Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

References:

- 1-Lawrence Rabiner and Biing-Hwang Juang
- 2- “Fundamentals of Speech Recognition”, Pearson Education, 2003.
- 3.Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education.
- 4.Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing.
- 5.Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.
- 6.Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
- 7.Ben Gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.
- 8.Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press.

Subject code: - EC 8031(D)

Subject Name: - SWAYAM/NPTEL-MOOC-8

Guideline

SWAYAM/NPTEL-MOOC-7 courses is a programme initiated by Government of India and designed to achieve the three cardinal principles of education via, access, equity and quality. The objective of this effort is to take the best teaching resources to all, including the most disadvantaged SWAYAM seeks to bridge divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

Courses delivered through SWAYAM/NPTEL-MOOC courses are available free of cost to the learners, however learners wanting SWAYAM/NPTEL-MOOC courses Certificate should register for the final proctoral exams that come at a fee and attend in-person at designated center on specified dates.

In perspective of the need to create synergist between the salient features of ‘anytime anywhere format of e-learning and traditional classrooms chalk and talk method to develop a unique content delivery

mechanism which is responsive to learners' needs and ensuring seamless transfer of knowledge across geographical boundaries. RKDF University proposes to incorporate MOOC courses delivered by SWAYAM/NEPTEL portal. Student can opt any courses from SWAYAM/NPTEL-MOOC courses as an elective Base on following condition

1. He/She has consulted and inform to the departmental coordinator regarding courses selection and mark obtain to him. No Subjected should be repeat from courses which is offer and courses which are selected.
2. He/She can opt from only courses which are not available from University.
3. Only enrollments in the courses and learning from it is free as this is a project supported by MHRD GOI.
4. To get Certificate from SWAYAM-NPTEL. The learner has to separately register and appear for a proctored exam at a fee as decided by host institution/Mooc of Rs. 1000/-Which be bearded by Student only.
5. If student successful appear in exam and obtain certificated of courses of 12 week course to earn 3 credits(As recommended by NPTEL) to suffice for required credit for the award of his/her degree.
6. The NPTEL recommended that an additional 1 credit may be awarded given by University. This credited can be given based on attendances, assignment and tutorial work submitted by the students.
7. All students would be motivated to take courses online with SWAYAM/NPTEL every semester to better prepared for the future so that they can cultivate the habit of self-study online. The University propose to implement MOOC courses under Department. The University also made provision if student unable to get certificate He/She still be able to appear in the department elective courses and complete there degree



R.K.D.F. UNIVERSITY, BHOPAL
B.Tech. (Electronics & Communication Engineering)
FOURTH YEAR
Semester – VIII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
EC	Departmental Elective Lab	EC – 8041	0L-0T-2P	2

Subject code:- EC 8041

Subject Name: - Advanced Communication Engineering Lab

Course Outcomes:

1. Understand ASK, FSK
2. Study modulation Schemes
3. Learn about Multiplexing and De multiplexing
4. Get knowledge of various types of Antennas
5. Study applications of Directional Couplers

List of Experiments

1. Amplitude Shift Keying Modulation and Demodulation
2. Frequency shift keying Modulation and Demodulation
3. BPSK Generation and Detection
4. DPSK Generation and detection.
5. QPSK Generation and detection
6. Time Division Multiplexing of 2 Bandlimited Signals
7. Analog and Digital Communication Link Using Optical Fiber
8. Study of Manchester Coding & Decoding
9. Measurement of frequency ,guided wavelength,power,VSWR and attenuation in a microwave test bench
10. Study Of Dipole Antenna Radiation Pattern (Simple Dipole and Folded Dipole antenna)
11. To find the Gain and Directivity of Yagi-Uda Antenna, Dipole antenna and Patch antenna
12. Determination of coupling and isolation characteristics of a stripline directional coupler.
13. Power Division and Isolation characteristics of a microstrip 3dB power divide

