

Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal

New Scheme of Examination as per AICTE Flexible Curricula

I Semester (Group A)

Bachelor of Technology (B.Tech.)

W.E.F. JULY 2022

GROUP A: (AB, RM, AN, AT, CS, EE, EI, EV, EX, IE, IT, MI, MM, AG, SD, CO, PC)

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.	Lab work & Sessional					
Mandatory Induction Program (First three weeks)				Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards classes will start													
1.	BT101	BSC-1	Engineering Chemistry	70	20	10	30	20	150	3	-	2	4
2.	BT102	BSC-2	Mathematics-I	70	20	10	-	-	100	3	1	-	4
3.	BT103	HSMC-1	English for Communication	70	20	10	30	20	150	3	-	2	4
4.	BT104	ESC-1	Basic Electrical & Electronics Engineering	70	20	10	30	20	150	2	-	2	3
5.	BT105	ESC-2	Engineering Graphics	70	20	10	30	20	150	2	-	2	3
6.	BT106	ESC-3	Manufacturing Practices	-	-	-	15	10	25	-	-	2	1
7.	BT107	DLC-1	Internship-I (60 Hrs Duration) at the Institute level	To be completed during or at the end of the second semester. Its evaluation/credit to be added in third semester.									
8.	BT108	DLC-2	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach				15	10	25	-	-	4	2
			Total	350	100	50	150	100	750	13	1	14	21

Automation and Robotics(AB), Robotics and Mechatronics (RM), Agriculture Engineering (AN), Agriculture Technology (AT), Computer Science & Engineering(CS), Electrical Engineering (EE), Electronics & Instrumentation Engineering (EI), Electric Vehicles (EV), Electrical & Electronics Engineering (EX), Applied Electronics & Instrumentation Engineering (IE), Information Technology (IT), Mining Engineering (MI), Mining and Mineral Processing (MM), 3 D Animation & Graphics (AG), Computer Science & Design (SD), Computer Engineering (CO), Petrochemical Engineering (PC)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal

New Scheme of Examination as per AICTE Flexible Curricula

II Semester (Group A)

Bachelor of Technology (B.Tech.)

W.E.F. JULY 2022

GROUP A: (AB, RM, AN, AT, CS, EE, EI, EV, EX, IE, IT, MI, MM, AG, SD, CO, PC)

S.No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot			L	T	P	
				End Sem.	Mid Sem Exam.	Quiz/ Assignme nt	End Sem.	Lab work & Sessional					
1.	BT201	BSC-3	Engineering Physics	70	20	10	30	20	150	2	1	2	4
2.	BT202	BSC-4	Mathematics-II	70	20	10	-	-	100	3	1	-	4
3.	BT203	ESC-4	Basic Mechanical Engineering	70	20	10	30	20	150	3	-	2	4
4.	BT204	ESC-5	Basic Civil Engineering & Mechanics	70	20	10	30	20	150	3	-	2	4
5.	BT205	ESC-6	Basic Computer Engineering	70	20	10	30	20	150	3	-	2	4
6.	BT206	HSMC-2	Language Lab & Seminars	-	-	-	30	20	50	-	-	2	1
7.	BT107	DLC-1	Internship-I (60 Hrs Duration) at the Institute level	To be completed during first/second semester. Its evaluation/credit to be added in third semester.									
			Total	350	100	50	150	100	750	14	2	10	21

Automation and Robotics(AB), Robotics and Mechatronics (RM), Agriculture Engineering (AN), Agriculture Technology (AT), Computer Science & Engineering(CS), Electrical Engineering (EE), Electronics & Instrumentation Engineering (EI), Electric Vehicles (EV), Electrical & Electronics Engineering (EX), Applied Electronics & Instrumentation Engineering (IE), Information Technology (IT), Mining Engineering (MI), Mining and Mineral Processing (MM), 3 D Animation & Graphics (AG), Computer Science & Design (SD), Computer Engineering (CO), Petrochemical Engineering (PC)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal

New Scheme of Examination as per AICTE Flexible Curricula

I Semester (Group B)

Bachelor of Technology (B.Tech.)

W.E.F. JULY 2022

GROUP B: (AD, AL, CL, AU, BM, CE, CI, CM, DS, EC, FT, IO, IP, IS, ME, RA, CY, CN, CD, AI, IA)

S.No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot			L	T	P	
				End Sem.	Mid Sem Exam.	Quiz/ Assignme nt	End Sem.	Lab work & Sessional					
Mandatory Induction Program (First three weeks)				Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards classes will start													
1.	BT201	BSC-3	Engineering Physics	70	20	10	30	20	150	2	1	2	4
2.	BT102	BSC-2	Mathematics-I	70	20	10	-	-	100	3	1	-	4
3.	BT203	ESC-4	Basic Mechanical Engineering	70	20	10	30	20	150	3	-	2	4
4.	BT204	ESC-5	Basic Civil Engineering & Mechanics	70	20	10	30	20	150	3	-	2	4
5.	BT205	ESC-6	Basic Computer Engineering	70	20	10	30	20	150	3	-	2	4
6.	BT206	HSMC-2	Language Lab & Seminars	-	-	-	30	20	50	-	-	2	1
7.	BT107	DLC-1	Internship-I (60 Hrs Duration) at the Institute level	To be completed during first/second semester. Its evaluation/credit to be added in third semester.									
			Total	350	100	50	150	100	750	14	2	10	21

Artificial Intelligence and Data Science (AD), CSE-Artificial Intelligence and Machine Learning(AL), Artificial Intelligence and Machine Learning(CL), Automobile Engineering (AU), Biomedical Engineering (BM), Civil Engineering (CE), Computer Science & Information Technology(CI), Chemical Engineering (CM), Data Science (DS), Electronics & Communication Engineering (EC), Fire Technology & Safety Engineering (FT), CSE –IOT(IO), Industrial Production Engineering (IP), CSE- IOT and Cyber Security Including Block Chain Technolgy (IS), Mechanical Engineering (ME), Robotics and Artificial Intelligence (RA), CSE-Cyber Security (CY), Cyber Security (CN), CSE-Data Science (CD), Artificial Intelligence (AI), CSE-Artificial Intelligence (IA)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

New Scheme of Examination as per AICTE Flexible Curricula

II Semester (Group B)

Bachelor of Technology (B.Tech.)

W.E.F. JULY 2022

GROUP B: (AD, AL, CL, AU, BM, CE, CI, CM, DS, EC, FT, IO, IP, IS, ME, RA, CY, CN, CD, AI, IA)

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5.	BT105	ESC-2	Engineering Graphics	70	20	10	30	20	150	2	-	2	3
6.	BT106	ESC-3	Manufacturing Practices	-	-	-	15	10	25	-	-	2	1
7.	BT107	DLC-1	Internship-I (60 Hrs Duration) at the Institute level	To be completed during or at the end of the second semester. Its evaluation/credit to be added in third semester.									
8.	BT108	DLC-2	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach				15	10	25	-	-	4	2
			Total	350	100	50	150	100	750	13	1	14	21

Artificial Intelligence and Data Science (AD), CSE-Artificial Intelligence and Machine Learning(AL), Artificial Intelligence and Machine Learning(CL), Automobile Engineering (AU), Biomedical Engineering (BM), Civil Engineering (CE), Computer Science & Information Technology(CI), Chemical Engineering (CM), Data Science (DS), Electronics & Communication Engineering (EC), Fire Technology & Safety Engineering (FT), CSE –IOT(IO), Industrial Production Engineering (IP), CSE- IOT and Cyber Security Including Block Chain Technology (IS), Mechanical Engineering (ME), Robotics and Artificial Intelligence (RA), CSE-Cyber Security (CY), Cyber Security (CN), CSE-Data Science (CD), Artificial Intelligence (AI), CSE-Artificial Intelligence (IA)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
New Scheme Based On AICTE Flexible Curricula
B.Tech. First Year

Branch- Common to All Disciplines

BT101	Engineering Chemistry	3L-0T-2P	4 Credits
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Course Contents:

(i) Water – Analysis, Treatments and Industrial Applications (4 Lectures)

Sources, Impurities, Hardness & its units, Determination of hardness by EDTA method, Alkalinity & Its determination and related numerical problems.

(ii) Boiler problem & softening methods (4 Lectures)

Boiler troubles (Sludge & Scale, Priming & Foaming, Boiler Corrosion, Caustic Embrittlement), Softening methods (Lime-Soda, Zeolite and Ion Exchange Methods) and related numerical problems.

(iii) Lubricants and Lubrication (4 Lectures)

Introduction, Mechanism of lubrication, Classification of lubricants, significance & determination of Viscosity and Viscosity Index, Flash & Fire Points, Cloud & Pour Points, Aniline Point, Acid Number, Saponification Number, Steam Emulsification Number and related numerical problems.

(iv) Polymer & polymerization (4 Lectures)

Introduction, types of polymerisation, Classification, mechanism of polymerisation (Free radical & Ionic polymerization). Thermoplastic & Thermosetting polymers Elementary idea of Biodegradable polymers, preparation, properties & uses of the following polymers- PVC, PMMA, Teflon, Nylon 6, Nylon 6:6, Polyester phenol formaldehyde, Urea- Formaldehyde, Buna N, Buna S, Vulcanization of Rubber.

(v) Phase equilibrium and Corrosion (5 Lectures)

Phase diagram of single component system (Water) Phase diagram of binary Eutectic System (Cu-Ag.) Corrosion: Types, Mechanisms & prevention.

(vi) Spectroscopic techniques and application (6 Lectures)

Principle, Instrumentation & Applications, electronics spectroscopy, Vibrational & Rotational Spectroscopy of diatomic molecules.

(vii) Periodic properties (4 Lectures)

Effective Nuclear Charge, Variations: s, p, d & f Orbital energies of atoms in periodic table, Electronics Configuration, atomic & Ionic sizes, electron affinity & electro negativity, Polarizability & Oxidation States.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular

w.e.f. July 2022

- energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Practical List

NOTE: At least 8 of the following core experiments must be performed during the session.

- Water testing**
 - Determination of Total hardness by Complexometric titration method.
 - Determination of mixed alkalinity
 - OH & CO₃**
 - CO₃ & HCO₃**
 - Chloride ion estimation by Argentometric method.
- Fuels & Lubricant testing:**
 - Flash & fire points determination by
 - Pensky Martin Apparatus,
 - Abel's Apparatus
 - Cleveland's open cup Apparatus
 - Calorific value by bomb calorimeter.
 - Viscosity and Viscosity index determination by
 - Redwood viscometer No.1
 - Redwood viscometer No.2
 - Proximate analysis of coal
 - Moisture content
 - Ash content
 - Volatile matter content
 - Carbon residue
 - Steam emulsification No & Aniline point determination
 - Cloud and Pour point determination of lubricating oil
- Alloy Analysis**
 - Determination of percentage of Fe in an iron alloy by redox titration using N-Phenyl anthranilic acid as internal indicator.
 - Determination of Cu and or Cr in alloy by Iodometric Titration.
 - Determination of % purity of Ferrous Ammonium Sulphate & Copper Sulphate.

Reference Books :

- Chemistry in Engineering and Technology - Vol.1 &2 Kuriacose and Rajaram , McGraw Hill Education
- Fundamental of Molecular Spectroscopy C.N. Banwell , McGraw Hill Education
- Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
- Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand &Company Ltd., Delhi.
- Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
- Elementary Spectroscopy ,Y .R. Sharma , S. Chand Publishing
- Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International Pvt. Ltd
- Advanced Inorganic Chemistry, G.R. Chatwal, Goal Publishing house
- Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
New Scheme Based On AICTE Flexible Curricula
B. Tech. First Year (I Semester)

Branch- Common to All Disciplines

BT102	MATHEMATICS-I	3L-1T-0P	4 Credits
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OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.

To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.

To familiarize the student with functions of several variables that is essential in most branches of engineering.

To develop the essential tool of matrices and linear algebra in a comprehensive manner.

Course Contents:

Module 1: Calculus: (10 hours): Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagranges Multipliers.

Module 2: Calculus: (8 hours): Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumes of the curves.

Module 3: Sequences and series: (6 hours): Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4: Vector Spaces (8hours): Vector Space, Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.

Module 5: Matrices (8 hours): Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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New Scheme Based On AICTE Flexible Curricula
B.Tech. First Year

Branch- Common to All Disciplines

BT103	English for Communication	3L-0T-2P	4 Credits
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COURSE CONTENTS:

Unit-I

Identifying Common errors in writing: Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

Unit-II

Vocabulary building and Comprehension:

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

Unit-III

Communication:

Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

Unit-IV

Developing Writing Skills:

Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report.

Unit-V

Business Correspondence:

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

Books Recommended:

1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood, Macmillan 2007.

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Communicative Language Laboratory:

Course objective: The language laboratory focuses on the practice of English through audio-visual aids and Computer software. It intends to enable the students to speak English correctly with confidence and intends to help them to overcome their inhibitions and self –consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions:

1. Listening Comprehension.
2. Pronunciation, Intonation, Rhythm
3. Practising everyday dialogues in English
4. Interviews.
5. Formal Presentation

Final Assessment should be based on assignment, assessment, presentation and interview of each candidate.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
New Scheme Based On AICTE Flexible Curricula
B.Tech. First Year

Branch- Common to All Disciplines

BT104	Basic Electrical & Electronics Engineering	2L-0T-2P	3Credits
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Course Contents:

Unit- I :

D.C. Circuits: Voltage and current sources, dependent and independent sources, Units and dimensions, Source Conversion, Ohm's Law, Kirchhoff's Law, Superposition theorem, Thevenin's theorem and their application for analysis of series and parallel resistive circuits excited by independent voltage sources, Power & Energy in such circuits. Mesh & nodal analysis, Star Delta transformation & circuits.

Unit – II :

1- phase AC Circuits: Generation of sinusoidal AC voltage, definition of average value, R.M.S. value, form factor and peak factor of AC quantity, Concept of phasor, Concept of Power factor, Concept of impedance and admittance, Active, reactive and apparent power, analysis of R-L, R-C, R-L-C series & parallel circuit

3-phase AC Circuits: Necessity and advantages of three phase systems, Meaning of Phase sequence, balanced and unbalanced supply and loads. Relationship between line and phase values for balanced star and delta connections. Power in balanced & unbalanced three-phase system and their measurements

Unit – III : Magnetic Circuits: Basic definitions, magnetization characteristics of Ferro magnetic materials, self inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F.

Single phase transformer- General construction, working principle, e.m.f. equation, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency, open circuit and short circuit test

Unit IV:

Electrical Machines: Construction, Classification & Working Principle of DC machine, induction machine and synchronous machine. Working principle of 3-Phase induction motor, Concept of slip in 3- Phase induction motor, Explanation of Torque-slip characteristics of 3-Phase induction motor. Types of losses occurring in electrical machines. Applications of DC machine, induction machine and synchronous machine.

Unit V :

Basic Electronics: Number systems & Their conversion used in digital electronics, De morgan's theorem, Logic Gates, half and full adder circuits, R-S flip flop, J-K flip flop. Introduction to Semiconductors, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations, different configurations and modes of operation of BJT

Course outcomes:

The final outcome of the subject will result into an enhancement in understanding the basic concepts of Core Electrical Engineering subjects. The topics covered under this subject will help to enhance the basic understanding of Electrical machines and power systems and basic electronics.

Evaluation: Evaluation will be continuous and integral part of the class followed by final examination.

List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and

verification by load test.

- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.
- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super- synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Study of V-I Characteristics of Diodes.
- Applications of Diodes and their verification.
- Transistor applications as amplifier and switch.
- Verification of truth table for various gates, Flip-Flops.
- Realizations of Various gates, Flip-Flops etc.
- Verification of De Morgan's theorems.

References

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh, Basic Electrical Engineering, P.H.I., 2013
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall, 2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press, 2012
5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
6. B.L. Theraja & A.K. Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication
7. E. Hughes & I.M. Smith Hughes Electrical Technology Pearson
8. Vincent Del Toro Electrical Engineering Fundamentals

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
New Scheme Based On AICTE Flexible Curricula
B.Tech. First Year

Branch- Common to All Disciplines

BT105	Engineering Graphics	2L-0T-2P	3Credits
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Course Objective:

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Contents:

Traditional Engineering Graphics: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Computer Graphics: Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

Module 1: Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Module 2: Orthographic Projections covering, Principles of Orthographic Projections- Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module 3: Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module 4: Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 5: Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids;

Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Module 6: Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]

Module 7: Customisation & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module 8: Annotations, layering & other functions covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Module 9: Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Goals & Outcomes:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

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B.Tech. First Year

Branch- Common to All Disciplines

BT106	Manufacturing Practices	0L-0T-2P	1Credits
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Course Objective:

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing / fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

Course Contents:

Lectures & videos: (10 hours)

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical & Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications.
- Selection of a suitable technique for meeting a specific fabrication need.
- Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work and also to participate in various national and international technical competitions.
- Introduction to different manufacturing methods in different fields of engineering.
- Practical exposure to different fabrication techniques.
- Creation of simple components using different materials.
- Exposure to some of the advanced and latest manufacturing techniques being employed in the industry.

(ii) Workshop Practice:(60 hours)

1. Machine shop **(10 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(6 hours)**
4. Electrical & Electronics **(8 hours)**
5. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6. Casting **(8 hours)**
7. Smithy **(6 hours)**
8. Plastic moulding & Glass Cutting **(6 hours)**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

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New Scheme Based On AICTE Flexible Curricula
B. Tech. First Year

Branch- Common to All Disciplines

BT201	Engineering Physics	2L-1T-2P	4 Credits
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Course Contents:

Module 1: Wave nature of particles and the Schrodinger equation (8 lectures)

Introduction to Quantum mechanics, Wave nature of Particles, operators ,Time-dependent and time-independent Schrodinger equation for wavefunction, Application: Particle in a One dimensional Box, Born interpretation, Free-particle wavefunction and wave-packets, v_g and v_p relation Uncertainty principle.

Module 2: Wave optics (8 lectures)

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer.

Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Module 3: Introduction to solids (8 lectures)

Free electron theory of metals, Fermi level of Intrinsic and extrinsic, density of states, Bloch's theorem for particles in a periodic potential, Kronig-Penney model(no derivation) and origin of energy bands. V-I characteristics of PN junction, Zener diode, Solar Cell, Hall Effect .

Module 4: Lasers (8 lectures)

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO₂), solid-state lasers(ruby, Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine. Introduction to Optical fiber, acceptance angle and cone, Numerical aperture, V number, attenuation.

Module 5: Electrostatics in vacuum (8 lectures)

Calculation of electric field and electrostatic potential for a charge distribution; Electric displacement, Basic Introduction to Dielectrics, Gradient, Divergence and curl, Stokes' theorem, Gauss Theorem, Continuity equation for current densities; Maxwell's equation in vacuum and non-conducting medium; Poynting vector.

List of Experiment

1. To determine the dispersive power of prism.
2. To determine the λ of sodium light with the help of newton's Ring.
3. Resolving Power of Telescope.
4. YDSE (Young's double slit Experiment).
5. To determine the frequency of AC mains supply.
6. V-I Characteristics of P-N junction diode.
7. To determine the λ of diode loses by single slit diffraction.
8. To determine the plank's constant with the help of photocell.
9. Hall's effect experiment.
10. Calibration of ammeter by using reference zener diode.

11. To study the effect of temperature on reverse saturation current in P-N junction diode and to determine the energy band gap.
12. To determine the λ of sodium by using plane diffraction grating.
13. To determine the prominent lines of mercury source by plane diffraction grating.
14. To determine the numerical aperture of an optical fiber.
15. To determine λ of given laser by plane diffraction grating.

Suggested Reference Books

1. A. Ghatak, Optics.
2. O. Svelto, Principles of Lasers.
3. David Griffiths, Introduction to Electrodynamics.
4. D.J. Griffiths, Quantum Mechanics.
5. Halliday & Resnick, Physics.

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New Scheme Based On AICTE Flexible Curricula
B. Tech. First Year (II Semester)

Branch- Common to All Disciplines

BT202	MATHEMATICS-II	3L-1T-0P	4 Credits
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OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in Ordinary and partial differential equations, complex variables and vector calculus. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.
- To acquaint the student with mathematical tools available in vector calculus needed various field of science and engineering.

Course Contents:

Module 1: Ordinary Differential Equations I :(6 hours) : Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

Module 2: Ordinary differential Equations II:(8 hours) : Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 3: Partial Differential Equations : (8 hours) : Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Module 4: Functions of Complex Variable :(8 hours) : Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

Module 5: Vector Calculus : (10 hours) : Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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B. Tech. First Year

Branch- Common to All Disciplines

BT203	Basic Mechanical Engineering	3L-0T-2P	4 Credits
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Course Contents:

Unit I :

Materials : Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness , ductility, brittleness , malleability etc. of materials , Tensile test- Stress-strain diagram of ductile and brittle materials , Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.

Unit II:

Measurement: Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set.

Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry, welding etc Introduction to Lathe and Drilling machines and their various operations.

Unit III :

Fluids : Fluid properties pressure, density and viscosity etc. Types of fluids , Newton's law of viscosity , Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps .

Unit IV:

Thermodynamics : Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering : Classification and working of boilers, mountings and accessories of boilers, Efficiency and performance analysis, natural and artificial draught, steam properties, use of steam tables.

Unit V:

Reciprocating Machines :

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

Reference Books:

- 1- Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age .
- 2- Nakra & Chaudhary , Instrumentation and Measurements, TMH.
- 3- Nag P.K, Engineering Thermodynamics , TMH .
- 4- Ganesan , Internal Combustion Engines, TMH .
- 5- Agrawal C M, Basic Mechanical Engineering ,Wiley Publication.
- 6- Achuthan M , , Engineering Thermodynamics ,PHI.

List of Suggestive Core Experiments:

Theory related Eight to Ten experiments including core experiments as follows:

- 1- Study of Universal Testing machines.
- 2- Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and Sine-bar.
- 3- Study of Lathe Machine.
- 4- Study of Drilling Machines.
- 5- Verification of Bernoulli's Theorem.
- 6- Study of various types of Boilers.
- 7- Study of different IC Engines.
- 8- Study of different types of Boilers Mountings and accessories.

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Branch- Common to All Disciplines

BT204	Basic Civil Engineering & Mechanics	3L-0T-2P	4 Credits
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Course Contents:

Unit I Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing.

Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

Unit II Surveying & Positioning:

Introduction to surveying Instruments – levels, theodolites, plane tables and related devices.

Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

Unit III Mapping & sensing:

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations, Introduction of remote sensing and its applications.

Engineering Mechanics

Unit IV

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems

Unit – V

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes.

Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

Reference Books:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
5. S.P,Timoshenko, Mechanics of stricture, East West press Pvt.Ltd.
6. Surveying by Duggal – Tata McGraw Hill New Delhi.
7. Building Construction by S.C. Rangwala- Charotar publications House, Anand.
8. Building Construction by Grucharan Singh- Standard Book House, New Delhi
9. Global Positioning System Principles and application- Gopi, TMH
10. R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
11. A. Boresi & Schmidt- Engineering Mechines- statics dynamics, Thomson' Books
12. R.K. Rajput, Engineering Mechanics S.Chand & Co.

List of suggestive core Experiments:

Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting experiments from each unit of syllabus.

1. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.
2. To perform leveling exercise by height of instrument or Rise and fall method.
3. To measure horizontal and vertical angles in the field by using Theodolite.
4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
6. To determine the Compressive Strength of brick.
7. To determine particle size distribution and fineness modulus of coarse and fine Aggregate.
8. To verify the law of Triangle of forces and Lami's theorem.
9. To verify the law of parallelogram of forces.
10. To verify law of polygon of forces
11. To find the support reactions of a given truss and verify analytically.
12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
13. To determine the moment of inertia of fly wheel by falling weight method.
14. To verify bending moment at a given section of a simply supported beam.

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B. Tech. First Year

Branch- Common to All Disciplines

BT205	Basic Computer Engineering	3L-0T-2P	4 Credits
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Course Contents:

UNIT I

Computer: Definition, Classification, Organization i.e. CPU, register, Bus architecture, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software. Computer Application in e-Business, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc.

Operating System: Definition, Function, Types, Management of File, Process & Memory. Introduction to MS word, MS powerpoint, MS Excel

UNIT II

Introduction to Algorithms, Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object oriented Programming. Introduction to C++: Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions,

UNIT III

Object & Classes, Scope Resolution Operator, Constructors & Destructors, Friend Functions, Inheritance, Polymorphism, Overloading Functions & Operators, Types of Inheritance, Virtual functions. Introduction to Data Structures.

UNIT IV

Computer Networking: Introduction, Goals, ISO-OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Introduction to Internet, World Wide Web, E-commerce

Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, Logic bombs, Hacking Spamming, Cyber Defamation, phishing Security measures Firewall, Computer Ethics & Good Practices, Introduction of Cyber Laws about Internet Fraud, Good Computer Security Habits,

UNIT V

Data base Management System: Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages.

Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public, private, community and hybrid clouds), Pros and Cons of cloud computing

List of Experiment

01. Study and practice of Internal & External DOS commands.
02. Study and practice of Basic linux Commands – ls, cp, mv, rm, chmod, kill, ps etc.
03. Study and Practice of MS windows – Folder related operations, My-Computer, window explorer, Control Panel,
04. Creation and editing of Text files using MS- word.
05. Creation and operating of spreadsheet using MS-Excel.
06. Creation and editing power-point slides using MS- power point
07. Creation and manipulation of database table using SQL in MS-Access.
- 08.WAP to illustrate Arithmetic expressions
09. WAP to illustrate Arrays.
10. WAP to illustrate functions.
11. WAP to illustrate constructor & Destructor
12. WAP to illustrate Object and classes.

13. WAP to illustrate Operator overloading
14. WAP to illustrate Function overloading
15. WAP to illustrate Derived classes & Inheritance
16. WAP to insert and delete and element from the Stack
17. WAP to insert and delete and element from the Queue
18. WAP to insert and delete and element from the Linked List

Recommended Text Books:

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Basic Computer Engineering: Silakari and Shukla, Wiley India
3. Fundamentals of Computers : V Rajaraman, PHI
4. Information Technology Principles and Application: Ajoy Kumar Ray & Tinku Acharya PHI.

Recommended Reference Books:

1. Introduction of Computers : Peter Norton, TMH
2. Object Oriented Programming with C++ :E.Balagurusamy, TMH
3. Object Oriented Programming in C++: Rajesh K.Shukla, Wiley India
4. Concepts in Computing: Kenneth Hoganson, Jones & Bartlett.
5. Operating Systems – Silberschatz and Galvin - Wiley India
6. Computer Networks:Andrew Tananbaum, PHI
7. Data Base Management Systems, Korth, TMH
8. Cloud Computing, Kumar, Wiley India

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Branch- Common to All Disciplines

BT206	Language Lab and Seminars	0L-0T-2P	1 Credits
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Course objective: This course intends to impart practical training in the use of English Language for Communicative purposes and aims to develop students' personality through language Laboratory.

Topics to be covered in the Language laboratory sessions:

1. Introducing oneself, family, social roles.
2. Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. To write a book review. Standard text must be selected by the teacher.
5. Role plays: preparation and delivery topic to be selected by teacher/faculty.

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.¹ This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond.

The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students.

The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

¹A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31 March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs.

work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2 Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.²

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

²Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

(1) IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

(2) IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

(3) Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and don't's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.³

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

³The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

<i>Time</i>	<i>Activity</i>
Day 0	
<i>Whole day</i>	<i>Students arrive - Hostel allotment. (Preferably do pre-allotment)</i>
Day 1	
<i>09:00 am - 03:00 pm</i>	<i>Academic registration</i>
<i>04:30 pm - 06:00 pm</i>	<i>Orientation</i>
Day 2	
<i>09:00 am - 10:00 am</i>	<i>Diagnostic test (for English etc.)</i>
<i>10:15 am - 12:25 pm</i>	<i>Visit to respective depts.</i>
<i>12:30 pm - 01:55 pm</i>	<i>Lunch</i>
<i>02:00 pm - 02:55 pm</i>	<i>Director's address</i>
<i>03:00 pm - 05:00 pm</i>	<i>Interaction with parents</i>
<i>03:30 pm - 05:00 pm</i>	<i>Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)</i>

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We first show a typical daily timetable.

<i>Sessn.</i>	<i>Time</i>	<i>Activity</i>	<i>Remarks</i>
Day 3 onwards			
	<i>06:00 am</i>	<i>Wake up call</i>	
I	<i>06:30 am - 07:10 am</i>	<i>Physical activity (mild exercise/yoga)</i>	
	<i>07:15 am - 08:55 am</i>	<i>Bath, Breakfast, etc.</i>	
II	<i>09:00 am - 10:55 am</i>	<i>Creative Arts / Universal Human Values</i>	<i>Half the groups do Creative Arts</i>
III	<i>11:00 am - 12:55 pm</i>	<i>Universal Human Values / Creative Arts</i>	<i>Complementary alternate</i>
	<i>01:00 pm - 02:25 pm</i>	<i>Lunch</i>	
IV	<i>02:30 pm - 03:55 pm</i>	<i>Afternoon Session</i>	<i>See below.</i>
V	<i>04:00 pm - 05:00 pm</i>	<i>Afternoon Session</i>	<i>See below.</i>
	<i>05:00 pm - 05:25 pm</i>	<i>Break / light tea</i>	
VI	<i>05:30 pm - 06:45 pm</i>	<i>Games / Special Lectures</i>	
	<i>06:50 pm - 08:25 pm</i>	<i>Rest and Dinner</i>	
VII	<i>08:30 pm - 09:25 pm</i>	<i>Informal interactions (in hostels)</i>	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

<i>Activity</i>	<i>Session</i>	<i>Remarks</i>
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book Reading / Lecture)	IV	For 3-5 days
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

<i>Time</i>	<i>Activity</i>
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor-mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological

etc. (For every 10 undergraduate first year students, there would be a senior student as a *student guide*, and for every 20 students, there would be a *faculty mentor*.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline⁴.

Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.

It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta-skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The *Induction Program* is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The *Universal Human Values* component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and

⁴We are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept.

nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:

Motivating UG Students Towards Studies,

Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors),
31 March 2016, IIT Directors' Secretariat, IIT Delhi.

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18 June 2017

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

New Scheme of Examination as per AICTE Flexible Curricula

III Semester

Bachelor of Technology (B.Tech.) [Electronics & Communication Engineering]

For batches admitted in July, 2020 (w.e.f. July, 2021)

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1.	BT301	BSC-5	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2.	EC302	DC-1	Electronic Measurement & Instrumentation	70	20	10	-	-	100	3	1	-	4
3.	EC303	DC-2	Digital System Design	70	20	10	30	20	150	3	-	2	4
4.	EC304	DC-3	Electronic Devices	70	20	10	30	20	150	3	-	2	4
5.	EC305	DC-4	Network Analysis	70	20	10	30	20	150	3	-	2	4
6.	EC306	DLC-3	EMI Lab	-	-	-	30	20	50	-	-	4	2
7.	BT107	DLC-1	Evaluation of Internship-I completed at I year level	-	-	-	-	50	50			4	2
8.	BT307	DLC-4	90 hrs Internship based on using various software's –Internship -II	To be completed anytime during Third/ fourth semester. Its evaluation/credit to be added in fifth semester.									
			Total	350	100	50	120	130	750	15	2	14	24
9.	BT308	MC	Indian Constitution	Non-credit course									
NC301		NSS/NCC											

*Students can earn additional credits from the University recognized MOOC courses.

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT301	Mathematics-III	3L-1T-0P	4 Credits
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OBJECTIVES: The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- To introduce effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.
- To enable young technocrats to acquire mathematical knowledge to understand Laplace transformation, Inverse Laplace transformation and Fourier Transform which are used in various branches of engineering.
- To acquaint the student with mathematical tools available in Statistics needed in various field of science and engineering.

Module 1: Numerical Methods – 1: (8 hours): Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods – 2: (6 hours): Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Module 3: Numerical Methods – 3: (10 hours): Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus: (8 hours): Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering III-Semester

EC302 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Unit-1 Theory of Measurement: Introduction, Characteristics of Instruments and measurement systems (Static & Dynamic) Error analysis: Sources, types and statistical analysis. Instrument Calibration: Comparison Method. DC and AC Ammeter, DC Voltmeter- Chopper type and solid-state, AC voltmeter using Rectifier. Average, RMS, Peak responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

Unit-2 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

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

Unit-3 (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, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor

Unit-4 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) and Liquid Crystal Display(LCD).

Unit-5 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 multi-meter.

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

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering III-Semester

EC303 DIGITAL SYSTEM DESIGN

Unit-1 Number Systems: 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, NAND-NOR implementations – Multi level gate implementations- Multi output gate implementations.

Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality, Boolean function, Canonical and standard forms, Minimization of Boolean functions, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method of minimization.

Unit-2 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/De-multiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

Unit-3. 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-4 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-5 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/Reference Books:

1. Malvino & Leach, "Digital Principles and Applications", TMH.
2. M. Morris Mano, "Digital Logic Design", PHI
3. R.P. Jain, "Modern Digital Design", TMH.
4. S. Salivahanan & S. Arivazhagan, "Digital Circuits and Design", Vikas Publishing.
5. D. Roy Chaudhuri, Digital Circuits, "An Introduction Part -1 & 2", Eureka Publisher.
6. Ronald J Tocci , "Digital Systems, Principles and Applications", PHI.
7. Taub & Schilling, "Digital Integrated Electronics", TMH.

DIGITAL SYSTEM DESIGN LAB

1. Study of different basic digital logic gates and verification of their Truth Table.
2. Study and verification of the law of Boolean Algebra and De-Morgan's Theorem.
3. Construction and verification of various combinational circuits such as Half Adder, Full Adder, Half & Full Subtractor.
4. Study of Multiplexer, De-multiplexer.
5. Study of Different Code Converters, Encoder, Decoder.
6. Construction and verification of various types of Flip-Flops using gates and IC's.
7. Construction and Verification of different Shift Registers.
8. Construction and verification of different types of Counters.
9. Study of important TTL technologies, Verifications of important TTL Circuit Parameters.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering III-Semester

EC304 Electronic Devices

Unit-1 Semiconductor Material Properties: Elemental & compound semiconductor materials, Bonding forces and Energy bands in intrinsic and extrinsic silicon, Charge carrier in semiconductors, carrier concentration, Junction properties, Equilibrium condition, biased junction, Steady state condition, breakdown mechanism (Rectifying Diodes, Zener Diodes), Metal Semiconductor Junction.

Special diodes: Tunnel diodes, Varactor diodes, Schottky diode, Photo diodes, Photodetector, LED, solar cell.

Unit-2 Diode circuits: Ideal and Practical diode, Clipper, Clamper.

Power Supply: Rectifiers-Half wave, Full wave, Bridge rectifier, filter circuits, Voltage regulation using shunt & series regulator circuits, Voltage regulation using IC.

Unit-3 Fundamentals of BJT: Construction, basic operation, current components and equations, CB, CE and CC configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region. BJT as an amplifier. Ebers-Moll model, Power dissipation in transistor (P_d , max rating), Photo transistor. Transistor biasing circuits and analysis: Introduction, various biasing methods: Fixed bias, Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point and Bias Stabilization and Thermal Runaway. Transistor as a switch.

Unit-4 Small Signal analysis: Small signal Amplifier, Amplifier Bandwidth, Hybrid model, analysis of transistor amplifier using h-parameter, Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier and cas-code amplifier, Coupling methods in multistage amplifier, Low and high frequency response, Hybrid π model, Current Mirror circuits. Large Signal analysis and Power Amplifiers: Class A, Class B, Class AB, Class C, Class D, Transformer coupled and Push-Pull amplifier.

Unit-5 FET construction- JFET: Construction, n-channel and p-channel, transfer and drain characteristics, parameters, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET drain and transfer Characteristics. Uni-junction Transistor (UJT) and Thyristors: UJT: Principle of operation, characteristics, UJT relaxation oscillator.

Text/Reference Books:

1. Millman & Halkias, "Electronic Devices And Circuits", TMH.
2. Salivahanan, Kumar & Vallavaraj, "Electronic Devices And Circuits", TMH.
3. Boylestad & Neshelsky, "Electronic Devices & Circuits", PHI.
4. Schilling & Belove, "Electronic Circuits , Discrete & Integrated", TMH.
5. Chattopadhyay & Rakhshit, "Electronic Fundamentals & Applications", New Age
6. Adel S. Sedra & Kenneth C. Smith, "Microelectronic Circuits", OUP.
7. R. A. Gayakwad, "Op-Amps And Linear Integrated Circuits", PHI
8. Theodore F. Bogart, Jeffrey S. Beasley, "Guillermo Rico Electronic Devices & Circuits".
9. Allen Mottershead, "Electronic Devices & Circuits".

ELECTRONIC DEVICES LAB

1. Diode Characteristic
 - a) pn junction diode Characteristics and Static & Dynamic resistance measurement from graph.
 - b) To plot Zener diode Characteristics curve.
2. Clipper Clamper
 - a) To plot the Characteristics curve of various clamper circuits.
 - b) To plot the Characteristics curve of various clamper circuits.
3. Half wave, full wave & bridge rectifier
 - a) To measure V_{rms} , V_{dc} for half wave, full wave & bridge rectifier.
 - b) To measure ripple factor, ratio of rectification for full wave & half wave rectifier.
4. Voltage regulation using zener diode shunt regulator and transistor series voltage regulator in the following cases
 - a) Varying input
 - b) Varying load
5. Characteristic of BJT
 - a) To plot the input & output Characteristics curve in CB & CE configuration
 - b) To find α & β and Q point from the above curve.

- c) To plot the Characteristics curve of various clipper circuits.
- 6. h- Parameter
 - To measure h- parameter (A_v , A_i , R_o & R_i) in CE Amplifier
- 7. Multi Stage Amplifier
 - a) To plot the Characteristics curve for Direct Coupled Amplifier.
 - b) To plot the Characteristics curve for RC Coupled Amplifier.
 - c) To plot the Characteristics curve for transformer Coupled Amplifier.
- 8. FET Characteristic
 - a) To plot the Characteristics curve for n channel – JFET in CS configuration.
 - b) To find out pinch off voltage from the above characteristics curve
- 9. UJT Characteristic
 - a) To plot the Characteristics curve for UJT.
 - b) To determine intrinsic stand off ratio.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering III-Semester

EC305 Network Analysis

Unit-1 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

Unit-2 Network Graph theory: Concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks

Unit-3 Network Theorems: Thevenins & Norton's, Super positions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Unit-4 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.

Unit-5 Two port parameters: Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Reciprocity and Symmetry in all parameter.

Text/Reference Books: 1. M.E. Van Valkenburg, Network Analysis, (Pearson)
2. S P Ghosh A K Chakraborty Network Analysis & Synth. (MGH).
3. <http://www.nptelvideos.in/2012/11/networks-and-systems.html>

REFERENCE:- 1. Sudhakar-Circuit Network Analysis & Synth(TMh).
2. J. David Irwin Engineering Circuit analysis tenth edition, Wiley india.
3. Kuo- Network Analysis & Synthesis, Wiley India.
4. Robert L Boylestad introductory Circuit analysis, Pearson
5. Smarajit Ghosh, NETWORK THEORY: ANALYSIS AND SYNTHESIS (PHI).

6. Roy Choudhary D; Network and systems; New Age Pub.
7. Bhattacharya and Singh- Network Analysis & Synth (Pearson)

EXPERIMENTS LIST:-

1. To Verify Thevenin Theorem and Superposition Theorem.
2. To Verify Reciprocity Theorem and Millman's Theorem.
3. To Verify Maximum Power Transfer Theorem.
4. To Determine Open Circuit and Short Circuit parameters of a Two Port Network.
5. To Determine A,B, C, D parameters of a Two Port Network.
6. To determine h parameters of a Two Port Network.
7. To Find Frequency Response of RLC Series Circuit RLC parallel Circuit and determine resonance and 3dB frequencies.
8. To determine charging and discharging times of Capacitors.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering III-Semester

EC306 EMI Lab

List of Experiments:

- 1. Study of Cathode Ray Oscilloscope.**
- 2. Study of displacement measurement by LVDT.**
- 3. Force measurement by strain gauge.**
- 4. Measurement of Capacitor using Q-meter.**
- 5. Measurement of Self-induction using Q-meter.**
- 6. Temperature measurement by thermistor.**
- 7. Study of optical Transducers: Photo-diode, Photo-Transistor.**
- 8. Design of digital to analog converter, R-2R ladder Type and analysis of its characteristics.**
- 9. To measurement of the unknown Inductance by using Maxwell's bridge method.**
- 10. To measurement of the unknown capacitance by using Schering bridge method.**
- 11. To measurement of the unknown Frequency by using Wein's bridge method.**
- 12. To measurement of the unknown Inductance by using Hay's bridge method.**
- 13. To calculate Frequency and amplitude using CRO & Function Generator.**
- 14. To calculate Frequency using Lissajious Pattern.**
- 15. To study RVDT.**
- 16. Study of Function Generator.**
- 17. Temperature measurement by thermocouple.**
- 18. Temperature measurement by RTD.**
- 19. Study of optical Transducers: Photo conductive, Photo voltaic.**
- 20. To study digital Multimeter.**

Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal

Scheme of Examination as per AICTE Flexible Curricula

IV Semester

Bachelor of Technology (B.Tech.) [Electronics & Communication Engineering]

For batches admitted in July, 2020 (w.e.f. Jan, 2022)

S. No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Term work					
								Lab Work & Sessional					
1.	ES401	BSC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
2.	EC402	DC	Signals & Systems	70	20	10	30	20	150	2	1	2	4
3.	EC403	DC	Analog Communication	70	20	10	30	20	150	3	1	2	5
4.	EC404	DC	Control System	70	20	10	30	20	150	3	1	2	5
5.	EC405	DC	Analog Circuits	70	20	10	30	20	150	3	0	2	4
6.	EC406	DLC*	Simulation Lab	-	-	-	30	20	50	-	-	4	2
7.	BT407	DLC	90 hrs Internship based on using various software’s –Internship -II	To be completed anytime during fourth semester. Its evaluation/credit to be added in fifth semester.									3
		Total		350	100	50	150	100	750	14	4	12	24
8.	BT408	MC	Cyber Security	Non-credit course									
9.	BT409I	MC	Indian Knowledge System	Non-credit course									
	NC001	NSS/NCC											

*A minimum of 2hours per week should be allotted for the Virtual Lab along with the slot fixed for the conventional lab classes.

MST: Minimum of two mid semester tests to be conducted.

*Students can earn additional credits from the University recognized MOOC courses.

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES401	Energy & Environmental Engineering	3L-1T-0P	4 Credits
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The objective of this Course is to provide *an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.*

Module 1: Introduction to Energy Science:

Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

Module2: Ecosystems

- Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3: Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module 4: Environmental Pollution

- Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster

management: floods, earthquake, cyclone and landslides.

Module 5: Social Issues and the Environment

- From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies
Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies
Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Module 6: Field work

- Visit to a local area to document environmental assets-
river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC402 Signals & Systems

Unit-1 Introduction of Signals and Systems: Definition of signal, Classification of Signal and representation: Continuous time and discrete time, even/odd, periodic/apperiodic, random/deterministic, energy/power, one/multidimensional, some standard signals, , Basic Operations on Signals for CT/DT signal, transformation of independent & dependent variables,

Definition of system and their classification: CT/DT, linear/non-linear, variant/non-variant, causal and non-causal system state/dynamic system, interconnection of systems. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

Unit-2 Linear Time- Invariant Systems: Introduction, Impulse Response Representation for LTI Systems, Convolution, Properties of the Impulse Response Representation for LTI Systems, Difference Equation for LTI Systems, Block Diagram Representations(direct form-I, direct form-II, Transpose, cascade and parallel). Impulse response of DT-LTI system and its properties.

Unit-3 z-Transform: Introduction, ROC of finite duration sequence, ROC of infinite duration sequence, Relation between Discrete time Fourier Transform and z-transform, properties of the ROC, Properties of z-transform, Inverse z-Transform, Analysis of discrete time LTI system using zTransform, Unilateral z-Transform.

Unit-4 Fourier analysis of discrete time signals: Introduction, Properties and application of discrete time Fourier series, Representation of Aperiodic signals, Fourier transform and its properties, Convergence of discrete time Fourier transform, Fourier Transform for periodic signals, Applications of DTFT.

Unit-5 State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction:

Reference Books:

1. Simon Haykin, "Signals and Systems", John Wiley.
2. Simon Haykin, "Analog and Digital Communications", John Willey.
3. Bruce Carlson, "Signals and Systems", TMH.

4. Oppenheim & Wilsky, "Signals & Systems", PHI.
5. Taub and Schilling "Principles of communication signals", 2nd ed. New York: Mcgraw-Hill, 1986.

LIST OF EXPERIMENTS

1. Introduction to MATLAB Tool.
2. To implement delta function, unit step function, ramp function and parabolic function for continuous-time.
3. To implement delta function, unit step function, ramp function and parabolic function for discrete-time.
4. To implement rectangular function, triangular function, sinc function and signum function for continuous-time.
5. To implement rectangular function, triangular function, sinc function and signum function for discrete-time.
6. To explore the communication of even and odd symmetries in a signal with algebraic operations.
7. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling & shifting).
8. To explore the time variance and time invariance property of a given system.
9. To explore causality and non-causality property of a system.
10. To demonstrate the convolution of two continuous-time signals.
11. To demonstrate the correlation of two continuous-time signals.
12. To demonstrate the convolution of two discrete-time signals.
13. To demonstrate the correlation of two discrete-time signals.
14. To determine Magnitude and Phase response of Fourier Transform of given signals.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC403 Analog Communication

Unit-1

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).

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.
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 modulatorand AM Demodulator using PLL.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC404 Control System

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 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 (Buterworth 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.
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 & design.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC405 Analog Circuits

COURSE CONTENTS:

Feedback Amplifier and Oscillators: Concept of feedback and their types, Amplifier with negative feedback and its advantages. Feedback Topologies.

Oscillators: Concept of Positive feedback, Classification of Oscillators, Barkhausen criterion, Types of oscillators: RC oscillator, RC Phase Shift, Wien Bridge Oscillators. LC Oscillator: Hartley, Colpitt's, Clapp and Crystal oscillator.

Introduction to integrated circuits: Advantages and characteristic parameters of IC's, basic building components, data sheets

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 op-AMP.

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 converter.

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

TEXT BOOKS:

1. Ramakant A. Gaikward, "OP- Amp and linear Integrated circuits" Third edition 2006, Pearson.
2. B. Visvesvara Rao Linear Integrated Circuits Pearson.
3. <http://www.nptelvideos.in/2012/11/analog-ics.html>
4. <http://nptel.ac.in/courses/117108107/>

REFERENCES:

1. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press, 2nd edition, 2010.
2. D. Roy Choudhury: Linear Integrated Circuits New Age Publication.
3. B. Somanathan Nair: Linear Integrated Circuits analysis design and application Wiley India Pvt. Ltd.
4. Maheshwary and Anand: Analog Electronics, PHI.
5. S. Salivahanan, V S Kanchana Bhaaskaran: Linear Integrated Circuits", second edition, McGraw Hill.
6. Gray Hurst Lewis Meyer Analysis and design of analog Integrated Circuits fifth edition Wiley India.
7. Robert F. Coughlin, Frederick F. Driscoll: Operational Amplifiers and Linear Integrated Circuits, sixth edition, Pearson.
8. Millman and Halkias: Integrated electronics, TMH.
9. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
10. Sedra and Smith: Microelectronics, Oxford Press.

List of Experiments :

Apparatus Required –Dual Channel Cathode Ray Oscilloscope (0-20 MHz), Function Generator (10MHz and above), Dual Power Supply, LM741, TL082, MPY634, TPS7250, Probes, digital multimeter.

1. To measure and compare the op-amp characteristics: offset voltages, bias currents, CMRR, Slew Rate of OPAMP LM741 and TL082.
2. To determine voltage gain and frequency response of inverting and non-inverting amplifiers using TL082.
3. To design an instrumentation amplifier and determine its voltage gain using TL082.
4. To design op-amp integrator (low pass filter) and determine its frequency response.
5. To design op-amp differentiator (high pass filter) and determine its frequency response.

6. Design 2nd order Butterworth filter using universal active filter topology with LM741
7. To design Astable, Monostable and Bistable multivibrator using 555 and analyse its characteristics.
8. Automatic Gain Control (AGC) Automatic Volume Control (AVC) using multiplier MPY634
9. To design a PLL using opamp with MPY634 and determine the free running frequency, the capture range and the lock in range of PLL
10. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250 IC.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC406 Simulation Lab

COURSE CONTENTS: Introduction to circuit simulation software (TINA-PRO/ PSPICE/ CIRCUIT MAKER). Study of the key features and applications of the software in the field of Electronic Circuits, Electronic Instrumentation and Network Analysis.

Design, Optimization and simulation of;

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

Introduction to 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. Students should simulate and design the PCB for at least two circuits they are learning in the current semester.

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B.Tech.) Electronics & Communication Engg. (w.e.f. July, 2019)

V Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1.	EC 501	DC	Microprocessor & its Application	70	20	10	30	20	150	2	1	2	4
2.	EC 502	DC	Digital Communication	70	20	10	30	20	150	2	1	2	4
3.	EC 503	DE	Departmental Elective	70	20	10	-	-	100	4	-	0	4
4.	EC 504	OE	Open Elective	70	20	10	-	-	100	3	-	0	3
5.	EC 505	D Lab	CNTL Lab	-	-	-	30	20	50	-	-	4	2
6.	EC 506	O/E Lab	Matlab Programming	-	-	-	30	20	50	-	-	4	2
7.	BT-407	IN	Evaluation of Internship-II	-	-	-	-	100	100	-	-	6	3
8.		IN	Internship-III	To be completed anytime during Fifth/Sixth semester. Its evaluation/credit to be added in Seventh Semester.									
9.	EC 508	P	Minor Project 1	-	-	-	-	50	50	-	-	4	2
10.	Additional Credits [#]	[#] Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.											
			Total	280	80	40	120	230	750	11	2	22	24

Departmental Electives	Open Electives
EC 503 (A) CNTI	EC 504 (A) EMT (Electro Magnetic (Theory)
EC 503 (B) Mobile Communication	EC 504 (B) Computer System Organisation
EC 503 (C) Advanced Control system	EC 504 (C) Process Control Instrumentation

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

EC501 MICROPROCESSOR AND ITS APPLICATIONS

UNIT I Salient features of advanced microprocessors. RISC & CISC processors. Review and evolution of advanced microprocessors:8086,8088, 80186/286/386/486/Pentium, introduction to 8086 processor: Register organization of 8086,Architecture,signal description of 8086,minimum mode 8086 systems and timings and maximum mode 8086 systems and timings

UNIT II Intel 8086 microprocessor programming: 8086 Instruction Set, Addressing modes, Assembly Language Programming with Intel 8086 microprocessor

UNIT III Introduction to the various interfacing chips like 8155, 8255, Interfacing key boards, LEDs , ADC, DAC and memory Interfacing.

UNIT IV General purposes programmable peripheral devices (8253), 8254 programmable interval timer, 8259A programmable interrupt controller & 8257 DMA controller, USART, serial I/O & data Communication .

UNIT V Introduction to microcontrollers (8051) and embedded systems: 8051 architecture, pin description , I/O configuration , interrupts, addressing modes, an overview of 8051 instruction set, embedded system, use of microcontrollers in embedded systems

Reference Books:

1. Advance microprocessor and peripheral –A.K. Ray and K. M. Bhurchandi, Tata McGraw Hill
2. Microprocessor and Interfacing – D.V.Hall, McGraw Hill.
3. The Intel microprocessor - Barry B. Brey, Pearson
4. The 8086 & 8088 Microprocessor- LIU and Gibson, Tata McGraw Hill
5. The 8051 microcontroller and embedded systems-M.A. Mazidi, Janice GillispieMazidi, Pearson Prentice Hall

EC502 DIGITAL COMMUNICATION

Unit I

Sampling theorem for low pass and band pass signals, Ideal sampling, Natural sampling, Flat top sampling, crosstalk, aliasing, time division multiplexing, PAM, PWM and PPM their generation and detection.

Unit II

Pulse code modulation, Quantization, quantization noise, companding, Inter symbol interference, Eye pattern, Delta and adaptive modulation, Encoding techniques: On-Off signaling, Polar signaling, RZ signaling, Bipolar signaling, AMI, Manchester code, Differential encoding their advantage and disadvantages.

Unit III

Band pass data transmission: ASK, Binary phase shift keying (BPSK), QPSK, DPSK, coherent and non coherent BFSK, minimum shift keying, QAM, Concept of M-ary PSK and M-ary FSK. Spectral properties of QPSK and MSK.

UNIT IV

Matched filter and correlator detector. Gram Schmidt orthogonalization procedure and concept of signal space for the computation of probability of error, calculation of error probability for BPSK, QPSK, QAM and coherent BFSK, comparison of different modulation techniques.

Unit V

Concept of information theory, entropy, information rate, channel capacity, Shannon's theorem, Shannon Hartley theorem, BW and signal to noise ratio trade off, sources encoding, extension of zero memory source, Error correcting codes: linear block codes and cyclic codes: encoder and decoder circuits, burst error correcting codes, concept of convolution codes.

Reference Books:

1. Communication Systems –Simon Haykins, Wiley
2. Principle of Communication Systems-Taub and Schilling, Tata McGraw-Hill
3. Communication Systems-Singh and Sapre, Tata McGraw-Hill

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering V-Semester

Departmental Elective EC- 503 (A) Communication Network and Transmission Lines (CNTL)

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, liner 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. Academic Session 2017-18

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.

References:

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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering V-Semester

Departmental Elective EC- 503 (B) MOBILE COMMUNICATION

Unit I Introduction to wireless communication systems, different generations of wireless networks. Cellular system design fundamentals, frequency reuse, handoff strategies, Interference and system capacity, Trunking and grade of service.

Unit II Mobile radio propagation: free space propagation model, Ground reflection propagation model, Long term fading, Small scale multipath propagation, Time dispersion parameters, Coherence bandwidth, Doppler spread and coherence time, types of small scale fading, Clarke's model for flat fading, level crossing and fading statistics.

Unit III Capacity in cellular systems, cell splitting and sectoring, cell-site antennas and mobile antenna, cochannel interference reduction, Frequency management and channel assignment.

Unit IV Frequency division and time division multiple access. Global System for Mobile: System Architecture. GSM Radio subsystem, GSM. GSM Traffic Channel and Control Channel, Frame Structure.

Unit V Spread spectrum multiple access (Frequency Hopped Multiple Access and Code Division Multiple Access). Different spreading codes. CDMA Digital Cellular system: different standards with detailed description of forward and reverse channels. Capacity of cellular systems.

Reference Books:

1. Mobile cellular telecommunication- W. C. Lee, McGraw-Hill
2. Wireless communication -T. S. Rappaport, Prentice Hall
3. Wireless communication – Simon Haykins, Pearson

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering V-Semester

Departmental Elective EC- 503 (C) ADVANCED CONTROL SYSTEM

Unit I Advantages and disadvantages of digital control system, Ideal sampler, sampled and hold circuit, zero order hold circuit, Z transform, Inverse Z transform by various method, mapping between s plane and Z plane, solution of the linear difference equation.

Unit II Pulse transfer function, general procedure for obtaining pulse transfer function, pulse transfer function of cascaded elements, pulse transfer function of closed loop systems. Transfer function of discrete data system, stability analysis of closed loop system in the z plane, Jury stability test.

Unit III Non Linear Systems: introduction , common physical non linearity's, phase plane method , basic concepts ,singular points, stability of non linear system , construction of phase trajectories, system analysis by phase plane method, Describing functions methods, basic concepts derivation of describing function, liapunov's stability criterion.

Unit IV Review of root locus, lead compensation, lag compensation, lag- lead compensation and their comparison, review of state space methods, observability and controllability of system , pole placement by state feedback.

UnitV Tuning rules of PID controller, modifications of PID controllers, Introduction to software package used in control systems- MATLAB SIMULINK.

Reference Books:

1. Automatic control system—B. C.Kuo, wiley
2. Control system engineering—Nagrath & gopal, Publishers: New Age International
3. Modern control engineering –K. Ogata, Pearson; 5 edition
4. Control system engineering—Norman Nise, Publisher: Wiley
5. Discrete time Control system— K. Ogata, Pearson; 2 edition

Unit I Steady Electric Field: Coulomb's Law, units, Electric field intensity, Electric flux and flux density, Gauss law, Boundary relations, concept of divergence, Curl, scalar and vector potential. electric field in dielectric and conductor, continuity equation, methods of images.

Unit II Magnetic field due to steady currents, force between current carrying wires, Stokes theorem, vector magnetic potential, magnetization vector and its relation to magnetic field.

Unit III Maxwell's Equation: Time varying field and displacement current, faraday's law.

Unit IV Wave Equation: Pointing vector, Plane electromagnetic waves in free space, dielectric medium and conducting medium, Skin depth, slepian vector.

Unit V Waves propagation in lossy dielectrics, plane waves in lossless dielectrics, reflection of a plane wave at normal incidence , reflection of a plane wave at oblique incidence .

Reference Books:

1. Elements of Engineering Electromagnetic Third Edition- N.N. Rao- Prentice Hall, India.
2. Elements of Electromagnetic, Second Edition- Matthew N.O. Sadiku- Saunders coll Publishing.
3. Fields & Waves in Communication Electronics- S.Ramo, J.R. Whinnery & T. Van Duzer- John Wiley & Sons.
4. Electromagnetic- J.D. Kraus-McGraw Hill
5. Electromagnetic Waves & Radiating Systems- E.C. Jordan & K.G. Balmain- Prentice Hall.

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, Floating point 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.

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

Unit-I

Introduction: Historical Perspective, incentives of process control, synthesis of control system. Classification and definition of process variables. Mathematical modeling: Need and application of mathematical modeling, Lumped and distributed parameters, Analogies, thermal, Electrical, and chemical systems, Modeling of CSTR, Modeling of heat exchanger, Interactive and non-interactive type of system, Dead time elements, Developing continuous time and discrete time models from process data.

Unit-II

Control Modes: Definition, Characteristics and comparison of on-off, proportional, Integral, Differential, PI, PD, PID, Dynamic behavior of feedback controlled processes for different control modes, Control system quality, IAE, ISE, IATE criterion, Tuning of controllers Ziegler-Nichols, Cohen-Coon Methods, controller trouble shooting.

Unit-III

Realization of Control Modes: Realization of different control modes like P, I, D in Electric, Pneumatic, Hydraulic controllers. Use of DDC and PLC, Process monitoring, man machine interface, real time systems: RTS introduction and its characteristics.

Unit-IV

Actuators: Hydraulic, Pneumatic actuators, Solenoid, E-P converters, control valves, Types, Functions, Quick opening, Linear and equal percentage valve, Ball valves, Butterfly valves, Globe valves, Pinch valves, valve application and selection, Cavitations and flashing, Dampers and variable speed Drives.

Unit-V

Advanced Controls: Introduction to advanced control system like Cascade, Feed forward, Ratio, Selective, Override, Split range and Auctioneering control, Plant wide control. PI Diagrams: Symbols, Terminology, Case studies, a brief study of instrumentation and control relevant to industries.

References:

- Dale Patrick, Stephen Fardo, "Industrial Process Control System".
- Shinsky F.G., "Process Control System", III Ed., McGraw Hill.
- Smith C.A. & A.B. Corripio, "Principle & Practiced Automatic Process Control", J. Willey.
- Rao M & S.Qiv, "Process Control Engg.", Gorden & Breach.
- S Levi and AK Agrawala. Real-time system design. McGraw-Hill International.
- GeorgeStephanopoulos " Chemical Process Control" PHI, Delhi
- C.D. Johnson "Process control instrumentation technology' PHI
- Harriott- Process Control 1st ed., TMH
- Patranabis- Principles of Process Control 2nd ed., TMH

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Bachelor of Technology (B.Tech.) Electronics & Communication Engg. (w.e.f. Jan, 2020)

VI Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1.	EC601	DC	Digital Signal Processing	70	20	10	30	20	150	2	1	2	4
2.	EC602	DC	Antenna & Wave propagation	70	20	10	30	20	150	2	1	2	4
3.	EC603	DE	Departmental Elective	70	20	10	-	-	100	4	-	0	4
4.	EC604	OE	Open Elective	70	20	10	-	-	100	4	-	0	4
5.	EC605	D Lab	Data Communication Lab	-	-	-	30	20	50	-	-	6	3
6.	EC606	O/E Lab	Microcontroller & Embedded system	-	-	-	30	20	50	-	-	6	3
7.	EC607	IN	Internship-III	To be completed anytime during Fifth/Sixth semester. Its evaluation/credit to be added in Seventh Semester.									
8.	EC608	P	Minor Project II	-	-	-	-	50	50	-	-	4	2
9.	Additional Credits [#]	[#] Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.											
			Total	280	80	40	120	130	650	12	2	20	24

Departmental Electives	Open Electives
603 (A) Data Communication	604(A) Microcontroller & Embedded system
603 (B) CMOS Design	604(B) Bio-medical Electronics
603(C) Satellite Communication	604(C) Power Electronics

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VI-Semester

EC- 601 Digital signal Processing

EC- 601 Digital signal Processing

Unit – I

Discrete-Time Signals and Systems

Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems, stability and causality, frequency domain representation of discrete time signals and systems.

Unit - II

The z-Transform

The direct z-transform, properties of the z-transform, rational z-transforms, inversion of the z transform, analysis of linear time-invariant systems in the z- domain, block diagrams and signal flow graph representation of digital network, matrix representation.

Unit - III

Frequency Analysis of Discrete Time Signals

Discrete fourier series (DFS), properties of the DFS, discrete Fourier transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit - IV

Efficient Computation of the DFT

FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for 'N' composite number.

Unit – V

Digital filters Design Techniques

Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques rectangular and other windows, examples of FIR filters, design using windowing.

References:

1. Oppenheim and Schafer: Digital Signal Processing, PHI Learning.
2. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI Learning.
3. Proakis: Digital Signal Processing, Pearson Education.
4. Rabiner and Gold: Theory and Application of Digital Signal Processing, PHI Learning.
5. Ingle and Proakis: Digital Signal Processing- A MATLAB based Approach, Thompson, Cengage Learning.

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).

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Electronics & Communication Engineering, VI-Semester

EC- 602 Antennas and wave Propagation

Unit I

Radiation

Potential function and the Electromagnetic field, potential functions for Sinusoidal Oscillations, retarded potential, the Alternating current element (or oscillating Electric Dipole), Power radiated by a current element, Application to short antennas, Assumed current distribution, Radiation from a Quarter wave monopole or Half wave dipole, sine and cosine integral, Electromagnetic field close to an antenna, Solution of the potential equations, Far-field Approximation.

Unit II

Antenna Fundamentals

Introduction, network theorems, directional properties of dipole antennas, travelling –wave antennas and effect of feed on standing-wave antennas, two –element array, horizontal patterns in broad-cast arrays, linear arrays, multiplication of patterns ,effect of earth on vertical patterns, Binomial array, antenna gain, effective area.

Unit III

Types of antennas

log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna,

Unit IV

Aperture and slot Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

Unit V

Propagation of radio waves

Fundamentals of electromagnetic waves, effects of the environment, modes of propagation.

Ground wave propagation- Introduction, plane earth reflection, space wave and surface wave, transition between surface and space wave, tilt of wave front due to ground losses.

Space wave propagation- Introduction, field strength relation, effects of imperfect earth, curvature of earth and interference zone, shadowing effect of hills and buildings, absorption by atmospheric phenomena, variation of field strength with height, super refraction, scattering, tropospheric propagation, fading, path loss calculations. Sky wave propagation- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

References:

1. Jordan and Balmain: Electromagnetic Waves and Radiating System, PHI Learning.
2. Krauss: Antennas and wave propagation, TMH.
3. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd.
4. Harish and Sachidananda: Antennas and wave propagation, Oxford University Press.
5. Raju: Antennas and Wave Propagation, Pearson Education.
6. Kennedy: Electronic Communication Systems, TMH.

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.

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Electronics & Communication Engineering, VI-Semester

Departmental Elective EC- 603 (A) DATA COMMUNICATION

Unit-I

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-II

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

Unit-III

ERROR CONTROL AND DATA LINK PROTOCOLS

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

Unit-IV NETWORKS

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.

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Electronics & Communication Engineering, VI-Semester

Departmental Elective EC- 603 (B) CMOS DESIGN

Unit I

Introduction

Introduction to CMOS VLSI circuit, VLSI design flow, Design strategies ,Hierarchy, regularity, modularity, locality, MOS Transistor as a Switches, CMOS Logic, Combinational circuit, latches and register, Introduction of CAD Tool , Design entry, synthesis, functional simulation.

Unit II

Specification of sequential systems

Characterizing equation & definition of synchronous sequential machines. Realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the state table of completely and incompletely specified sequential machines.

Unit III

Asynchronous Sequential Machine

Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

Unit IV

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 V

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.

References:

1. Neil Weste: Principle of CMOS VLSI Design, TMH.
2. Kohavi: Switching & Finite Automata Theory, TMH.
3. Lee: Digital Circuits and Logic Design, PHI Learning..
4. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
5. Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
6. Weste and Eshraghian: Principles of CMOS VLSI design, Addison-Wesley

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Electronics & Communication Engineering, VI-Semester

Departmental Elective EC- 603 (C) Satellite Communication

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, inter-satellite 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 Pratt: 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.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VI-Semester

Open Elective EC- 604 (A) Microcontroller & Embedded system

UNIT-I

8051 Interfacing, Applications and serial communication

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based data acquisition system 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.

UNIT II:

Microcontroller 8096 Introduction to 16-bit Microcontroller, functional block-diagram, memory status, complete 8096 instruction set, classification of instruction set, addressing modes, programming examples using 8096, hardware features of 8096, parallel ports, control & status Registers, Introduction to 16/32 bit PIC microcontrollers and DSPIC.

UNIT-III

Introduction to Embedded Systems:

Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, common design metrics, and processor technology: general purpose processor, application specific processor, single purpose processor.

UNIT-IV

Embedded System Architecture:

Von Neumann v/s Harvard architecture, instruction set architecture, CISC and RISC instructions set architecture, basic embedded processor, microcontroller architecture, CISC & RISC examples: 8051, ARM, DSP processors.

UNIT-V

Input Output and Peripheral Devices

Timers and counters, watchdog timers, interrupt controllers, PWM, keyboard controller, analog to digital converters, real time clock.

Reference Books:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005.

2. Kenneth J. Ayala, The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
3. V. Udayashankara and M.S. Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw - Hill, 2009.
4. McKinlay, The 8051 Microcontroller and Embedded Systems - using assembly and C, PHI, 2006 / Pearson, 2006.
5. Tim Wilmshurst, Designing embedded system with PIC microcontrollers Principles and applications. 2nd ed. 2011 Bsp books pvt lt
6. Shibu K V, "Introduction to Embedded System", TMH.
7. David E Simon, "An Embedded Software Primer", Pearson education Asia, 2001.
8. Steven F. Barrett, Daniel J. Pack, "Embedded Systems" Pearson education, First Impression 2008.

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Electronics & Communication Engineering, VI-Semester

Open Elective EC- 604 (B) BIOMEDICAL ELECTRONICS

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

REFERENCES

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.Rajaroo and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation',Universities press (India) Ltd, Orient Longman ltd, 2000.

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Open Elective EC- 604 (C) POWER ELECTRONICS

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

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Electronics & Communication Engineering VI-Semester

EC- 605 DATA COMMUNICATION LAB

- 1 TO STUDY VARIOUS MULTIPLEXING TECHNIQUES
- 2 TO STUDY OF NETWORK INTERFACE CARD (NIC)
- 3 TO STUDY OF PARALLEL AND SERIAL TRANSMISSION
- 4 TO STUDY OF NRZ AND RZ CODES
- 5 TO STUDY OF DIFFERENT TYPES OF MODEM.
- 6 TO STUDY OF INTEGRATED SERVICES DIGITAL NETWORK.
- 7 TO STUDY OF TWISTED PAIR, COAXIAL CABLE AND FIBRE OPTIC CABLE.
- 8 TO STUDY OF DIGITAL INTERFACE RS-232.
- 9 TO STUDY DIFFERENT TOPLOGIES.
- 10 TO STUDY LAN USING STAR TOPOLOGY

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Electronics & Communication Engineering VI-Semester

EC- 606 MICROCONTROLLER & EMBEDDED SYSTEM LAB

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

- **As per Keil software available in department.**

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VII Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1.	EC701	DC	VLSI Design	70	20	10	30	20	150	2	1	2	4
2.	EC702	DE	Departmental Elective	70	20	10	-	-	100	3	1	-	4
3.	EC703	OE	Open Elective	70	20	10	-	-	100	3	0	0	3
4.	EC704	D Lab	Microwave Lab	-	--	-	30	20	50	-	-	6	3
5.	EC705	O/E lab	I.O.T. Lab	-	-	-	30	20	50	-	-	6	3
6.	EC706	P	Major Project-I	-	-	-	100	50	150	-	-	8	4
7.	EC607		Evaluation of Internship -III	-	-	-	-	100	100	-	-	6	3
8.	Additional Credits [#]	#Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.											
			Total	210	60	30	190	210	700	8	2	28	24

Departmental Electives	Open Electives
702(A) Microwave Engg.	703(A) Cellular Mobile Communication
702 (B) Information Theory & Coding	703(B) Internet of Things
702 (C) Nano Electronics	703(C) Probability Theory & Stochastic Processor

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VII-Semester

EC- 701 VLSI Design

Course Objective:

- To understand the fabrication process of CMOS technology.
- To teach fundamentals of VLSI circuit design and implementation using circuit simulators and layout editors.
- To study various problems due to VLSI technology advancement.
- To study digital circuits using various logic methods and their limitations.
- To highlight the circuit design issues in the context of VLSI technology.

Course Contents:

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.

Course Outcome: 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

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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Departmental Elective EC- 702 (A) MICROWAVE ENGINEERING

Prerequisite:- Electromagnetic fields , Antenna and wave propagation.

Course Outcome:-

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 S

SYLLABUS

- Unit 1.** 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 2.** 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 3.** 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 4.** 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 5.** 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 Easter Pub.
3. Watson, Solid State Microwave Devices, 5th ed. 2008, Wiley.
4. David M. Pozar, Microwave Engineering, 3rd edition, 2011 Willey 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Departmental Elective EC- 702 (B) INFORMATION THEORY AND CODING

Course Objective: The course aims to introduce information theory, fundamentals of error control coding techniques and their applications, importance of various communication channels, utilization of codes for error detection and correction as well as for practical applications.

Prerequisite: Digital communication and its applications, Probability theory

Course Description: This course will first introduce the basic concepts of information theory, leading to the different coding theorems and then various channel capacity theorem. Afterwards, the course will consider error control coding techniques and various codes for applications.

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.

SYLLABUS

UNIT1 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 2 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 3 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 4 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 5 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

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Departmental Elective EC- 702 (C) Nano Electronics

Unit-I: Overview of semiconductor physics. Nanoscale band structure and Electron transport, Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, super-lattices, 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 Terchnology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springe.
2. Fundamentals of Nanoelectronics, George W. Hanson, 1/e Pearson Education.
3. Nano: The Essentials – Understanding Nano Scinece 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. Stroscio, World Scientific.

Suggested Reference Books:

1. Stephen D. Sentaria, Microsystem Design, Kluwer Academic Press
2. Marc Madou, Fundamentals of microfabrication & Nanofabrication.

3. T. Fukada&W.Mens, Micro Mechanical system Principle & Technology, Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, Micro sensors MEMS & Smart Devices, 2001.
5. James R Sheats and Bruce w.Smith, "Microlithography Science and Technology", Marcel Dekker Inc., New York, 1998.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Open Elective EC- 703 (A) 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Open Elective EC- 703 (B) Internet of Things (IoT)

Course Objectives (CEO):

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

Unit 2: Machine-to-machine (M2M), SDN (software defined networking) and NFV (network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

Unit 3: 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, Media Access control.

Unit 4: Sensor Technology, Participatory Sensing, Industrial IOT and Automotive IOT, Actuator, Sensor data Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Network Technology.

Unit 5: IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view. IOT Privacy and security solutions, Raspberry Pi & Arduino devices. IOT Case studies: smart city streetlights control & monitoring.

Reference Book:

1. Rajkamal, "Internet of Things", Tata McGraw Hill publication
2. Vijay Madisetti and Arshdeep Bahga, "Internet of things (A-Hand-on-Approach)" 1st Edition, Universal Press
3. Charles Bell "MySQL for the Internet of things", Apress publications.
4. Francis dacosta "Rethinking the Internet of things: A scalable Approach to connecting everything", 1st edition, Apress publications.
5. Hakima Chaouchi "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.

Course Outcomes (COs): 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Open Elective EC- 703 (C) Probability Theory and Stochastic processing

Course objective

1. Understand the random experiments, sample space and event probabilities
2. Study the random variables, density and distribution functions, moments and transformation of random variables.
3. Understand the concept of random process and sample functions (signals)
4. Explore the temporal and spectral characteristics of random processes.

Course Outcomes

1. Simple probabilities using an appropriate sample space.
2. Simple probabilities and expectations from probability density functions (pdfs)
3. Likelihood ratio tests from pdfs for statistical engineering problems.
4. Least -square & maximum likelihood estimators for engineering problems.
5. Mean and covariance functions for simple random processes.

UNIT-I:

Probability and Random Variable

Probability: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables

UNIT -II:

Distribution & Density Functions and Operation on One Random Variable –

Expectations Distribution; Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties. Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT-III:

Multiple Random Variables and Operations

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV:

Stochastic Processes – Temporal Characteristics: The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, Nth Order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V:

Stochastic Processes – Spectral Characteristics: Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4Ed., 2001, TMH.
2. Probability and Random Processes – Scott Miller, Donald Childers, 2 Ed, Elsevier, 2012.

REFERENCE BOOKS:

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, 4 Ed., TMH.
2. Theory of Probability and Stochastic Processes- Pradip Kumar Gosh, University Press
3. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, 3 Ed., PE
4. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MC Gillem, 3 Ed., 1999, Oxford.
5. Statistical Theory of Communication - S.P. Eugene Xavier, 1997, New Age Publications.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VII-Semester

EC- 705 IOT LAB

List of Experiments

LAB INDEX Design, Developed and implement following using Arduino, Raspberry Pi compiler and Python language in Linux/Windows environment.

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.

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal
New Scheme of Examination as per AICTE Flexible Curricula
VIII Semester Bachelor of Technology (B.Tech.) [Electronics & Communication Engg.] (w.e.f. Jan, 2021)

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1.	EC 801	DC	Optical Fibre Communication	70	20	10	30	20	150	2	1	2	4
2.	EC 802	DE	Departmental Elective	70	20	10	-	-	100	3	1	-	4
3.	EC 803	OE	Open Elective	70	20	10	-	-	100	3	-	-	3
4.	EC804	D/O/E Lab	Advanced Communication Engg. Lab	-	--	-	30	20	50	-	-	6	3
5.	EC 805	P	Major Project-II	-	-	-	70	30	100	-	-	8	4
6.	Additional Credits [#]	#Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.											
			Total	210	60	30	130	70	500	8	2	16	18

Departmental Electives	Open Electives
802(A) AI & Signal Processing	803(A) Wireless Network
802 (B) Wireless Communication	803(B) Digital Image Processing
802 (C) 5G Technology	803(C) Speech Processing

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

EC801- Optical Fibre Communication

PREREQUISITE:-Engineering Physics, Communication Engineering

COURSE OUTCOME:-

Students should be able to:

1. Understand Optical Fiber Communication System and its parameters.
2. Analyze transmission characteristics of optical fiber
3. Understand the construction and operation of various optical sources and detectors.
4. Performance analysis of optical receivers and study of fiber joints
5. Brief introduction of optical fiber networks and amplifiers

Unit 1. Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal analysis of fiber. Optical fibres : Structure & wave guiding fundamentals, basic optical laws.

Unit 2. Signal degradation in Optical Fibre : Signal degradation on optical fiber due to dispersion and attenuation, intermodal and intramodal dispersion, Fabrication of fibers and measurement techniques like OTDR

Unit 3. Optical sources and detectors: LEDs, LASER diodes, Basic concepts of optical Sources various laser and LED structures, Optical detectors: basic principle of photo detection, PIN and avalanche photo diode, phototransistor, photo detector noise, detector response time.

Unit 4. Optical transceivers; Direct detection and coherent receivers, noise in detection process, digital receiver performance calculation, BER, System design, power budgeting, rise time budgeting; fibre joints, and splicing techniques, Optical fibre connectors.

Unit 5. Optical networks and amplifiers- Optical networks : Topologies, networks SONET and SDH. Optical amplifiers - EDFA, Raman amplifier, and WDM systems Passive Optical Networks.

TEXT BOOKS RECOMMENDED:-

1. Senior J.M., Optical Fibre Communications: Principles & Practice, 2nd ed. 2001, PHI.
2. Agrawal Govind P., Fibre Optic Communication Systems, 5th ed. 2001, John Wiley & Sons, studentsed.
3. Black Uyles, Optical Networks and 3rd Genration Transport Systems, 3rd ed. 1998, Pearson.

REFERENCE BOOKS RECOMMENDED:-

1. Keiser G, Optical Fibre Communication, 5th ed. 2006, McGrawHill.
2. Mynbanv and Scheiner, Fibre Optic Communication Technology, 2n^d ed 2010, PearsonEdu.
3. Djfar K Mynbaev & Scheiner, Fibre Optic Communication Technology, 5th ed. 2005, Pearson

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (A) AI & Signal Processing

Course Objective:

To impart knowledge about Artificial Intelligence and to give understanding of the main abstractions and reasoning for intelligent systems 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.

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:

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (B) Wireless Communication

Course Objective:

Understand the functioning of wireless communication system and evolution of different wireless communication systems and standards, comparison of recent technologies used for wireless communication, explanation of architecture, functioning, protocols, capabilities and application of various wireless communication networks.

Course Outcomes:

1. Explain and compare the various cellular systems and its components
2. Apply and analyze mobile communication concepts
3. Describe network and system architecture, channel concept and system Operations in TDMA and CDMA systems
4. Apply and analyze radio propagation models, coding and modulation Techniques in Wireless Communication systems.
5. Analyze improved data services in cellular communication

Unit-I

Introduction

Applications and requirements of wireless services: history, types of services, requirements for the services, economic and social aspects.

Technical challenges in wireless communications: multipath propagation, spectrum limitations, limited energy, user mobility, noise and interference-limited systems.

Propagation mechanism: free space loss, reflection and transmission, diffraction, scattering by rough surfaces, wave guiding.

Unit-II

Wireless Propagation channels

Statistical description of the wireless channel: time invariant and variant two path models, small-scale fading with and without a dominant component, Doppler spectra, temporal dependence of fading, large scale fading.

Wideband and directional channel characteristics: causes of delay dispersion, system theoretic description of wireless channels, WSSUS model, condensed parameters, ultra wideband channels, directional description.

Unit-III

Channel models: Narrowband, wideband and directional models, deterministic channel-modeling methods.

Channel sounding: Introduction, time domain measurements, frequency domain analysis, modified measurement methods, directionally resolved measurements.

Antennas: Introduction, antennas for mobile stations, antennas for base stations.

Unit-IV

Transceivers and signal processing: Structure of a wireless communication link: transceiver block structure, simplified models. Modulation formats, demodulator structure, error probability in AWGN channels, error probability in flat-fading channels, error probability in delay and frequency-dispersive fading channels.

Unit V

Diversity: Introduction, microdiversity, macrodiversity and simulcast, combination of signals, error probability in fading channels with diversity reception, transmit diversity.

Equalizers: Introduction, linear equalizers, decision feedback equalizers, maximum likelihood sequence estimation (Viterbi detector), comparison of equalizer structures, fractional spaced equalizers, blind equalizers.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Taub and Schilling: Principles of Communication Systems, TMH.
3. Haykin: Modern Wireless Communication, Pearson Education.
4. Upena Dalal: Wireless Communication, Oxford University Press.
5. Rappaport: Wireless Communication, Pearson Education.
6. Price: Wireless Communication and Networks, TMH.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (C) 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 mmWave 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.Danials, 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.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (A) Wireless Network

PREREQUISITES: - Communication systems, Digital Communication, Telecommunication switching system, Computer Networks, Mobile and Wireless Communication

COURSE OUTCOMES:-

1. Review the concepts of wireless and mobilecommunication
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 traditionalnetworks
5. Understand the technology and standards of IoT, ZigBee

Unit 1 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 Layer-IEEE 802.16 (fixed and mobile).

Unit 2 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, MIMO system, OFDM-MIMO.

Unit 3 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 4 Wireless routing Protocols

Medium access problems in wireless networks, Traditional routing, Mobile network layer-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 5 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 united approach*- Pearson Education, 2002
2. Vijay K. Garg – *Wireless communication and networking* – Morgan-Kaufmann series in networking- Elsevier publication
3. Feng Zhao and Leonidas Guibas – *Wireless Sensor Networks, An information processing approach* - Morgan Kaufmann publication

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*.”

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (B) Digital Image Processing

Course Objectives

To study the image fundamentals and mathematical transforms necessary for image processing, image enhancement techniques, image restoration procedures, and image compression.

Course Outcomes:

1. Understand the basic elements of digital image processing
2. Develop and analyse the algorithm for discrete fourier transformations.
3. Understand the concept of Image enhancement by analyzing different filtering techniques.
4. Applying different models and techniques to understand the concept of image restoration
5. Analyze and implement different image encoding methods

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, image reconstruction 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).

References:

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.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (C) Speech Processing

Course Objectives

To study speech production and related parameters of speech and to understand different speech modeling procedures such as Markov and their implementation issues.

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-word units; 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:

2. Lawrence Rabiner and Biing-Hwang Juang, “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.

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Electronics & Communication Engineering VIII-Semester

EC 804- Advanced Communication Engg. Lab

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 divider