SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Electronics & Telecommunication (2020 – 2021)

Program: B. Tech. (EXTC)				**Semester: III**	
Course: Mathematics III				**Code:** BTET03010	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	1	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite:
Knowledge ofIntegration, Differential Equation, Periodic function, Even and odd Function, Beta-Gamma Function, Circular Function and Trigonometric series.

Objectives:

1. To provide an understanding of Laplace transform and its applications, Fourier series, Fourier Transform,*Z*-transform.
2. To provide students with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.

Outcomes:
After completion of the course, students would be able to :

1. Solve problems using Laplace transform, Fourier series, Fourier Transform, *Z* -transform.
2. Analyze the concept of Laplace transform, Fourier series, Fourier Transform,*Z* -transform.
3. Apply the techniques of Laplace transform, Fourier series, Fourier Transform and*Z* -transform to engineering problems.

Detailed Syllabus:

Unit	**Description**	**Duration**
1	**Laplace transformation:** Definition of Laplace transform, Laplace transform of 1, e^{at},	**13**

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	$\sin at$, $\cos at$, $\sinh at$, $\cosh at$, t^n , Properties of Laplace transform: Linearity property, First and second shifting theorems of Laplace transform, Change of scale property, $L\{t^n f(t)\}$, $L\left\{\frac{f(t)}{t}\right\}$, $L\{f^n(t)\}$, $L\left\{\int_0^t f(u)\,du\right\}$, Evaluation of Inverse Laplace transform by partial fraction, Convolution theorem,Laplace transforms of Periodic functions, Unit step functions, Dirac delta functions. Applications: to solve initial and boundary value problems involving ordinary differential equations.	
2	**Fourier series:** Orthogonality and Orthonormality, Periodic function, Trigonometric Series, Dirichlet's conditions, Euler's formulae (Derivative of Fourier coefficients a_0, a_n, b_n is not expected), Fourier Series of Functions for the interval $[\alpha, \alpha+2\pi]$ and $[\alpha, \alpha+2c]$, Functions having points of discontinuity, Even and odd functions, half range sine and cosine expansions, Parseval's identities. Complex form of Fourier series, Fourier integral theorem, Fourier sine and cosine integral.	**11**
3	**Fourier Transform:** Fourier Transform, Fourier Sine Transform, Fourier Cosine Transform, Properties of Fourier Transform (Linearity property, Change of scale property, Shifting property), Inverse Fourier Transform, Inverse Fourier Sine Transform, Inverse Fourier Cosine Transform, Finite Fourier Transform. Application: Fourier transform to solve differential equations.	**9**
4	***Z*-transforms:** Introduction, Sequences, Representation of sequences, Basic operators on Sequences, *Z*-transforms, Properties of *Z*-Transforms, Change of scale, Shifting Properties, Inverse *Z*-transform, Solution of Difference equations, Multiplication by *K*, Division by *K*, Initial value, Final value, Partial sum, Convolution, Convolution Property of Casual Sequence, Transform of important sequences, Inverse of Z-transform by division, binomial	**12**

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	expansion and partial fraction, Inverse by residue Method, Solution of Difference equation.	
	Total	**45**

Text Books:

1. B. V. Ramana (2017), "Higher Engineering Mathematics", *McGraw Hill Education, 1st Edition.*

Reference Books:

1. G. B. Thomas (2014), "Calculus", *Pearson, 13th Edition.*
2. Erwin Kreyszig (2017), "Advanced EngineeringMathematics", *Wiley India, 10th Edition.*
3. B. S. Grewal (2017), Higher Engineering Mathematics, *Khanna Publishers, 44thEdition.*

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. At least ten Tutorials based on the entire syllabus duly recorded and graded.
2. Tutorials/Assignments/Viva-voce/ Quiz/Tutorial test/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : III**	
Course : Electronic Devices				**Code :** BTET03011	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 100 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 50 Marks	Scaled to 50 Marks

Pre-requisite: Engineering Physics

Objectives:

1. To understand the construction, working principle, characteristics and simple applications of basic electronic devices.
2. To understand the application of these devices in making advanced circuits like amplifiers and oscillators.

Outcomes:

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

1. Understand construction and characteristics of various types of diodes and illustrate simple circuits with diodes.
2. Understand bipolar junction transistor (BJT) and Field Effect Transistor (FET), their modes of operation and analyse their applications.
3. Analyse different types of amplifier and oscillator circuits.
4. Understand the basic concepts of Operational amplifier.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	Diodes and Applications covering: Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications, Schottky diode, solar cell;	**08**

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2.	Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-Vcharacteristics, and small signal switching models;	**08**
3.	Bipolar Junction Transistor covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, I-V characteristics, Ebers-Moll Model, Voltage Divider Bias Configuration;	**07**
4.	Field Effect Transistor covering, Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits; MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor;	**07**
5.	Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators;	**09**
6.	Operational Amplifiers covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; calculation of differential gain, common mode gain, CMRR and ICMR. Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground; OP-AMP Design of gain stages and output stages, compensation.	**06**
	Total Hours	**45**

Text Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education

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3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.

Reference Books:

1. Donald Schilling & Charles Belove, "Electronic Circuits Discrete and Integrated", McGraw Hill International, 3rd edition, 1989.
2. Martin Roden, Gordon Carpenter, William Wieserman, "Electronic Design", Shroff.Publishers, 4th edition, 2002.
3. Robert Boylestad& Louis Nashelsky, "Electronic Devices & Circuit Theory", Pearson Education India - 9th Edition, 2007.
4. B.L. Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co., 2nd Edition, 2004.

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
   - PN Junction Diode Characteristics
   - Zener diode characteristics and load and line regulation
   - Rectifiers and filters
   - BJT Characteristics and biasing methods
   - FET Characteristics and biasing methods
   - BJT applications- Amplifier and switch
   - OP-AMP parameter measurements
   - Differential Amplifier
   - Oscillators: High and low frequency
   - Simulation on above topics
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : III**	
Course : Digital System Design				**Code :** BTET03012	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 100 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 50 Marks	Scaled to 50 Marks

Pre-requisite:

Objectives:

1. To provide knowledge of digital logic & digital system as well as their applications in technical field.
2. To provide knowledge of basic building blocks and their working.
3. To provide knowledge of designing the digital logic circuit using basic building blocks and necessary techniques which is required in computer hardware design.

Outcomes:

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

1. Understand concept of digital system and logic simplification.
2. Apply HDL & appropriate EDA tools for digital logic circuit design.
3. Design and analyze combinational and sequential circuits.
4. Understand different logic families and semiconductor memories.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction To Digital Systems and logic simplification:** Number Systems: binary, octal, hexadecimal, BCD. Conversion from one system to another, Binary Subtractionusing 1's and 2's Complement method. Weighted codes: BCD and binary, non-weighted codes: grey and excess 3, conversion from one code to another. Logic gates and implementation of digital logic using universal gates, Review of Boolean Algebra and De Morgan'sTheorem,	**10**

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	SOP & POS forms, Canonical forms, Karnaugh maps up to 4 variables	
2.	**Introduction to VHDL:** VLSI Design flow: Design entry, Schematic, different modelling styles in VHDL: Dataflow, Behavioural and Structural Modelling. Data types and objects, Synthesis and Simulation of any digital logic	**06**
3.	**Combinational logic circuit and its implementation:** Combinational circuits : Adders, Subtractors(half and full), BCD adder, Serial and Parallel adder, ALU, Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, Design of digital logic using MUX. VHDL codes for combinational digital circuits.	**12**
4.	**Sequential Logic Circuits:** Flip-flops: SR, T, D, JK, master slave JK, converting one flip-flop to another.Shift registers, Synchronous and Asynchronous (Ripple) Counters and its designing. Ring counter, Johnson counter, pseudo random binary sequence generator. Finite state machines: mealy and moore circuits, Design of synchronous FSM, VHDL codes for sequential digital circuits.	**12**
5.	**Logic Families and Semiconductor Memories:** TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, ECL, CMOS families, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementationusing Programmable Devices.	**05**
	Total Hours	**45**

Text Books:

1. Morris Mano, Digital Design, PHI, 4th edition, 2008.

Reference Books:

1. R.P Jain, Digital Electronics and Microprocessors, Tata McGraw-Hill, 25th reprint 2007.
2. Roth and John: Principles of Digital Systems Design, Ceneage Learning, Sixth Indian Reprint 2011.
3. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.

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Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
    - Logic gates and universal gates
    - De-Morgan's theorem
    - Codes and code conversion
    - Combinational circuits
    - Sequential circuits
    - Study of logic families and Semiconductor Memories
    - VHDL programming of combinational and sequential circuit
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : III**	
Course : Signals and Systems				**Code :** BTET03013	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 100 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 50 Marks	Scaled to 50 Marks

Pre-requisite: Engineering Mathematics

Objectives:

1. To provide knowledge of analog domain signals and systems for time and frequency domain analysis.
2. To study various continuous and discrete time transforms.

Outcomes:

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

1. Define and identify various types of signals and systems.
2. Apply mathematical operations to analyze signals and systems.
3. Apply various mathematical transforms for continuous time signal and systems.
4. Use various transforms to analyze discrete time signal and systems.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Signals and Systems:** Introduction to Signals and Systems, Classification of signals, Elementary signals: analog and discrete time, Basic operation of signals.	**04**
2.	**Time domain representation for linear time invariant systems (analog& discrete):** Classification of systems, Convolution of infinite and finite time continuous signals and discrete time signals, Impulse, step response for first and second order LTI systems	**06**
3.	**Fourier Series for continuous time and discrete time signals:** Representation of signals in terms of orthogonal and orthonormal functions, Dirichlet Conditions, Gibb's Phenomenon, Fourier	**07**

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	series representation of continuous and discrete time signals.	
4.	**Fourier Transform for continuous time signals:** Limitations of Fourier Series, Introduction to Fourier transform, properties, Fourier transform of periodic signal, Relation between Fourier and Laplace Transform, Frequency response.	**06**
5.	**Laplace transforms:** Limitations of Fourier transform, Introduction to Laplace transform, ROC and properties, Application of Laplace Transform in electrical circuit, Laplace Transform of elementary signals, Unilateral Laplace transform, Inverse Laplace transform, Using Laplace Transform with or without initial conditions.	**12**
6.	**Z - transform:** Introduction to Z transform, Z transform of elementary signals, ROC, Properties of Z transform, Inverse of Z transform using Partial Fraction and long division rule, Solution of difference equation, Introduction to Unilateral Z transform.	**10**
	Total Hours	**45**

Text Books:

1. Tarun Kumar Rawat, Signals and Systems, Oxford University Press, July-2010.
2. NagoorKani , Signals and Systems, McGraw-Hill publication, 1st Edition, March-2010.

Reference Books:

1. Oppenheim &Willsky, Signal and Systems, Prentice Hall of India publication, 2nd edition, 2008.
2. Simon Haykin& Barry van veen, Signal and Systems, John Wiley publication. 2nd edition, 2008.

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
    - Plotting of elementary signals like sine, cos and impulse

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- Find whether given signal is even or odd
- Find whether given signal is periodic or aperiodic
- Evaluate convolution integral
- Evaluate convolution sum
- Compute Laplace transform of the continuous time signal
- Compute and plot poles and zeros of the system
- Find whether given system is stable or unstable
- Evaluate CTFT of the given signal
- Self-Experiment (Project)

3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : III**	
Course : Circuit and Network Theory				**Code :** BTET03014	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 100 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	0	0	3	Scaled to 50 Marks	Scaled to 50 Marks

Pre-requisite: Knowledge of Basic Electrical Engineering

Objectives:

1. To provide knowledge of basic fundamentals of Electrical & Electronics network analysis and synthesis.
2. To expose students to simulation tools for circuit analysis.
3. To analyse and synthesize two port networks.

Outcomes:

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

1. Apply knowledge of basic electrical engineering to analyze ac and dc circuits.
2. Apply knowledge of mathematics to evaluate the steady state and transient responses of electrical circuits.
3. Know different parameters of two-port networks and compute network parameters.
4. Synthesize L-C, R-C and R-L circuits.

Detailed Syllabus:

Unit	Description	Duration
1.	**Mesh & Node Analysis** Mesh & Node Analysis of circuits with independent & dependent AC and DC sources.	**05**
2.	**Network Theorems** Linearity, Superposition, Current & Voltage Source Transformation, Thevenin's& Norton's Theorem, Maximum power transfer theorem, Compensation and Tellegen's theorem – as applied with independent & dependent AC and DC sources.	**09**

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3.	**Circuit Analysis** Introduction to Graph Theory. Tree, link currents, branch voltages, cut set & tie set. Mesh & Node Analysis, Duality.	**04**
4.	**Transient Analysis of Circuits using Classical Technique** First & second Order Differential equations for Evaluation & analysis of Transient and Steady state responses, initial conditions.	**05**
5.	**Transient and steady state response of circuits using Laplace Transform** Circuit analysis using Laplace Transform. Transfer function, Concept of poles and zeros of immitance functions and their properties, sinusoidal response from pole-zero locations	**05**
6.	**Network functions and Two - port Networks** Concept of two- port network. Driving point & Transfer Functions, Open Circuit impedance (Z) parameters, Short Circuit admittance (Y) parameters, Transmission (ABCD) parameters. Inverse Transmission (A'B'C'D') parameters. Hybrid (h) parameters. Inter Relationships of different parameters. Interconnections of two – port networks. T & Pi representation. Terminated two - port networks.Introduction to band pass, low pass, high pass and band reject filters	**10**
7.	**Network Synthesis** Positive real functions, Properties of Positive real functions, Testing Positive real functions. Driving Point functions, Testing driving point functions. Properties of Hurwitz polynomials, Residue computations, Even & odd functions, Driving Point Synthesis with L-C, R-C and R-L circuits.	**07**
	Total Hours	**45**

Text Books:

1. William. H. Hayt, Jack E. Kemmerly& Steven M. Durbin, 'Engineering Circuit Analysis', McGraw Hill International, 6th edition, 2002.
2. M. E. Van Valkenburg, 'Network Analysis', Prentice Hall of India, 3rd edition, 2006.

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Reference Books:

1. A. Sudhakar& S. P. Shyammohan, 'Circuits and Networks', Tata McGraw Hill, thirteenth reprint, 2000.
2. Artice M. Davis, 'Linear Circuit Analysis', Thomson Asia Pte. Ltd., Singapore, first edition, 2001
3. Raymond A. DeCarlo& Pen-Min Lin, 'Linear Circuit Analysis', Oxford University Press, second edition, 2001.
4. Ravish Singh 'Electrical Networks' Tata McGraw hill publication, 2009.

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. Assignments/Viva-voce/ Quiz/Seminar/Presentation

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<table>
<tr><td colspan="4">Program : B. Tech. (EXTC)</td><td>Semester : III</td></tr>
<tr><td colspan="4">Course : Presentation and Communication Techniques</td><td>Code : BTET03015</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td>Evaluation Scheme</td></tr>
<tr><td>Lecture Hours per week</td><td>Practical Hours per week</td><td>Tutorial Hours per week</td><td>Credit</td><td>Internal Continuous Assessment (ICA) (Marks – 50)</td></tr>
<tr><td>2</td><td>---</td><td>---</td><td>2</td><td>Marks Scaled to 50</td></tr>
<tr><td colspan="5">Pre-requisite: NIL</td></tr>
<tr><td colspan="5">Objectives:
• To impart an understanding of basic tenets of business communication that helps students to effectively engage in organizational communication.
• To develop in students an understanding of interpersonal communication challenges and the ability to effectively overcome these challenges in an organizational context.
• To develop leadership, team building and decision making skills which could be later applied in a professional set up.
• To impart technical writing skills towards designing and structuring persuasive technical communication.
• To build and strengthen presentation skills towards making impressive and persuasive presentations.
• To train the students for participating in group discussions, building Resume and facing personal interviews.</td></tr>
<tr><td colspan="5">Outcomes:
After completion of the course, students would be able to:
• Understand and apply the postulates of technical writing in a formal set up
• Apply fundamentals of business correspondence to create well-structured Resumes, application letters, Minutes of Meetings and similar business related documents
• Understand and analyse group dynamics and apply leadership skills for effective team building in professional set ups.
• Analyze the context and select appropriate communication techniques for effective interpersonal communication in professional context.</td></tr>
</table>

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Detailed Syllabus: (per session plan)		
Unit	**Description**	**Duration**
1	**Understanding the foundations of Business Communication:** Professional Communication in a Digital, Social, Mobile World	5
2	**Collaboration, Interpersonal Communication and Business Etiquette:** Communicating effectively, collaborating, conducting productive meetings, using meeting technologies, improving listening skills and non-verbal communication, business etiquettes	5
3	**Development of Interpersonal and Group Communication Skills** Theatre techniques: Use of drama (in workshop format) to promote meaningful, active and reflective thinking processes as well as enhancing communication skills development. **Group Communication** • Forms of Group Communication; Use of body language in Group communication • Group Discussion etiquette: Introducing oneself and others; Expressing Opinions and Ideas; expressing disagreement etc. Group Discussion Strategies: Speaking, taking turns, Creating a Cordial and cooperative atmosphere etc.	4
4	**Building Problem-solving teams** • Orientation to Personality Values – Importance of Values • Understanding of Teams- Types of Teams, stages of Team development; Team building leadership skills and leaderless scenarios • Decision Making-Group and Individual Decision Making Techniques • Stress Management-Sources of Stress; consequences; Managing Stress	4
5	**Employment Communication** • Personal Interviews-Objectives, Types, Stages of Interview • Interview Preparation-types of Interview Questions ; Interview Follow ups	4

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	• Resume- Types and Format**;** Cover letters • Mock Interviews (simulation)	
6	**Organizational networks and communication Structures** • Process and Functions of Communication ;Formal Networks in Organizational Communication • Informal networks of organizational communications ;choice of communication channels	2
7	**Meetings** • Meetings- Purposes ,Importance and Meeting Procedures including Chairperson's and participants' roles Meeting Documentation (Minutes of resolution; Minutes of Narration; Meeting Notice and Agenda)	2
8	**Technical Report Writing** • Importance , objectives and Characteristic of Reports ; Types of Reports • Report formats and Structure -Memo Reports; Letter Reports; Office Orders and Manuscript Reports	2
9	**Presentation Skills** • Planning and structuring Presentations; Visual Aids in Presentations • Applications of MS Power Point Audience analyses; Nuances of Delivery; Modes of delivery; Controlling Nervousness and stage fright	2
	Total	**30**

Text Books:

1. Bovee, C., Thill, J., & Roshan Lal Raina (2013). *Business Communication Today* (14th ed.). Pearson.
2. Meenakshi Raman and Sangeeta Sharma (2015), *Technical Communication* Oxford University Press,3rd Edition

Reference Books:

1. Fred Luthans (2013), 'Organizational Behavior', *McGraw Hill, 12th Edition*

Any other information :

1. Links to websites:

- https://www.mindtools.com/
- https://www.pearsonmylabandmastering.com/northamerica/mybcommlab/

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2. Pedagogy:

- Classroom teaching
- classroom exercises and discussion
- case studies
- written assignments
- presentations and role play

Details of Internal Continuous Assessment (ICA)

Test Marks: 20
Term Work Marks: 30
Details of Term work :

- Group/Individual presentations
- Report writing-Memo Reports and letter reports
- Drafting meeting Agenda and Minutes of Meeting
- Resume and Cover letter writing
- Group Discussion
- Mock Interviews

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SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Electronics & Telecommunication (2020 – 2021)

Program: B. Tech. (EXTC)				**Semester : IV**	
Course : Probability and Stochastic Processes				**Code :** BTET04012	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	1	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Nil

Objectives:

1. To develop the concepts and techniques associated with the understanding of probability and random processes
2. To be able to analyse the chances of occurrence of error in communication field.

Outcomes:

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

1. Know the concept of probability and random variables.
2. Analyze the different probability density functions and their applications.
3. Learn the basics of random processes and evaluate different random processes and its applications in telecommunication.
4. To learn about the applications of Fourier Transforms like Spectral Density and others

Detailed Syllabus:

Unit	Description	Duration
1.	**Review of Probability** Sample Space, Events, and Probability, Conditional Probability, Mutually exclusive events, Joint probability of related and independent events, Statistical independence, Total Probability theorem, Bayes theorem	**06**
2.	**Random Variables** Random Variables, Cumulative Distribution function, Probability Density Function, , Discrete Distributions: Bernoulli, Binomial	**12**

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	and Poisson, Continuous distributions: Uniform, Exponential, Rayleigh, Gaussian distribution Mean, Variance, Moments of random variables.	
3.	**Two dimensional Random Variables:** Joint PDF's and CDF's, Conditional PMF and PDF,Marginal PDF, Conditional Mean &Variance, Rule for Independence, Covariance and correlation of random variables	**08**
4.	**Introduction to Random Processes: Basic Concepts** Classification of Random Processes, Statistics– first order, Second order, Wide-Sense Stationary Processes, Strict Sense Stationary Processes, Ergodic Random Processes	**08**
5.	**Linear Systems with Random Inputs** Fourier Transform of Random signals, Power Spectral Density, Cross Spectral Densities, Overview of linear system with deterministic inputs, Linear system with Discrete and continuous random inputs	**06**
6.	**Estimation Theory** Point Estimate, Interval estimate and confidence Interval, Maximum likelihood estimation, Minimum mean squared error estimation	**05**
	Total	**45**

Text Books:

1. Anthanasios Papoulis, S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill 2002, 4th edition, 2008.
2. Oliver C. Ibe, Fundamentals of applied probability and random processes, Academic Press, 2nd edition, 2014.

Reference Books:

1. John G. Proakis, MasoudSalehi, Fundamentals of Communication Systems, First Edition, Pearson Education, 2006.
2. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw-Hill 2003, 3rd edition, 2008.

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Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30

Term Work:

1. At least ten Tutorials based on the entire syllabus duly recorded and graded
2. Tutorials/Assignments/Viva-voce/ Quiz/Tutorial Test/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : IV**	
Course : Analog Circuits				**Code :** BTET04013	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Electronics Devices

Objectives:

1. To study the ac small signal models of BJT and JFET.
2. To design and understand single stage and multistage amplifiers using BJT, power amplifiers and oscillator circuits.
3. To understand, analyze and design Differential amplifier, OP-AMP based circuits, DAC and ADC.

Outcomes:

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

1. Analyze different transistor amplifier circuits.
2. Analyze various high frequency transistor models and power amplifier circuits.
3. Design oscillators and Power supply circuits.
4. Analyze various OP-AMP and D/A and A/D converter circuits.

Detailed Syllabus:

Unit	Description	Duration
1.	Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design for particular specifications, low frequency analysis of multistage amplifiers.	**10**
2.	High frequency transistor models, frequency response of single stage and multistage amplifiers, Cascode amplifier. Various	**10**

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	classes of power amplifiers (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies:Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability.	
3.	Oscillator Circuit Analysis and Design: Design of Phase-Shift Oscillator, Wien-bridge Oscillator, Colpitts Oscillator, Hartley Oscillator, Crystal Oscillator.	**06**
4.	Power Supply Circuit Analysis and Design: Design of Rectifier Circuits and Filters (all types). Study of Linear regulators, Transistorized series regulator, Regulator with error amplifier.	**04**
5.	OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.	**10**
6.	Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.	**05**
	Total	**45**

Text Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier
theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University
Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11 Publishing, Edition IV.
5. Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits,
John Wiley, 3rd Edition.

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Reference Books:

1. Donald Schilling & Charles Belove, "Electronic CircuitsDiscrete and Integrated", McGraw Hill International, 3rd edition, 1989.
2. Martin Roden, Gordon Carpenter, William Wieserman, "Electronic Design", Shroff.Publishers, 4th edition, 2002.
3. Robert Boylestad& Louis Nashelsky, Electronic Devices & Circuit Theory, Pearson Education India - 9th Edition, 2007.

Details of Internal Continuous Assessment (ICA)

Test Marks : 20

Term Work Marks : 30

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
   - Design and modelling of BJT amplifier
   - Design and modelling of FET amplifier
   - Power amplifiers
   - Cascade amplifier design (BJT and FET)
   - Oscillator design
   - Power supply design
   - OP-AMP applications
   - Analog to Digital Converter
   - Digital to Analog Converter
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : IV**	
Course : Microprocessor and Microcontroller				**Code :** BTET04014	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Digital System Design

Objectives:

1. The course objective is to have good understanding of 8086 architecture.
2. It stresses on the programming and interfacing aspects.
3. It also covering the integrated approach of 8 bit 8051 microcontroller and its interfacing with different devices.
4. This would be helpful in understanding the programming with microcontroller.

Outcomes:

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

1. Understand the architectural design of 8086 along with its feature.
2. Create assembly language programs using 8086 microprocessor.
3. Understand the microcontroller architecture (8/32 bit) and its programming.
4. Design microcontroller based system for real time applications.

Detailed Syllabus:

Unit	Description	Duration
1.	**Intel 8086/8088 microprocessor family :-** Introduction Feature of 8086Architecture and programming model of 8086, Microprocessor family Latches 8282, clock generator 8284, Transceiver 8286. Min and Max Mode Timing diagram of 8086, 8288 bus controller. Hardware software and program generated interrupts in 8086, Response to interrupt, Interrupt vector Table, Block diagram of 8259 Priority Interrupt Controller.	**08**
2.	**Programming of 8086:-**Introduction, Addressing Modes, Instruction sets of 8086, Assembly language programming, Assembler Directive, Passing parameter to Procedure and Macro.	**07**

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	Introduction 8255A Programmable peripheral interface and its programming.	
3.	**8087 Math Co-processor:-** Study of architecture of 8087, architecture of NIC architecture of 8087. Data type Supported by 8087.	**04**
4.	**Introduction and Hardware of 8051 Microcontrollers:** Comparison of microprocessor and microcontroller, architecture and pin functions of 8051 chip controller, CPU timing and machine cycles, internal memory organization, program counter and stack, input/output ports, counters and timers, serial data input and output interrupts.	**06**
5.	**8051 Assemble language programming:** Introduction to 8051 Assembly programming, Data Types and directives, 8051 flag bits and PSW register. Register banks and stack. Jump loop and call instructions, I/O Port programming: Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, memory and Timer/counters of 8051.	**06**
6.	**Microcontroller Design and Interfacing:** Serial communication, 8051 connection to RS 232 and its programming, Interfacing of microcontroller to LCD, ADC and DAC, 4*4Keyboard, and stepper motor.	**08**
7.	**Introduction to advanced Microcontroller:** **PIC 16F877:** PIC 16F877 Introduction and its architecture, RESET options, Memory organization of PIC16F877 **ARM 7 Fundamentals:** Introduction of 32 bit microcontrollers (ARM7), its architecture, Registers model, Current Program and Status program Register, ARM Pipeline and its stages.	**06**
	Total	**45**

Text Books:

1. Badri Ram, "Advanced Microprocessors and Interfacing", Tata McGraw Hill publication, 2011.

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2. Muhammad Ali Mazidi, "Microcontroller & Embedded system", Second Edition Prentice Hall, 2011.

Reference Books:

1. Douglas Hall, "Microprocessors Interfacing and Programming", Tata McGraw Hill publication, 2006.
2. Kenneth Ayala(2012),"The 8051 Microcontroller", *CENGAGE Learning,3rd Edition*
3. MykePredko, "Programming and customizing the 8051 Microcontroller", Tata McGraw Hill publication, 2008.
4. Andrew Sloss, Dominic Symes, and Chris Wright, "ARM System Developer's Guide" Morgan Kaufmann Publishers, First Edition 2004.

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
   - 8086 based assembly language programs
   - 8051 based assembly language programs
   - Interfacing and application of 8051
   - Analyze and demonstrate PIC18 Microcontroller
   - Analyze and demonstrate ARM7 Microcontroller
   - Implementation of application on microcontrollers
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : IV**	
Course : Database Management Systems				**Code :** BTET04015	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Basics of Computer systems

Objectives:

1. To impart knowledge about Data compression.
2. To have conceptual understanding, and hands-on experience, of the state-of-the-art compression algorithms and approaches in Text, Image, Audio and Video.

Outcomes:

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

1. Evaluate business information problem and find the requirements of a problem in terms of data. Understand the uses the database schema and need for normalization.
2. Design the database schema with the use of appropriate data types for storage of data in database.
3. Use different types of physical implementation of database
4. Use database for concurrent use and Backup data from database.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Introductory concepts of DBMS:** Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings, Database, users and DBA	**03**

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2.	**Relational Model:** Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus	**04**
3.	**Entity-Relationship model:** Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.	**04**
4.	**Relational Database design:** Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1Nf, 2NF, 3NF, Decomposition using FD-dependency preservation, BCNF, Multivalued dependency, 4NF, Join dependency and 5NF.	**05**
5.	**Query Processing & Query Optimization:** Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views	**05**
6.	**Transaction Management:** Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two-Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol, Isolation, Intent locking	**09**
7.	**Introduction to Data Security**: Introduction, Discretionary access control, Mandatory Access Control.	**02**
8.	**SQL Concepts:** Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-	**10**

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	queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. transaction control commands – Commit, Rollback, Savepoint	
9.	**PL/SQL Concepts:** Cursors, Stored Procedures, Stored Function, Database Triggers.	**03**
	Total	**45**

Text Books:

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth& S. Sudarshan, McGraw Hill.
2. An introduction to Database Systems, C J Date, Addition-Wesley.

Reference Books:

1. Understanding SQL by Martin Gruber, BPB
2. SQL- PL/SQL by Ivan bayross
3. Oracle – The complete reference – TMH /oracle press

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : IV**	
Course : Electromagnetic Field Theory				**Code :** BTET04016	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	0	3	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of Basic Electrical Engineering and Mathematics.

Objectives:

1. To introduce concepts of electric and magnetic fields and propagation of uniform plane waves.
2. To impart knowledge on electrostatics, electrical potential, energy density and their applications.
3. To understand concepts of magneto statics, magnetic flux density and relations between field due to time-varying situations.
4. To introducethe concept of transmission lines.

Outcomes:

After successful completion of this course, students should be able to

1. Apply vector calculus concepts to understand behavior of static electric field.
2. Apply vector calculus concepts to understand behavior of static magnetic field.
3. Analyze Maxwell's equation in different forms (differential and integral) and apply them to uniform plane wave propagation.
4. Understand the concept of voltage, current impedance, and power along two-conductor transmission lines using the solution of the wave equation and Smith chart.

Unit	**Description**	**Duration**

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1.	**Review of Vector Calculus:** Vector Field, Rectangular, Cylindrical and Spherical Coordinate systems.	**04**
2.	**Coulomb's law and electric field intensity:** Coulomb's law, electric field intensity, calculation of electric field intensity for various charge distributions. **Electric flux density and Gauss's law:** Electric flux density, Gauss's law, vector operator and divergence theorem.	**08**
3.	**Energy , potential and Capacitance:** Energy expended in moving a point charge in an electric field, line integral, potential and potential difference, calculations of electric field of both point charge and system of charges, potential gradient, dipole, energy density, Capacitance, calculation of capacitance of various configurations. Current and current density continuity of current, conductor properties, dielectric material and properties, method of images.	**08**
4.	**Steady magnetic field:** Biot – Savart law, Ampere's circuital law, curl of H, Stoke's theorem, magnetic flux and flux density.	**04**
5.	**Time varying fields and Maxwell's equations:** Faraday's law concept of displacement currents, Maxwell's equations in point form, Maxwell's equations in integral form, boundary conditions and significance of Maxwell's equations.	**04**
6.	**Uniform Plane waves:** Uniform plane waves in time domain in free space, Sinusoidally time varying uniform plane waves in free space, wave equation in dielectrics and conductors.	**04**

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7.	**Poynting vector and flow of power:** Poynting vector and flow of power: Poynting theorem, power flow for a plane wave, Poynting loss in a plane conductor.	**03**
8.	**Introduction to Transmission Lines:** Equations of Voltage and Current on TX line, Propagation constant andcharacteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission linesections as circuit elements.	**10**
	Total	**45**

Text Books:

1. Hayt& Buck, Engineering Electromagnetics, Tata McGraw-Hill, 8h Edition, 2011.
2. Matthew Sadiku, Elements of Electromagnetism, Oxford University Press, 5th Edition, 2010.

Reference Books:

1. Edward C. Jordan, Keith G Balmain, Electromagnetic Waves and radiating systems, Prentice Hall of India, 2nd edition, 2011.
2. NannapaneniNarayana Rao, Elements of Engineering Electromagnetics, Pearson Education, 6th edition, 2006.
3. Edminister J.A, Electromagnetics, Tata McGraw-Hill, 2nd edition, 2006.

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30
Term Work:

1. Assignments/Viva-voce/ Quiz/Seminar/Presentation

Signature
(Prepared by Concerned Faculty/HOD)

<table>
<tr><td colspan="3">Program: B. Tech. (EXTC)</td><td colspan="2">Semester : IV</td></tr>
<tr><td colspan="3">Course : Study of Technology Trends</td><td colspan="2">Code : BTET04017</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td>Evaluation Scheme</td></tr>
<tr><td>Lecture (Hours per week)</td><td>Practical (Hours per week)</td><td>Tutorial (Hours per week)</td><td>Credit</td><td>Internal Continuous Assessment (ICA)
As per Institute Norms
(50 Marks)</td></tr>
<tr><td>0</td><td>2</td><td>0</td><td>1</td><td>Scaled to
50 Marks</td></tr>
<tr><td colspan="5">Pre-requisite: Basic knowledge of Hardware and programming</td></tr>
<tr><td colspan="5">Objectives:
1. To teach the importance of using software tools.
2. To develop/implement algorithms/electronic modules.</td></tr>
<tr><td colspan="5">Outcomes:
After the successful completion of this course, the student will be able to
1. Select an appropriate topic on an emerging technology.
2. Identify the latest developments in the concerned topic.
3. Summarize the topic into a technical report by discussing with team members.
4. Implement the technology using modern tools and demonstrate the module.</td></tr>
<tr><td colspan="5">Detailed Syllabus:
A group comprising up to 3 students should identify the problem definition from recent trends in Electronics and Telecommunication Engineering. The students should finalize the topic in consultation with a faculty member / mentor. While choosing the topic for implementation the students should identify modern technology related to subjects of previous or current semesters. A small module or a set of codes which represent a complete system is to be implemented. It can be done using software tools used in the laboratory work of subjects of previous or current semesters which include:
Electronic Devices
Digital System Design
Signals and Systems
Circuit and Network Theory
Probability and Stochastic Processes</td></tr>
</table>

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Analog Circuits
Microprocessor and Microcontroller
Database Management Systems and Data Security
Electromagnetic Field Theory
Open source software should be preferred.

Evaluation:
Each group is expected to maintain the log book. The log book needs to be evaluated by the mentor every week as the part of continuous evaluation. Each group must show the presentation and demonstration of the implementation as the part of semester end exam. Also a report needs to be prepared on the selected topic. Report primarily should contain the entire overview of the Project from Literature Survey, Feasibility Study, Design, Analysis, Implementation, and Testing.

Mid-Term Presentation: 10 marks
End-Term Presentation and demonstration: 40 marks

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<table>
<tr><td colspan="4">Program : B. Tech. (EXTC)</td><td colspan="2">Semester : IV</td></tr>
<tr><td colspan="4">Course : Principles of Economics and Management</td><td colspan="2">Code: BTET04011</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="2">Evaluation Scheme</td></tr>
<tr><td>Lecture (Hours per week)</td><td>Practical (Hours per week)</td><td>Tutorial (Hours per week)</td><td>Credit</td><td>Internal Continuous Assessment (ICA) (Marks – 50)</td><td>Term End Examinations (TEE) (Marks- 100 in Question Paper)</td></tr>
<tr><td>3</td><td>---</td><td>---</td><td>3</td><td>Marks Scaled to 50</td><td>Marks Scaled to 50</td></tr>
<tr><td colspan="6">Pre-requisite: Nil</td></tr>
<tr><td colspan="6">Objectives:
This course provides basic orientation towards economic (micro and macroeconomic) principles and help them understand the functions of management
• To combine elements of basic micro and macroeconomics.
• To understand issues dealing with small-scale economic phenomena and concepts such as prices and output of firms, industries and resource owners.
• To examine market impact of technological change.
• To understand broader aspects of the economy and its environment.</td></tr>
<tr><td colspan="6">Outcomes:
After completion of the course, students would be able to:
• Analyse and evaluate the impact of Economic Policies and its implication on the Business Environment
• Understand basic concepts of economics (demand, supply, elasticity, scarcity) and explain behaviour on individual, households and firm.
• Handle economic data and write economic report
• Orient students towards basic management principles and act as foundation for higher levels of learning
• To be able to handle basic functions of management (planning, organising, coordination, and control)</td></tr>
<tr><td colspan="6">Detailed Syllabus: (per session plan)</td></tr>
<tr><td>Unit</td><td colspan="4">Description</td><td>Duration</td></tr>
</table>

Signature
(Prepared by Concerned Faculty/HOD)

1	Introduction: Definition of Economics, Types of economic systems, problem of scarcity of economic resources.	2
2	Demand and Supply: Demand Curve and Supply Curve, Equilibrium of Demand and Supply, Shift in Demand and Supply. Application of Demand and Supply: Price Elasticity of Demand, Price Elasticity of Supply, Factors which influence Elasticity, Elasticity and Revenue.	3
3	Market Structure /industry analysis types of Competition: monopoly, oligopoly, monopolistic competition, perfect and imperfect competition, government policies towards industries. Circular flow of Economy, Structures, Role of Government, Business Cycles.	3
4	Macroeconomics : National Income – Gross Domestic Product (GDP), Gross National Product (GNP), Inflation – Cost Push and Demand Pull Inflation, Unemployment, Philips Curve	3
5	Functions of Central Bank Money supply, RBI & Monetary Policy.(Current Credit Policy to be critiqued) Stabilization policy : Role of fiscal Policy Demand and Consumer Behavior: Utility and Marginal Utility, Types of Goods	3
6	New economic policy: Liberalization, privatization and globalization	3
7	Theory of Production : Law of Diminishing Returns, Returns to Scale, Productivity	3
8	Analysis of Costs: Types of Costs – Total Cost, Fixed Cost, Variable Cost, Marginal Cost, Impact of Marginal Cost on Average Cost.	3
9	Introduction to Management: Management & Organizations, Management History, Understanding Management thought ,contribution of F.W. Taylor, Henry Fawol, Elton –Mayo Contexts-Constraints & Challenges	5
10	Planning: Managers as Decision makers, Foundations of Planning, Strategic Management	4
11	Organizing: Line and staff relationships ,centralization and decentralization , role of delegation ,Managing Human Resources,	4

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	Managing Teams	
12	Leading and Motivation: Basic concepts and practices –Maslows Herzberg McClealand 's theory of Achievement	4
13	Controlling: Introduction to Controlling inventory, quality control.	3
14	Orientation towards Finance, Marketing Human resources and Operation departments	2
	Total	**45**

Text Books:

1. Samuelson and Nordhaus, (2010), *Economics - 19th edition*, Tata McGraw Hil Publication.
2. Datt and Sundharam, (2009), *Indian Economy - 67th edition*, S. Chand Publication.
3. Koontz. H. (2012). *Essentials of Management: International and Leadership Perspective.* McGraw Hill Education (India).
4. Collins, J. (2001). *Good to Great: Why Some Companies Makes the Leap and Other's Don't.* Random House Business Books.

Reference Books:

1. Mankiw Gregory, (2008), *Principles of Economics*, Cengage Learning
2. Rakesh Singh, (2007), *Analyzing Macro-Economics*, Shroff Publishers

Any other information :

Details of Internal Continuous Assessment (ICA)

Test Marks: 20
Term Work Marks: 30
Details of Term work : Class Test/ Assignment/Case Studies/Projects/ Presentations

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(Prepared by Concerned Faculty/HOD)

<table>
<tr><td colspan="5">Program: B. Tech. (EXTC)</td><td>Semester : IV</td></tr>
<tr><td colspan="5">Course : Essence of Indian Traditional Knowledge</td><td>Code: BTET04018</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="2">Evaluation Scheme</td></tr>
<tr><td>Lecture (Hours per week)</td><td>Practical (Hours per week)</td><td>Tutorial (Hours per week)</td><td>Credit</td><td colspan="2">Internal Continuous Assessment (ICA) (Marks - 50)</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>0</td><td colspan="2">Marks Scaled to 50</td></tr>
<tr><td colspan="6">Pre-requisite: NIL</td></tr>
<tr><td colspan="6">Objectives: This course provides introduction to Indian traditional knowledge and its relevance in the modern society.</td></tr>
<tr><td colspan="6">Outcomes:
After completion of the course, students would be able to :
1. Understand the concept of Traditional knowledge and its importance
2. Apply the concept of Vedic mathematics to solve problems
3. Understand relevance of Chanakya niti in modern management</td></tr>
<tr><td colspan="6">Detailed Syllabus</td></tr>
<tr><td>Unit</td><td colspan="4">Description</td><td>Duration</td></tr>
<tr><td>1</td><td colspan="4">Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge</td><td>5</td></tr>
<tr><td>2</td><td colspan="4">Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment,</td><td>5</td></tr>
</table>

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	Management of biodiversity, Food security of the country and protection of TK.	
3	**Vedic mathematics:** Introduction, subtraction, multiplication, division, linear and quadratic equations, simultaneous linear equations, factorizations	10
4	**Chanakya and modern management:** leadership, qualities of a leader, people management, strategy, teamwork	10
	Total	**30**

Text Books:

[1] R. Pillai, Corporate Chanakya, Jaico Publishing House: Mumbai, 2012.
[2] S. B. K. Tirtha and V. S. Agrawala, Vedic Mathematics, New Delhi: Motilal Banarsidass, 2004.
[3] A. Jha, Traditional Knowledge System in India, New Delhi: Atlantic Publishers and Distributors (P) Ltd, 2009.

Reference Books:

[1] D. Bathia, Vedic Mathematics Made Easy, Mumbai: Jaico Publishing House, 2014.
[2] B. K. Mohanta and V. K. Singh, Traditional Knowledge System and Technology in India, Delhi: Pratibha Prakashan, 2012.
[3] S. Bose, Vedic Mathematics, V&S Publishers: New Delhi, 2015.

Any other information :

Details of Internal Continuous Assessment (ICA)

Term Work Marks: 50
Details of Term work : As per Institute norms

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SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Electronics & Telecommunication Engineering (2020 – 2021)

Program: B. Tech. (EXTC)				**Semester: V**	
Course: Elements of Biology				**Code:** BTET05014	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	1	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Fundamental Knowledge of physics, chemistry and mathematics.

Objectives:

1. To provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers.
2. To encourage engineering students to think about solving biological problems with engineering tools.

Course Outcomes:

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

1. Convey that all forms of life have the same building blocks and yet the manifestations are diverse.
2. Identify DNA as a genetic material in the molecular basis of information transfer.
3. Classify enzymes and distinguish between different mechanisms of enzyme action.
4. Apply thermodynamic principles to biological systems.
5. Identify and classify microorganisms.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Introduction** Convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent	**3**

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	scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	
2.	**Classification** Convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus	**6**
3.	**Genetics** Convey that "Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.	**6**

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4.	**Biomolecules** Convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	**5**
5.	**Enzymes** Convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	**5**
6.	**Information Transfer** The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	**6**
7.	**Macromolecular analysis** How to analyses biological processes at the reductionistic level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	**5**
8.	**Metabolism** The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 +	**5**

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	H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy Charge.	
9.	**Microbiology** Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	**4**
	Total	**45**

Text Books:

1. Arthur T. Johnson, ''Biology For Engineers'' CRC Press Taylor & Francis group, 2011.
2. Prescott, L.M J.P. Harley and C.A. Klein, "Microbiology", 7th edition McGraw-Hill Higher Education, 2008.

Reference Books:

1. Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B., "Biology: A global approach", Pearson Education Ltd
2. Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., "Outlines of Biochemistry", John Wiley and Sons
3. Nelson, D. L.; and Cox, M. M.W.H. Freeman, Principles of Biochemistry, 5th Edition.

Term Work: As per institution norms.

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Program: B. Tech. (EXTC)				**Semester : V**	
Course : Analog and Digital Communication				**Code :** BTET05015	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Signals and Systems, Probability and Stochastic Processes

Objectives:

1. To teach various types of Analog & digital modulation and demodulation techniques.
2. To recognise concept of baseband shaping for data transmission and detection.
3. Understand various coding and decoding techniques.
4. To learn basic concepts spread spectrum techniques and their applications.

Outcomes:

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

1. Evaluate the principles and concepts of different analog & digital modulation techniques.
2. Apply different base band shaping techniques for data transmission and detection.
3. Analyze different algorithms for source and error control coding.
4. Understand the concepts and applications of spread spectrum modulation.

Detailed Syllabus:

Unit	**Description**	**Duration**
1	**Introduction to Electronic communications:** Elements of a communication system, modulation and demodulation, Electromagnetic frequency spectrum, Principles of Amplitude Modulation systems- DSB, SSB and VSB modulations.	**07**

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	Angle modulation: Frequency modulation (FM), Phase modulation (PM), FM noise triangle, pre-emphasis and de-emphasis.	
2	**Analog Pulse modulation and Multiplexing Techniques:** Sampling theorem for low- pass and band–pass signals- proof with spectrum, aliasing, Sampling techniques. **Pulse modulation:** Classification of Pulse modulation**,** Generation and detection of**:** Pulse amplitude modulation (PAM), Pulse width modulation (PWM), and Pulse position modulation (PPM). **Multiplexing:** Principles of Time division multiplexing (TDM), Frequency division multiplexing (FDM).	**07**
3	**Waveform coding techniques:** Model of digital communication system, Quantization and Encoding, Pulse Code Modulation (PCM) transmitter and receiver, Differential PCM (DPCM) transmitter and receiver, Delta Modulation (DM) transmitter and receiver, quantization noise and slope overload distortion, Adaptive delta modulation (ADM) transmitter and receiver, Discrete PAM signals: Line coding techniques: Unipolar, Polar and bipolar.	**07**
4	**Base Band Shaping for data Transmission and detection:** GRAM-SCHMIDT orthogonalization procedure, Geometric Interpretation of signal, Power Spectra of discrete PAM, Inter symbol Interference (ISI), Eye pattern. **Baseband Detection:** Detection of binary signals, Maximum likely hood detector, Probability of error, Correlation receiver, Matched filter receiver.	**06**

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5	**Digital Modulation Techniques:** Digital Modulation formats, Coherent Binary modulation techniques: FSK and PSK , Coherent Quadrature modulation techniques: Quadriphase-shift Keying, Minimum Shift Keying.	**07**
6	**Source coding and Error Control Coding:** Uncertainty, Information and Entropy, Properties of Entropy, Source coding Theorem, Huffman coding. Channel Coding Theorem, Linear Block codes, Encoder and Decoder using Shift Register Method for Cyclic codes.	**07**
7	**Spread Spectrum Modulation:** Pseudo noise sequences, A Notion of Spread spectrum, Direct sequence spread coherent binary phase shift keying, Frequency hop spread spectrum: Slow Frequency hopping and fast frequency hopping, applications.	**04**
	Total Hours	**45**

Text Books:

1. Wayne Tomasi, Electronics Communication systems, Fundamentals through advanced, Pearson Education, 5th edition, 2009.
2. Simon Haykin, Digital Communication, Wiley India Edition, Reprint 2010.
3. Herbert Taub, Donald L Schilling, Goutam Saha, Principles of Communication systems, 4th Edition, McGraw Hill, July 2013.

Reference Books:

1. Simon Haykin, Digital Communication systems, first edition, John Wiley & Sons, 2014.
2. John G. Proakis, Masoud Salehi, Digital Communications, 5th Edition, McGraw Hill, September 2018.
3. G. Kennedy, B. Davis, SRM Prasanna, Kennedy's Electronic Communication System (SIE), 6th edition, McGraw Hill Education private ltd., 2017.

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Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consist of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics:
    - Amplitude Modulation
    - Frequency Modulation
    - SSB and DSBSC Modulation
    - PAM, PWM and PPM
    - TDM and FDM
    - Pre-emphasis & De-emphasis Circuits in FM applications.
    - Verification of Sampling Theorem
    - Pulse Code Modulation
    - Delta Modulation
    - Line Coding Techniques
    - Cyclic Code and Linear Block Code
    - ASK, FSK and PSK
    - DPSK and QPSK
3. Lab Experiments/Tutorials/Assignments/Viva-voice/Quiz/Lab Exam/Seminar/Presentation.

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Program: B. Tech. (EXTC)				**Semester: V**	
Course: Control System Engineering				**Code:** BTET05016	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of Engineering Mathematics, Circuits and Network Technology, Signals and Systems.

Objectives:

1. To understand the Basics theory of process and control systems and System stability.
2. To analyze and Design the system for fulfilling the performance and stability criterion.
3. To evaluate different stability criterion.

Outcomes:

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

1. Understand the modelling of linear-time-invariant systems using transfer function and state space representations.
2. Understand the concept of stability and its assessment for linear-time invariant systems.
3. Design simple feedback controllers.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Introduction to control problem** Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function	**08**

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	models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.	
2	**Time Response Analysis** Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.	**10**
3	**Frequency-response analysis** Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.	**06**
4	**Introduction to Controller Design** Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.	**10**
5	**State variable Analysis** Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of Controllability and Observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of	**06**

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	linear discrete-time systems. Stability of linear discrete-time systems.	
6	**Introduction to Optimal Control and Nonlinear Control** Performance Indices. Regulator problem, Tracking Problem. Nonlinear system–Basic concepts.	**05**
	Total	**45**

Text Books:

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 4th Edition 2012.
2. B. C. Kuo, F. Golnaraghi "Automatic Control System", John Wiley & Sons,9th Edition 2010.

Reference Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 5th Edition 2010.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 6th Edition 2017.
3. Norman S. Nise, "Control Systems Engineering" Wiley Student Publication, 7th Edition 2014.

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:

Term work should consists of the following

1. At least Ten Laboratory Experiments based on the entire syllabus recorded and graded.
2. Experiments covering the following topics:
   - Mathematical models of physical systems(Simulation)
   - Block diagram algebra.

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- Time response of first and second order systems for standard test inputs.
- Design specifications for second-order systems based on the time-response.
- Construction of Root-loci.
- Bode plots.
- Relative stability using Nyquist criterion
- Proportional, Integral and Derivative Controllers
- State space model
- Pole-placement by state feedback.

3. Lab Experiments/Tutorials/Assignments/Viva-voice/Quiz/Lab Exam/Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : V**	
Course : Statistical Methods and Analysis				**Code :** BTET05017	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	0	0	3	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Probability and stochastic processes

Objectives:

1. Learn the language and core concepts of probability theory.
2. Understand basic principles of statistical inference

Outcomes: On successful completion, students will be able to

1. Understand probabilities distributions and densities.
2. Formulating the hypothesis.
3. Hypothesis testing using, Parametric. inferential statistical tests.
4. Hypothesis testing using, Non- Parametric. inferential statistical tests.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction** Various types of data What is and why statistics, Application of statistics to various domain, Visualization of the data (Plotting various graphs)	**04**
2	**Descriptive Statistics** Mean Median, Mode, other averages, Measure of Desperation – Range , Mean and standard deviation , Correlation Analysis: Pearson correlation and spearman's correlation coefficient	**08**
3	**Sampling mean and variance** Sampling distributions based on normal, Estimation, Properties of	**08**

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	point estimators, Confidence interval, Maximum likelihood and Bayes estimators, Prediction intervals.	
4	**Probability distributions-** Binomial, Poisson, Probability densities- Normal Distribution	**08**
5	**Inferential statistics** Hypothesis Testing: Hypothesis Test Procedure ,Type I and Type II Errors ,One-Tailed and Two-Tailed Tests(Z-Test, T –test,), Chi-square tests, Goodness of fit test	**10**
6	**Non- Parametric Tests** Wilcoxon rank sum and sign rank tests, Kruskal-Wallis test, Friedman F test, Analysis of Variance: ANOVA	**07**
	Total	**45**

Text Books:

1. Miller J.R., Freund J.E. and Johnson R: Probability and Statistics for Engineers, 9th Edition, Pearson Education, 2018.
2. Elliot A. Tanis, Robert V. Hogg, Dale L. Zimmerman, Probability and Statistical Inference, 10th Edition, Pearson Education, 2019.

Reference Books:

1. Oliver C.Ibe, Fundamental of applied probability and statistics, 2nd edition, Academic press, 2014.

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30

Details of Term Work:
Term work should consist of the following

1. Tutorials/Assignments/Viva-voce/ Quiz/Seminar/Presentation

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Program: B. Tech. (EXTC)					**Semester: V**
Course: Environmental Studies					**Code:** BTET05019
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- -- in Question Paper)**
2	0	0	0	Marks Scaled to 50	--

Pre-requisite: Chemistry, Physics

Objectives:

1. Introduce – Environment, Environmental Pollution,
2. Acquaint with Social Issues and methods to manage them
3. Improving Planning of activities

Outcomes:

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

1. Discuss Types of Environmental Pollution, Natural resources and its misuse, Importance of Environmental management for Construction Projects
2. Prepare plan for water management, promotion of recycle and reuse, generation of less waste, avoiding electricity waste
3. Prepare Slogan, Poster and plan activities for environmental protection and social issues

Detailed Syllabus:

Unit	**Description**	**Duration**
1	Introduction to Environment and its components: Natural Resources and it Misuse leading to Environmental degradation. Role of Ecology in Environmental Degradation and Protection. Major industrial and other environmental disasters	**08**

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	Environmental pollution- Types, Causes, Effects, Reduction methodology.	
2	Introduction to waste generation, Methods to Reduce, Reuse and Recycle of Waste Importance of 3R's, Promotion of 3R's - Methods Solid wastes, Industrial Waste, Bio-Medical Waste and Hazardous waste management – Types, Storage, Transportation, Treatment Disposal. C&D and E-waste – Concept, methods for reduction, management Campaigning for waste reduction and management.	**08**
3	Concept of EIA and SIA, significance, methodology, report drafting. Environmental Management System, ISO 14000 EMS certification	**05**
4	Environmental Protection, Social Issues, Disaster Management Social Issues and Environment International Conventions, Summits and Protocols Generation of less waste and avoiding electricity waste. Environmental management for construction Projects	**05**
5	Role of the Government in managing the environmental activities in all sectors. Organisational set up at the Central and state level to manage the environment. Role of judiciary in managing the environment. Role of Citizens, Role of NGOs/ Environmental Activists. Major Laws Air (P&C.P.) Act, Water (P & C.P) Act. Environment Protection Act EPA 1986. Wild life Protection Act etc., PIL	**04**
	Total	**30**

Text Books:

1. Benny Joseph (2017), "Environmental Studies", *The McGraw-Hill Companies*
2. Gerard Kiely (2007), "Environmental Engineering", *Tata McGraw-Hill Education*

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Reference Books:

1. P. Aarne Vesilind, Susan M. Morgan (2004), "Introduction to Environmental Engineering", *Thomas/Brook/Cole*.
2. Mackenzie Davis, David Cornwell (2017), "Introduction to Environmental Engineering", *McGraw-Hill Companies.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA):

Test Marks: 20

Term Work Marks: 30

Details of Term work:

Term work should consist of the following:

1. Minimum five assignments on the above syllabus
2. Report on Social Issues
3. Report on Environmental Management Case Study

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Signature
(Approved by Dean)

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Program : B. Tech. (EXTC)				**Semester : V**	
Course: Management Accounting for Engineers				**Code :** BTET05018	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
2	---	---	2	Marks Scaled to 50	Marks Scaled to 50
Prerequisite: Nil					
Objectives: 1. To provide conceptual understanding of Cost and Management Accounting principles and practices relevant for business analysis and decision making. 2. To develop the ability to understand, analyze and use cost information in day-to-day business functioning. 3. To provide an understanding of measurement of cost and tracing the costs to products and customers. 4. To explain the role of relevant costs in decision making and developing better strategies. 5. To discuss contemporary issues in Cost and Management Accounting and their practical applications.					

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Outcomes:

After completion of this course, participants should be able to;

1. Understand the principles of various Costing methods viz., Activity Based Costing (ABC) Method, Job and Process Costing Methods.
2. Preparation of cost sheet
3. Apply Cost-Volume-Profit Analysis in business decision making.
4. Analyze Price and Cost Variances
5. Using budgetary control techniques for managerial decision making
6. Apply different methods of Inventory management
7. Apply Activity Based Costing to generate reliable and accurate product cost data

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	Topic: Introduction to Cost accounting and Cost concepts: • Interface of Financial accounting with Cost accounting – • Methods of costing • Types of Costing • Classification of Costs based on Behaviour • Classification of Costs based on Behaviour Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill – Chapter1 and 2	2

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	Outcome addressed 1	
2	Topic: Cost Concepts • Classification of Costs based on Degree of Traceability to the product • Functional Classification of Costs • Costs for Decision making and planning Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 2 Outcome addressed 1	2
3	Topic: Preparation of Cost sheet Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 2 Outcome addressed 2	2

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4	Topic: Cost-Volume-Profit Analysis: • Concept of Marginal Costing • Cost-Volume-Profit relationship – • The break-even point – Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 16 Outcome addressed 3	2

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5	Topic: Cost-Volume-Profit Analysis: • Contribution margin concept – • Margin of safety Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 16 Outcome addressed 3	2
6	Topic: Cost-Volume-Profit Analysis: • Applying cost-volume-profit analysis – Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 16 Outcome addressed 3	2

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7	Topic: Decisions making: • Alternative choice decisions – • Limiting factor decisions • Add or drop products Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 17 Outcome addressed 3	2
8	Topic: Decisions making: • Make or Buy decisions • Shut down decision • Special orders	2

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	Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 17 Outcome addressed 3	
9	Topic: Variance analysis- • Direct material variances • Cost Variance • Price Variance • Usage Variance Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 19 Outcome addressed 4	2
10	Topic: Variance analysis-	2

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	• Direct labour variances • Cost Variance • Rate Variance • Efficiency Variance Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 19 Outcome addressed 4	
11	Topic: Budgetary Control • Flexible Budget Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 20 Outcome addressed 5	2

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12	Topic: Budgetary Control • Cash Budget Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 20 Outcome addressed 5	2
13	Topic: Inventory Management • EOQ • Inventory levels- Minimum, Maximum, Re-order, Average	2

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	• Inventory control Techniques- ABC Analysis, JIT method Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 3 Outcome addressed 6	
14	Topic: Activity Based Costing • under costing and over costing- • traditional vs activity-based costing- • Evaluation of costs and benefits of implementing ABC systems Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 8 Outcome addressed 7	2

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15	Topic: Activity Based Costing • Application of Activity based costing in decision making Readings: Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill - Chapter 8 Outcome addressed 7	2
	Total	**30**

Text Book :

Cost accounting. 5/e, Lal. J., & Srivastava, S. (2013). New Delhi, Tata McGraw Hill.

Reference Books :

- Horngren, C., Datar, S. &Rajan, M. (2014). *Cost accounting: A managerial emphasis.* 15/e, New Delhi, Pearson Publication.
- Khan, M.Y., & Jain, P.K. (2007). *Cost accounting*. 7/e, New Delhi, Tata Mc- Graw Hill.
- Ramanathan, S. (2014). *Accounting for Management.* New Delhi, Oxford University Press.
- Shah, P. (2012). *Management Accounting.* 7/e, New Delhi, Oxford University Press.
- Sanyers, J., & Jenkins, & Arora. (2012). *Managerial Accounting.* 1/e, Delhi, Cengage

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Learning.

Internet References :

http://icmai.in

https://www.cimaglobal.com

Any other information:

Detail of Test: Questions based on concepts, applications and numerical

MT-01: Scope: Topics from Unit - 01 to 06 for 10 Marks

MT-02: Scope: Topics from Unit - 07 to 09 for 10 Marks

Test Marks – 20 Marks

Term Work – 30 Marks

Details of Term work: Projects/Presentations application of concepts from on Unit 01 to Unit 15.

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SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Electronics & Telecommunication (2020 – 2021)

Program: B. Tech. (EXTC)				**Semester : VI**	
Course : Discrete Time Signal Processing				**Code :** BTET06012	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of Signals and Systems

Objectives:

1. To introduce different types of linear discrete time systems.
2. To analyze techniques to transform time domain discrete time signal representation to frequency domain representation.
3. To design discrete time filters.

Outcomes:

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

1. Analyze Finite Impulse Response and Infinite Impulse Response systems.
2. Apply various transforms on Discrete Time signals.
3. Design Finite Impulse Response and Infinite Impulse response filters.
4. Implement the structures of discrete time filters and their quantization effects.

Detailed Syllabus:

Unit	Description	Duration
1	**Analysis of LTI systems:** Frequency response of LTI systems, pole zero plots, phase and delay distortion, All pass systems, minimum, maximum mixed phase systems, Review of low pass, high pass, band pass filters, digital resonator, comb filters, notch filters & digital sinusoidal oscillators	**08**
2	**Transforms for Discrete Time Signals:** Discrete Fourier transform: DFT and its properties, multiplication of two DFTs- the circular convolution, additional DFT properties, use of DFT in linear filtering, overlap-save and overlap-add method	**07**

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3	**Fast Fourier transform** Radix 2, 4 and 8 point FFT using radix-2,application of FFT algorithm, Decimation in Time FFT, Decimation-in-Frequency FFT, Inverse FFT , Comparison between DFT and FFT	**06**
4	**Design of FIR filters:** Linear phase filters, causal generalized linear phase system, symmetric, anti-symmetric filters, FIR Filter Design: Frequency sampling method, Windowing method of FIR design, Types of windows(Rectangular, Hamming, Hanning and Blackman)	**06**
5	**Design of IIR filters:** Butterworth filter, Introduction to Chebyshev filters. Design IIR filter using Bilinear transformation Frequency transformation low pass to high pass, band pass, band reject filters	**07**
6	**Structures for discrete time systems:** FIR structures (direct form, cascade form, frequency sampling and lattice); structures for linear phase filters. Structures for IIR systems, direct form-I, Direct form-II, Transposed structures. Analysis of cascaded and parallel IIR structures and FIR structures.	**07**
7	**Amplitude quantization:** Effect of coefficient quantization in IIR and FIR systems, effect of round off noise in digital filters, quantization errors.	**04**
	Total	**45**

Text Books:

1. John Proakis, Digital signal processing, Pearson Education , 4th edition, 2014.
2. Tarun Kumar Rawat, Digital Signal Processing, Oxford University Press, December-2015

Reference Books:

1. Monson H. Hays, Schaums Outline of Digital Signal Processing, McGraw-Hill, 2nd edition, 2011.
2. Maurice Bellanger, Digital Processing of signals, John Wiley Publication, 3rd edition, 2000.

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Details of Internal Continuous Assessment (ICA)

Test Marks : 20

Term Work Marks : 30

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
    - Generation of sinusoidal signal of given frequency and sampling frequency.
    - Frequency response and pole zero plot of IIR/FIR - LPF, HPF, BPF and BRF.
    - Frequency response and pole zero plot of digital resonator, comb filters, notch filters
    - N-Point DFT and IDFT.
    - Circular convolution and linear convolution.
    - Frequency extraction of audio file using digital filtering.
    - Designing Butterworth filter.
    - Designing chebyshev type-I and II filters.
    - Designing FIR filters using windowing technique.

3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Microwave and Antenna Theory				**Code:** BTET06013	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of Electromagnetic Field Theory

Objectives:

1. To introduce the students about the basics of microwaves and different microwave components.
2. To introduce the working principles of various types of antennas.
3. To introduce the various measurement techniques of microwave and antenna parameters.

Outcomes:

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

1. Understand the Frequency Spectrum, Applications, Advantages and Disadvantages of Microwaves.
2. Understand various modes of propagation in WG, active and passive microwave components and their properties.
3. Understand basics of antenna parameters and its types.
4. Measurement of different microwave and antenna parameters.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Introduction to Microwaves:** History of microwaves, Microwave Frequency bands, Characteristics, advantages and disadvantages, applications of microwaves in various fields. Microwave Radiation Hazards, safety and Precautions.	**03**

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2	**Mathematical Model of Microwave Transmission:** Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission **Analysis of RF and Microwave Transmission Lines:** Coaxial line, Rectangular waveguide, Circular waveguide.	**10**
3	**Passive and Active Microwave Devices:** Introduction to S–Parameters and its properties, Microwave passive components: Directional Coupler, Power Divider, Magic Tee. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes. Microwave Tubes: Klystron, TWT, Magnetron.	**07**
4	**Antenna – Basic Concepts** Introduction, Basic Antenna Parameters, Radiation Pattern, Beam width, Radiation Intensity, Directivity and Gain, Antenna aperture concept, Beam efficiency, Effective antenna height, Polarization, Input impedance, FRIIS transmission equation, Antenna temperature. Near field and Far field, duality theorem, reciprocity and reaction theorem.	**07**
5	**Types of Antennas** Traveling wave and broad band antennas: V antenna, Rhombic antenna, Yagi – Uda Antenna. Log periodic and Helical Antennas. Aperture antennas: Rectangular, circular and horn antennas. Reflector Antennas: Plane, Corner and Parabolic reflectors. Concept and benefits of smart antennas, Fixed weight beam forming, Adaptive beam forming.	**10**
6	**Measurement of Microwave and Antenna Parameters:** Measurement of Power, impedance, attenuation, VSWR, at microwave frequency.Measurement of radiation pattern, different methods of Gain measurement, Measurement of radiation efficiency, Antenna impedance measurement, polarization and phase.	**04**
7	**Antenna Measurements:** Introduction, different methods for indoor and outdoor ranges, Measurement of radiation pattern, different methods of Gain	**04**

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	measurement, Measurement of radiation efficiency, Antenna impedance measurement, polarization and phase.	
	Total	**45**

Text Books:

1. David M Pozar, Microwave Engineering, John Wiley, 4th edition, 2011.
2. Sushrut Das, Microwave Engineering, Oxford University Press, 2014.
3. Constantine A. Balanis, Antenna Theory analysis and design, John Wiley publication, 4th edition, 2016.
4. John D Kraus, Antennas, Tata McGraw Hill publication, 5th edition, 2017.

Reference Books:

1. Anapurna Das, Microwave Engineering, Tata McGraw Hills, 3rd edition, 2017.
2. K. D. Prasad, Antenna & Wave Propagation, Khanna Publication, 2nd edition, 2009.
3. Samuel Y. Liao, Microwave Devices and circuits, PHI, 3rd edition, 7 print 2011.

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30
Details of Term Work:
Term work should consists of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics:
    - Measurement of VSWR and reflection coefficient of rectangular WG.
    - Measurement of effect of various dielectric materials on WG parameters.
    - Measurement of insertion loss, coupling, directivity of directional coupler.
    - Measurement of microwave frequency using direct and indirect method.
    - Analysis of E-H (magic) Tee.
    - Analysis of Circulator and Isolator.
    - VI characteristic of Gunn diode.

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- Analysis of radiation pattern of half wave dipole.
- Analysis of radiation pattern of Yagi Uda antenna (3 and 5 element).
- Analysis of radiation pattern of Log periodic.

3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation/Mini Project

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Program: B. Tech. (EXTC)				**Semester : VI**	
Course : Minor Project				**Code :** BTET06014	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
0	2	0	1	Marks Scaled to 50	--

Pre-requisite: Basic knowledge subjects studied till semester V

Objectives:

1. To be able to implement the project.
2. Circuit building/Simulation of the project.
3. Testing of the results, validation.

Outcomes:

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

1. Select an appropriate design based topic.
2. Know about the different methods for implementation of design.
3. Formulate the feasible design model.
4. Summarize the topic into a technical report and demonstrate the model.

Activities to be done in Minor Project:

1. The Project group to be formed consisting of not more than 3 students.
2. The Project area and topic is to be selected in consultation with Project Mentors, alternatively students can propose the topics.
3. Topics can be selected using subjects studied up to semester V and based on latest technology
4. The minor project will involve development implementation and testing of the module/circuit.
5. A mid-term presentation based on Literature survey and Design overview.
6. Report primarily containing the entire overview of the Project from Literature Survey, Feasibility Study, Design, Analysis, Implementation, and Testing is to be submitted at the end of the semester
7. Presentation (about 30 minutes) of the work done during the semester to be evaluated by Internal Examiner and External Examiner.

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Evaluation Scheme:
Mid-Term Presentation: 10 marks
End-Term Presentation and demonstration: 40 marks

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Computer Networks				**Code:** BTET06015	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite:

Objectives:

1. To introduce the concepts of various types of Communication networks and their topologies.
2. To understand the layered computer network architecture and the protocols in different layers.
3. To know the different types of addressing and routing algorithms.
4. To be able to understand the TCP/IP architecture of internet.

Outcomes:

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

1. Analyze various topologies of computer networks
2. Analyze the layered architecture and the transfer of information using protocols in various layers
3. Understand the concepts of internet and the protocols in the TCP/IP protocol suite and use it for various types of information flow and applications.
4. Apply the concept of packet switching and routing algorithms for network design.

Detailed Syllabus: (per session plan)

Unit	**Description**	**Duration**
1.	**Communication networks and services:** Network functions and network topology, basics of switching techniques. Reference network Model (ISO-OSI, TCP/IP)	04
2.	**The Physical Layer:** Function of physical layer, introduction to guided and unguided transmission media.	02

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3.	**The data link layer:** Peer to peer protocols and service models, end to end versus hop by hop. ARQ protocols, stop and wait ARQ, Go back-N ARQ, selective repeat ARQ, sliding windows flow control, error detection and correction, framing. Data link protocols: - HDLC data link control, point to point protocol, statistical multiplexing	08
4.	**The Medium Access Sub layer: Data link layer** The channel allocation problem, multiple access protocols, IEEE standard 802.3, 802.11, Network devices-repeaters, hubs, switches and bridges.	06
5.	**The Network Layer:** Functions of Network layer, The Internet Protocol (IP), IP packet, IPv4 addressing, subnet mask, classless inter-domain routing (CIDR), address resolution, reverse address resolution, IP fragmentation and reassembly, ICMP, IGMP Dynamic Host Configuration Protocol (DHCP), IPv6.	08
6.	**Packet switching networks and routing protocols:** Network services and internal network operation: Connection oriented packet switching, connectionless packet switching, virtual circuit packet switching. Routing and routing algorithm classification: shortest path algorithm, flooding, distance vector routing algorithm: Bellman-ford algorithm, Dijkstra's algorithm, link state routing, hierarchical routing, Internet routing protocols: open shortest path first protocol, border gateway protocol, multicast routing.	09
7.	**Transport Layer:** User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP Reliable stream service, TCP operation: - Three way handshake, TCP congestion control	05
8.	**Application Layer:** Application layer function and protocols: DNS, HTTP, FTP, SNMP, SMTP.	03
	Total	45

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Text Books:

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th edition, Pearson, 2013
2. Forouzan, Data Communication and Networking, Tata McGraw Hill publication, 4th edition, 2013.

Reference Books:

1. William Stallings," Data and Computer Communication", 10th edition, Pearson Education publication, 2013.

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consist of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.

2. Experiments covering the following topics
   - Communication networks
   - OSI reference model
   - Transmission media
   - Multiple access protocols
   - IEEE 802.11
   - Network layer protocols
   - Network layer addressing
   - TCP/IP
   - TCP operation
   - Application layer

3. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Embedded Systems				**Code:** BTET06016	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Digital Design, Microprocessor and Microcontrollers

Objectives:

1. Understand an embedded systems and real-time operating systems.
2. Identify the unique characteristics of real-time operating systems
3. Define the unique design problems and challenges of real-time operating systems
4. Apply embedded design techniques to various low power embedded system application.

Outcomes:

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

1. Understand embedded system and its design requirement for various applications.
2. Implement embedded system's communication protocols.
3. Understand the concept of Real Time Operating System (RTOS) and its multitasking.
4. Design an embedded system for low power applications.

Detailed Syllabus: (per session plan)

Unit	**Description**	**Duration**
1	**Introduction of Embedded Systems (ES):** 8/16 bit microcontrollers block diagram,basic requirements of ES, Design of embedded systems, system on chip concept, VLSI and ASCI concepts, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System Components used in ES.	**8**

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2	**Hardware Software Co-Design and Program Modeling**: Fundamental Issues in Hardware Software Co-Design, Embedded communication protocols (Xbee, RS-232, IrDA, I2C and CAN) Computational Models in Embedded Design, Introduction to Unified Modeling Language, Hardware Software Trade-offs and Higher level programming models.	**8**
3	**Embedded Firmware & Hardware Design and Development:** Embedded Firmware Design Approaches, Embedded Firmware Development Languages, Programming in Embedded C, Hardware Design: Analog electronics and digital electronics components, Electronic design automation (EDA) tools, Schematic design using OrCad, PCB layout design.	8
4	**Real-Time Operating System (RTOS) Basics**: Operating System Basics, Types of OS, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads and Processes Scheduling: Putting them altogether, Task Communication, Task Synchronization, Device Drivers, How to Choose an RTOS.	6
5	**The Embedded System Development Environment**: The Integrated Development Environment (IDE), Types of Files Generated on Cross-compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.	4
6	**Trends in the Embedded Industry**: Processor Trends in Embedded System, Embedded OS Trends, Development Language Trends, Open Standards, Frameworks and Alliances, RTOS examples: VxWorks/MicroOS/OS-II	8
7	**Case study**: DSP/microprocessor based or FPGA based system design.	3
	Total	**45**

Text Books:

1. Raj Kamal (2017), "Embedded Systems", *Tata McGraw Hill Education Private Limited,* 2017

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2. Shibu K V (2009), " Introduction to Embedded Systems", *Tata McGraw Hill Education Private Limited*, 2009

Reference Books:

1. James K Peckol (2015), "Embedded Systems - A Contemporary Design Tool", *John WeilyPublicatoin, 2015*.
2. Frank Vahid, and Tony Givargis (2014), "Embedded System Design", *John Wiley Publication*, 2014
3. David E. Simon (1999), "An Embedded Software Primer", *Addison-Wesley ProfessionalPublication*, 1999.

Any other information:

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consist of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics:
   - Study of 8/16/32 bit microcontrollers (AT89c51/52, P89C51RD2, LPC21xx, LPC22xx)
   - Interface LED's to 8/32 bit controllers (P89C51RD2, LPC21xx)
   - Implement hardware real time timer using 8/32 bit controllers (P89C51RD2, LPC21xx)
   - Interface 16*2 Char LCD to 8/32 bit Microcontrollers (P89C51RD2, LPC21xx)
   - Implement device driver code for I2C bus protocol using 8-bit microcontroller
   - Implement temperature monitoring system using LM35
   - Interface 4*4 matrix keyboard to 8/16 bit microcontrollers
   - Implement serial communication using 8/16 bit microcontrollers

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- Implement RTC using 32 bit microcontrollers
- Design embedded system based on RTOS

3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation/Mini Project

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Power Electronics (Departmental Elective - 1)				**Code:** BTET06017	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Electronic Devices, Analog Circuits

Objectives:

1. To analyze different converters and control with their applications
2. To study advanced converters and switching techniques implemented in recent technology
3. To understand, simulate and design single-phase and three-phase thyristor converters.

Outcomes:

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

1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Characteristics of Semiconductor Power Devices:** Thyristor, power MOSFET and IGBT structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs	08

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	and IGBTs (discrete and IC based).Concept of fast recovery and schottky diodes as freewheeling and feedback diode.	
2	**Controlled Rectifiers:** Principle of Phase-Controlled converter operation, Single Phase Semi Converter and Single Phase Full Converter with R, RL, RLE load. Three Phase Half Wave Converters, Three Phase Semi Converter and Three Phase Full converter with R, RL, RLE load. Design of Converter Circuits, Effect of Load and source inductances.	09
3	**Choppers:** Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper	08
4	**Single-phase inverters:** Principle of operation of Series and Parallel, full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter	10
5	**Switching Power Supplies:** Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter - series loaded half bridge DC-DC converter.	05
6	**Applications**: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, and sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.	05
	Total	45
Text Books: 1. Muhammad H. Rashid, "Power electronics", edition IV, Prentice Hall of India.		

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2. Ned Mohan, Robbins, "Power electronics", edition III, John Wiley and sons.
3. P.C. Sen., "Modern Power Electronics", edition II, Chand& Co.

Reference Books:

1. V.R.Moorthi, "Power Electronics", Oxford University Press.
2. Cyril W., Lander," Power Electronics", edition III, McGraw Hill.
3. G K Dubey, S R Doradla,:Thyristorised Power Controllers", New Age International Publishers. SCR manual from GE, USA.

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consists of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics,
   - V-I characteristics of Silicon Controlled Rectifier (SCR)
   - V-I characteristics of DIAC.
   - Working of UJT relaxation oscillator as a gate firing circuit.
   - Operation of a single phase controlled bridge converter for different values of firing angle.
   - Determine the chopping frequency and output voltage of a step up chopper for different values of duty cycle.
   - Determine the chopping frequency and output voltage of a step down chopper for different values of duty cycle.
   - Verify the working of parallel inverter.
   - Verify the working of series inverter.
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation/Mini Project

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Computational Methods (Departmental Elective - 1)				**Code:** BTET06018	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Mathematics – I, II, and III. Basic Knowledge of Programming

Objectives:

1. To instill in prospective engineer's knowledge of techniques in calculus, multivariate analysis and linear algebra.
2. To equip the students with intermediate to advanced level concepts and aligned tools to help them tackle advanced mathematics and related applications.

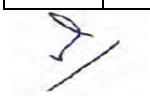
Outcomes:

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

1. Understand the concept of floating point and errors.
2. Identify and solve problem using numerical methods
3. Implement algorithm based solution for scientific computation.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Computer Arithmetic:** Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmetic, Cancellation.	**05**
2	**System of linear equations:** Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric	**07**



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	Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems.	
3	**Eigenvalues and singular values:** Eigen-values and Eigenvectors, Methods for Computing All Eigen-values, Jacobi Method, Methods for Computing Selected Eigen-values, Singular Values Decomposition, Application of SVD.	**06**
4	**Linear least squares:** Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting.	**07**
5	**Nonlinear equations:** Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares	**05**
6	**Interpolation:** Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation	**05**
7	**Numerical Integration and Differentiation:** Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation.	**05**
8	Initial Value Problems for ODES, Euler's Method, Taylor Series Method, Runga – Kutta Method, Extrapolation Methods, Boundary Value Problems for ODES, Finite Difference Methods, Finite Element Method, Eigenvalue Problems.	**05**
	Total	**45**

Text Books:

1. Heath Michael T., "Scientific Computing: An Introductory Survey", McGraw-Hill, 2nd Edition,2002.
2. Xin-she Yang (Ed)., "Introduction to Computational Mathematics", World Scientific Publishing Co., 2nd Edition, 2008.

Reference Books:

1. Press William T.,Saul A. Teukolsky, Vetterling William T and Brian P. Flannery,

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"Numerical Recipes: The Art of Scientific Computing", Cambridge University Press,, 3rd Edition,2007.
2. Kiryanov D. and Kiryanova E., "Computational Science", Infinity Science Press, 1st Edition, 2006.
3. Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, "Scientific Computing with Matlab and Octave", Springer, 3rd Edition, 2010.

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consists of the following

1. Minimum ten experiments covering the whole syllabus, duly graded.

2. List of Experiments:

- Gauss Elimination Method
- Gauss Jordan Method
- Inverse of a Matrix by LU Decomposition
- Roots of Equation (Bisection, Secant, RegulaFalasi, etc.)
- Least Square Method for generating the function
- Numerical Differentiation
- Numerical Integration
- Newton's Method of Interpolation
- Solving ODE (Euler's, Taylor's, and Runga-Kutta)
- Determining Eigen values and Eigen vectors.

3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation/Mini Project

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Industrial Automation (Departmental Elective - 1)				**Code:** BTET06019	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of basic electronics and control theory

Objectives:

1. To provide knowledge to learn essential concepts behind control system elements and operations.
2. To expose students to the topics of process control, measurement, and instrumentation to allow applications-oriented design.

Outcomes:

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

1. Learn and apply essential concepts behind control system elements and operations in hydraulics and pneumatics automation.
2. Identify systems approach of the process control in industry and state-of-the-art coverage of computer integrated manufacturing using PLCs and flexible manufacturing systems as applicable in industrial applications.
3. Develop skills in handling computer-based controllers.
4. Explain fundamentals of sensorics technology and modular mechatronics along with robot technology.

Detailed Syllabus:

Unit	**Description**	**Duration**
1	**Introduction to Automation** Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations.	**04**

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2	**Introduction to Fluid Power Generating/Utilizing Elements** Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics - Linear actuator -. Reservoir capacity, heat dissipation, accumulators - standard circuit symbols, circuit (flow) analysis.	**04**
3	**Control and Regulation Elements** Direction flow and pressure control valves-Methods of actuation, types, sizing of ports-pressure and temperature compensation, overlapped and under lapped spool valves-operating characteristics- Electro Hydraulic System, Electro Hydraulic servo valves-Different types characteristics and performance.	**06**
4	**Hydraulics** Introduction to Hydraulics, Physical Fundamentals and principles, Hydraulic components (Pump, Valves, etc.), Basic hydraulics circuits and Electro Hydraulics, Practical examples based on simple automation tasks, types of proportional control devices- Pressure relief, Flow control, Direction control, Hydraulic symbols, Spool configurations, Selection & sizing with reference to manufacturer's data, Electrical operation, Basic electrical circuits and operation, Solenoid design, Comparison between conventional and proportional valves.	**06**
5	**Pneumatics** Introduction to Pneumatics, Physical Fundamentals and principles of Pneumatics, Pneumatic Components (Compressor, Valves, Compressed Air), Basic hydraulics circuits and Electro Pneumatics, Practical examples based on simple automation tasks	**06**
6	**Control schemes & controllers** On/OFF control, P, PI, PID control, related terminologies, parameter adjustments and implications Electronic P, PI & PID controller. Data acquisition, set point control, direct digital control Review of Z-transform theory and its application in digital control Digital PID algorithms	**06**
7	**PLC** Introduction to Automation Technology and Programming Languages (Ladder Diagram), Interface I/O modules with PLC,	**07**

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	Working principle of relays and contactors, Area of application, Programming with Relay and PLC	
8	**Sensorics, Robotics and Mechatronics** Introduction to Sensorics Technology, Basics and Fundamentals, Functions of Inductive, Capacitive, Magnetic, Ultrasonic and Optical types of sensors, Introduction to Robot Technology Basics of Mechatronics and Modular Mechatronics.	**06**
	Total	**45**

Text Books:

1. Johnson Curtis, Process Control Instrumentation Technology, Prentice hall of India, 8th edition, 2007.
2. Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing, Pearson Education, 4th edition, 2013.

Reference Books:

1. IlangoSivaraman, Introduction to Hydraulics and Pneumatics, PHI Learning Pvt Ltd., **3rd**edition, **2017.**
2. Study Material from Bosch-Rexroth Automation Company.

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consists of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics:
    - Pump characteristics
    - Basic (manual) hydraulic circuits
    - Electrohydraulic circuits
    - Basic pneumatic circuits
    - Electropneumatic circuits
    - Sequencing circuits with pneumatics
    - Sensors (inductive, capacitive, magnetic, ultrasonic, photoelectric)
    - PLC programming (ladder diagram)

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- Electronic controllers (P, PI, PD, PID)

3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation/Mini Project

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Program: B. Tech. (EXTC)				**Semester : VI**	
Course : Image and Video Processing (Departmental Elective - 1)				**Code:** BTET06020	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of Digital Time Signal Processing

Objectives:

1. To understand Image fundamentals and resolutions
2. To comprehend Image processing techniques in spatial and frequency domain
3. To design techniques for filtering images and feature extraction.
4. To develop image and video processing applications in practice

Outcomes:

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

1. Apply spatial domain techniques for grey and color image enhancement.
2. Implement various transforms to convert and process image in frequency domain.
3. Understand various morphological operations and segmentation techniques for images.
4. Use motion estimation techniques for analysis of video signals

Detailed Syllabus:

Unit	Description	Duration
1.	**Image Fundamentals:** Basics of sampling and quantization, Representing Digital Image, Spatial and Gray level resolution, Basic relationships between pixels, RGB ,HSI, CMY and CMYK colour models	**04**

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2.	**Image Enhancement** **Spatial Domain:** **Point Processing-** Digital negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transformation, power law transformation. **Neighbourhood Processing:** Smoothing spatial filters, Sharpening spatial filters. **Color image enhancement:** intensity transformation and spatial filters **Frequency Domain:** 2-D DFT and its properties, Ideal, Butterworth and Gaussian Smoothing and Sharpening filters, Homomorphic filtering **Histogram processing:** Histogram equalization, histogram specification.	**10**
3.	**Image Transforms:** Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Discrete Wavelet Transform	**08**
4.	**Morphological Image Processing:** Dilation, erosion, opening, closing, Hit –or-Miss transformation **Basic Morphological Algorithms**: Boundary extraction on binary images, Region filling , Skeletonization	**06**
5.	**Image Segmentation:** **Detection of discontinuities:** Point, Line and Edge detection **Edge linking and boundary detection:** Local processing, global processing via Hough transform, Global processing via Graph Theoretic techniques. **Thresholding** **Region based segmentation**: Region growing, region splitting and merging	**08**
6.	**Fundamentals of Digital Video** **Video Formation , Perception and Representation:** Digital video sampling, temporal correlation, video frame classifications, I, P and B frames, Digital video quality measure.	**04**
7.	**Digital Video Processing Techniques** Fundamentals of motion estimation and compensation General methodologies in motion estimation: Motion	**05**

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	representation, Motion Estimation Algorithms: Sequential Search Block Matching, Hierarchical Block Matching Algorithm	
	Total	**45**

Text Books:

1. Rafael.C. Gonzalez and Richard E. Woods, Digital Image Processing, Pearson Education, 4th Edition, 2019.
2. Oge Marques, Practical Image and Video Processing using Matlab, IEEE Press, John Wiley & Sons Publication, 2011.

Reference Books:

1. **Li**, Ze-Nian, **Drew**, Mark S., **Liu**, Jiangchuan, "Fundamentals of Multimedia", Springer, 2nd Edition, 2014.
2. Scotte Umbaugh, Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools, 2nd edition, CRC Press, 2011.

Details of Internal Continuous Assessment (ICA)

Test Marks : 20

Term Work Marks : 30

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics
    - Colour image to grey scale
    - Image enhancement using point processing techniques
    - Grey scale and sampling resolution
    - Image enhancement using neighbourhood processing
    - Histogram processing
    - Frequency domain filtering
    - Image Transform
    - Morphological algorithms
    - Edge detection techniques
    - Basic video processing techniques
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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<table>
<tr><td colspan="4">Program: B. Tech. (EXTC)</td><td colspan="2">Semester : VI</td></tr>
<tr><td colspan="4">Course: Digital Television Systems
(Departmental Elective - 1)</td><td colspan="2">Code : BTET06021</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="2">Evaluation Scheme</td></tr>
<tr><td>Lecture (Hours per week)</td><td>Practical (Hours per week)</td><td>Tutorial (Hours per week)</td><td>Credit</td><td>Internal Continuous Assessment (ICA) (Marks-50)</td><td>Term End Examinations (TEE) (Marks -100 in Question Paper)</td></tr>
<tr><td>3</td><td>2</td><td>0</td><td>4</td><td>Marks Scaled to 50</td><td>Marks Scaled to 50</td></tr>
<tr><td colspan="6">Pre-requisite: Knowledge of Analog Circuits, Analog and Digital communication.</td></tr>
<tr><td colspan="6">Objectives:
1. To provide knowledge and principle of Colour TV and Advanced TV systems.
2. To teach fundamentals of colour signal transmission and their standards.
3. To introduce principles of display technologies like LCD TV and LED TV.
4. To give an insight of the concepts of digital signal transmission and principle of Digital TV, HDTV, EDTV, IPTV and 3D TV.</td></tr>
<tr><td colspan="6">Outcomes:
After completion of the course, students would be able to:
1. Understand the working principles of various colour TV systems.
2. Apply knowledge of basic colour TV systems for advanced TV technologies.
3. Analyze the principles of various display technologies.
4. Analyse the fundamentals of digital signal transmission.</td></tr>
<tr><td colspan="6">Detailed Syllabus:</td></tr>
<tr><td>Unit</td><td colspan="4">Description</td><td>Duration</td></tr>
<tr><td>1.</td><td colspan="4">Fundamentals of Colour Television:
Compatibility and reverse compatibility, colour perception, Three colour theory, luminance, hue and saturation, colour TV camera, generation of luminance and colour difference signals,</td><td>06</td></tr>
</table>

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	unsuitability of (G-Y) signal for transmission. **Colour signal transmission**: Frequency interleaving, bandwidth, Quadrature AM, colour burst signal, weighting factors, formation of chrominance signal, colour signal Phasor diagram.	
2.	**Colour TV Systems:** **NTSC colour TV system**: Phasor diagram of I and Q signals, colour subcarrier frequency, coder and decoder, limitations. **PAL colour TV system**: features, PAL burst, cancellation of phase errors, PAL-D demodulation, choice of colour subcarrier frequency, PAL coder and decoder, merits and demerits, **SECAM III colour TV system**: Coder and decoder, merits and demerits.	**08**
3.	**LCD :** Liquid crystal display **(**LCD) technology, Liquid crystals, operation of Liquid crystal display, Twisted Nematic (TN) transmissive LCD, passive and active- matrix LCD's, TFT-LCD panel drive, Backlight assembly. **LED TV:** LED technology, materials used for LED's, working of LED TV, Parameters of a LED module, advantages of LED screens, comparison of LCD, edge lit LED and back lit LED TV, Organic LED TV (OLED).	**06**
4.	**Digital Television Transmission Standards:** ATSC terrestrial transmission standard, vestigial sideband modulation, DVB-T transmission standard, ISDB-T transmission standard, channel allocations, antenna height and power.	**07**
5.	**Digital TV:** Principles of digital video broadcasting: digitization, compression and channel encoding, Standard definition (SDTV)	**08**

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	sampling rate, video sampling, MPEG encoding: components of DTV, Video- MPEG-2 coding, MPEG video compression, Digital TV receiver, Merits of Digital TV receivers, Direct to home (DTH) Television system.	
6.	**High definition TV (HDTV):** Advantages of HDTV, HDTV parameters, comparison of SDTV and HDTV aspect ratio, HDTV common interface format, Introduction to Ultra HDTV, Extended definition TV.	**04**
7.	**IPTV:** Internet protocol TV technology, On-line convergence, Asymmetrical digital subscriber line (ADSL) bandwidth allocation, Bit rates, Closed IPTV network, Video on demand, comparison of IPTV and cable technology. **3 D TV:** Introduction to 3 D TV technology, three dimensional video displays.	**06**
	Total	**45**

Text Books:

1. Gulati R.R, Monochrome and Colour Television, New Age International, 3rd edition, 2014.
2. K.F. Ibrahim, Newnes guide to Television and Video technology, 4th edition, 2007.

Reference Books:

1. Gerald w. Collins, Fundamentals of Digital Television Transmission, John Wiley & Sons, 2001.
2. Gulati R. R., Modern Television Practice: Transmission, Reception and Applications, New Age International, 5th edition, 2015.
3. Herve Benoit , Digital Television, 2nd Edition, Focal Press, 2002.

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Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term Work:
Term work should consist of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Experiments covering the following topics:
    - Working of Colour TV receiver.
    - Measurement of Composite video signal for various video patterns and corresponding sweep waveform in the Colour TV receiver.
    - Construction of Colour picture tube, and measuring various voltages.
    - Learn fault creation and rectification at various stages of T.V
    - Installation of satellite dish antenna and measurement of LNB frequency, RF power with DTH system for reception of TV channels.
    - Comparison of Analog colour TV (CRT) and LCD TV.
    - Utilization of LCD screen and set top box to receive the satellite TV station to get satellite TV reception on PC monitor (Input given from Camera or Indoor antenna).
    - Measurement of different voltages using Switch mode power supply (SMPS).
    - Comparison of various Advanced Television Technologies.
3. Lab Experiments/Tutorials/Assignments/Viva-voce/ Quiz/Lab Exam/ Seminar/Presentation

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Program: B. Tech. (EXTC)				**Semester : VI**	
Course: Research Methodology				**Code:** BTET06022	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
0	2	0	1	Marks Scaled to 50	-

Prerequisite: --

Objectives:

The aim of this course is to introduce students to the approach to do research in the computing domain

Outcomes:

After completion of this course, students should be able to

1. Produce a review report related to the research conducted
2. Identify and use print and electronic library resources effectively and appropriately
3. Adhere to ethical guidelines for writing reports and collecting information
4. Create a research proposal based on the review findings

Detailed Syllabus: (per session plan)

Week	**Description**	**Duration**
1	- Identify and use print and electronic library resources effectively and appropriately - Literature search and review	**6**
2	- Literature search and review - Referencing style, plagiarism basics and checks - Writing a review report	**14**
3	- Writing a review report - Using Latex and other tools for report/research paper writing - Drafting a research proposal	**10**
	Total	**30**

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Text Books / Reference books: --
Any other information : **Details of Internal Continuous Assessment (ICA)** **Test Marks :** NA **Term Work Marks :** 50 **Details of Term work :** Assignment/Presentation/Viva

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Program: B. Tech. (EXTC)				**Semester: VI**	
Course: Professional Ethics and Legal Aspects				**Code:** BTET06023	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks – 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
2	0	0	2	Marks Scaled to 50	Marks Scaled to 50
Pre-requisite: Constitution of India (BTMA01005)					
Objectives: 1. To familiarize with basic concepts of the laws governing corporations 2. To provide knowledge of recent developments in Law at the national level 3. To facilitate social and legal awareness from legal perspective					
Outcomes: After completion of the course, students would be able to: 1. Knowledge about the basic concepts of the important business laws 2. Application and interpretation of the business and labour laws in the actual business environment					
Detailed Syllabus: (per session plan)					

Unit	**Description**	**Duration**
1	**<u>Indian Contract Act, 1872</u>** • Introduction to Concepts, Major Definitions under the Act • Stages to formation of a Contract • Essential Elements- o Offer & Acceptance (Essentials) o Capacity of parties (Minors, Unsound Mind, Disqualified by Law) o Free Consent (Vitiating Elements & Effects- Coercion, Undue Influence, Fraud, Misrepresentation, Mistake) o Lawful Consideration & Lawful Object o Possibility to Perform (Doctrine of Frustration) o Agreement Expressly Declared Void	03

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	• Types-Valid, Void & Voidable Agreements
	• Performance & Discharge of Contract;
	• Remedies for Breach of Contract
	• Special Contracts:
	  o Indemnity & Guarantee
	  o Bailment & Pledge
	  o Contract of Agency	

2	**Sale of Goods Act, 1979** • Concept of Sale as a Contract • Essentials of contract of sale & it's conditions • The Rule of Caveat Emptor and the Exceptions • Conditions & Warranties including implied Conditions & Warranties • Rules of Delivery, Unpaid Seller & his rights • Suits for Breach of contract	02
3	**Companies Act, 2013** • Introduction to Act • Administration of Company Law (NCLT/NCLAT) • Types of companies • Characteristics of a company • Essential Documents and their clause: Memorandum of Association, Articles of Association, Certificate of Incorporation • Management: Classification of directors, Key managerial personnel, Types of meetings & resolutions • Lifting of the Corporate Veil • Concept and modes of Winding Up a company	03
4	**Partnership Laws** A) The Partnership Act, 1932 • Nature and Characteristics of Partnership • Types of Partners • Rights and Duties of Partners • Incoming and outgoing Partners • Mode of Dissolution of Partnership	03

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	B) The Limited Liability Partnership Act, 2008 • Salient Features of LLP • Differences between LLP and Partnership, LLP and Company • LLP Agreement • Partners and Designated Partners • Partners and their Relationship	
5	**Industrial Relations** • The Trade Union Act, 1926 - Emergence of Trade Unions in India and the changing trends in Trade Unionism and their politics • Industrial Disputes Act, 1947 - Industrial Strikes and Employer Lockouts • Managing Industrial conflicts - Trends and Issues in effective Labour Court Administration • Role of Conciliation Officers in the Resolution of Industrial Disputes	03
6	**Intellectual Property Rights** • Introduction and the need for IPR (WIPO, TRIPS) • Trade Marks Act,1999 - Registration of Trademarks; passing off and infringement • Indian Copyright Act, 1957 - Registration and infringement of copyright • Patents Act, 1970 - Meaning of patent & Inventions; Opposition proceedings & Grant of Patent • Overview of Trade secrets and Industrial Designs	02
7	**Competition Act, 2002** • Objectives of Competition Law • Concept of Appreciable Adverse Effect on Competition (AAEC) • Anti-Competitive Agreements (S.3)- Horizontal Agreements, Vertical Agreements, Cartels, Blanket provision for IPR • Abuse of Dominance (S.4) • Competition Commission of India – Role, Duties, Competition	02

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	Advocacy • Appellate Tribunal – Role of NCLAT	
8	**Alternative Dispute Resolution** • The Law and Methods of Alternative Dispute Resolution • Comparative Study of the various forms of ADR • Application of ADR Methods in Different Fields & Areas • Arbitration & Conciliation Act, 1996 & International Developments • Arbitration clauses, Preparation for Arbitration, Conducting an Arbitration, Seat, Venue, Examinations and its various aspects, Evidence	02
9	**Universal Ethics** • Nature and Essence of Ethics • Role of ethics in Governance • Business Ethics Concepts • Professional ethics	02
10	**Understanding Professional Ethics** • Characteristics of ethical organizations • Causes of unethical behaviour • Benefits of ethical behaviour	02
11	**Applied Ethics: Unethical Practices in Businesses** • Bribery, Conflict of interest and Anti-corruption behaviour • Insider-Trading; meaning and legal provisions • Sexual harassment: The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	03
12	**Applied Ethics: Combating Unethical Practices in Businesses** • Whistleblowing: Concept and Mechanism • Socially responsible leadership and Corporate Social Responsibility's role in corporate governance • Alternative Dispute Resolution as a tool to overcome unethical practices	03
	Total	**30**

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Text Books:

1. Pathak A, 2013, *Legal Aspects of Business*, 6th Edition, McGraw Hill
2. P Narayanan, 2009, *Intellectual Property Law; 3rd Edition,* Eastern Book Company

Reference Books:

1. Mahesh Tandon, (6th Edition), *Company Law*
2. K R Bulchandani, (2009), *Business Law*, Himalaya Publications
3. H M Jhala, (2007), *Intellectual Property and Competition Law in India;* N M Tripathi P. Ltd.
4. Lucjan Klimsza, (1st Edition), *Business Ethics – Introduction to Ethics of Value*; ISBN: 978-87-403-0690-3
5. Padhi, P..K. (2012), Labor and Industrial Laws, PHI
6. Venkatratnam, C.S. (2004). Industrial Relations, OUP.

Internet References:

1. www.mahalibrary.com
2. www.alllaw.com
3. www.findlaw.com
4. www.justice.com
5. www.legalpundits.com
6. www.indlaw.com
7. www.maupatra.com

Details of Internal Continuous Assessment (ICA)
Test Marks : 20
Term Work Marks : 30

Details of Term work:
Term work should consist of the following:

- Class Test/ Assignment/Case Studies/Projects/ Presentations

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SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Electronics & Telecommunication (2020 – 2021)

<table>
<tr><td colspan="4">Program: B. Tech. (EXTC)</td><td colspan="2">Semester : VII</td></tr>
<tr><td colspan="4">Course : Optical Fiber Communication</td><td colspan="2">Code : BTET07001</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="2">Evaluation Scheme</td></tr>
<tr><td>Lecture Hours per week</td><td>Practical Hours per week</td><td>Tutorial Hours per week</td><td>Credit</td><td>Theory (3 Hrs, 70 Marks)</td><td>Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)</td></tr>
<tr><td>3</td><td>2</td><td>0</td><td>4</td><td>Scaled to 70 Marks</td><td>Scaled to 30 Marks</td></tr>
<tr><td colspan="6">Pre-requisite: Knowledge of Analog and digital communication, Electromagnetic wave theory.</td></tr>
<tr><td colspan="6">Objectives:
1. To provide knowledge of the basic elements of optical fiber transmission.
2. To understand the structure and characteristics of Optical sources and detectors.
3. To understand the different types of losses and signal degradation in optical wave guides.
4. To understand concepts of optical budgeting, WDM and optical networks.</td></tr>
<tr><td colspan="6">Outcomes:
After the successful completion of this course, the student will be able to
1. Explain the different elements of optical fiber communication system, propagation of optical signals, losses and signal degradation in optical system.
2. Analyze and assess between different technologies of transmission, reception and communication link.
3. Apply knowledge for evaluating the performance of the system and design the system for specified parameters.
4. Determine concept of optical networks, soliton based communication and WDM.</td></tr>
<tr><td colspan="6">Detailed Syllabus:</td></tr>
<tr><td>Unit</td><td colspan="4">Description</td><td>Duration</td></tr>
</table>

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1.	**Introduction** Electromagnetic spectrum, optical fiber communication system, digital optical fiber link, advantages of optical fiber communication, optical fiber waveguide, Ray theory transmission, Electromagnetic mode theory for optical propagation, mode coupling, Step index fibers, Graded index fibers, Single mode and multimode fibers, Fiber materials.	**08**
2.	**Transmission characteristics of optical fibers:** Attenuation, Absorption losses, Linear and Nonlinear scattering losses, Fiber bend loss, Dispersion: Intramodal and Intermodal, Dispersion shifted fibers, Dispersion flattened fibers. **Optical fiber connection:** Fiber alignment and joint loss, Fibers splices, Fiber connectors, Fiber couplers, Wavelength division multiplexing.	**08**
3.	**Optical sources** Types of Optical sources, requirements of optical fiber emitter, absorption and emission of radiation, population inversion, Laser structure, semiconductor injection Laser, Surface and Edge emitter LEDs structures, LED characteristics, output spectrum.	**05**
4.	**Optical detectors** Requirements of Optical detectors, direct and indirect absorption, quantum efficiency, responsivity, p-i-n photodiode, Avalanche photodiode, Receiver noise, Receiver structure.	**05**
5.	**Optical Amplification** Semiconductor Optical Amplifiers (SOA), Fiber amplifiers and their applications, Erbium doped silica fiber laser, Raman and Brillouin fiber amplifiers.	**04**
6.	**Optical Fiber Systems and measurements** Link power budget, rise time budget, Wavelength division multiplexing, lines codes and clock recovery **Optical Fiber measurements:** Measurement of attenuation, dispersion, refractive index profile, numerical aperture, fiber diameter,	**07**

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	Optical time domain reflectometry (OTDR).	
7.	**Optical Networks Architectures** Introduction to Optical Networks, SONET / SDH, Metropolitan-Area Networks, Layered Architecture, Broadcast and Select Networks Topologies, Media-Access Control Protocols and Test beds, Wavelength Routing Architecture, Next generation optical Internets. **Soliton systems:** Nonlinear effects. Soliton – based communication. High speed and WDM soliton systems.	**08**
	Total	**45**

Text Books:

1. John M. Senior, Optical Fiber Communications Principles and Practice, Pearson, 3rd Edition, 2009.
2. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks: A Practical perspective, Elsevier, 3rd edition, 2010.

Reference Books:

1. G. Keiser, Optical Fiber Communications, Tata Mc –Graw Hill Publication, 4th edition, 2008.
2. G. Agrawal, Nonlinear fiber optics, Academic Press, 5th edition, 2012.
3. G. Agrawal, Fiber Optic Communication Systems, John Wiley and Sons, New York, 3rd edition, 2002.
4. C. Siva ram Murthy and Mohan Gurusamy, WDM optical networks: concepts, design and algorithms, Prentice Hall of India, 2002.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : Wireless Communication Technology				**Code :** BTET07002	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Principles of Communications Engineering and digital communication

Objectives:

1. To provide the knowledge of mobile communication systems in various aspects and trends.
2. To understand the mobile radio propagation mechanism.
3. To understand 2G (GSM, GPRS,EDGE), 3G cellular mobile systems.
4. To understand LTE and 4G: emerging technologies for wireless communication.

Outcomes:

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

1. Recognize the significance of cellular concept and the capacity of wireless communication.
2. Explain the mobile radio propagation mechanism.
3. Describe the working and application of GSM, CDMA and 3G (UMTS, IMT 2000) mobile systems.
4. Describe the techniques and technological advancement in LTE and 4G networks.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**The cellular concept:** Introduction to cellular system, Frequency reuse, handoff, interference, methods of improving the capacity of cellular systems, Packet radio	**05**

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2.	**Mobile radio propagation:** Large scale path loss, reflection, ground reflection model (2 ray model), diffraction, practical link budget design using path loss models, small scale fading and multi-path, small-scale multipath propagation, parameter of multi-path channels, types of small scale fading, Rayleigh and Ricean distribution.	**08**
3.	**2G Technologies:** **Global System for Mobile Communication (GSM)** GSM-services, features, radio specifications, system architecture, channel types, frame structure, security aspects, network operations **GSM evolution:** GPRS and EDGE; Architecture and services offered **Code Division Multiple Access (CDMA) digital cellular standard :** Soft hand off and power control, Radio Specifications, forward and reverse CDMA channel.	**12**
4.	**3G Technologies**: **Universal Mobile Terrestrial system (UMTS):** System architecture, air interface specification, forward and reverse channels in Wideband CDMA (WCDMA) and CDMA 2000.	**06**
5.	**3GPP LTE and 4G** Introduction and system overview, Frequency bands and spectrum, network structure, and protocol structure, Frame slots and symbols, Logical and Physical Channels: Mapping of data on to logical sub-channels physical layer procedures, establishing a connection, retransmission and reliability, power control. 4G : Introduction, features and architecture Multi antenna Technologies: MIMO	**10**

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6.	**Emerging Technologies:** **5G** Characteristics envisioned for 5G, specifications and architecture **SDN(Software Defined Network)** Objective and architecture	**04**
	Total	**45**

Text Books:

1. Theodore S. Rappaport, Wireless Communications, Prentice Hall of India, PTR publication, 2nd edition, 2011.
2. Andreas F. Molisch , Wireless Communications, Wiley, 2nd edition, 2010

Reference Books:

1. Jochen H. Schiller, Mobile Communication, Pearson, 2nd edition, 2010.
2. Gary J. Mullet, Introduction to wireless telecommunications systems and networks, Cengage learning, 1st edition, 2011.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**
Course : Project Phase I				**Code :** BTET07003
Teaching Scheme				**Evaluation Scheme**
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) As per Institute Norms (100 Marks)**
0	8	0	4	Scaled to 100 Marks

Pre-requisite: Core EXTC subjects till 3rd year

Objectives:

1. To do literature survey in the topic selected for major project.
2. To explore the feasibility of the project.
3. To design and formulate the work to be carried out in next phase.

Outcomes:

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

1. Select an appropriate problem statement.
2. Analyze different designing parameters.
3. Formulate the feasible design model.

Activities to be done in phase I:

1. The Project group to be formed consisting of not more than 3 students.
2. The Project area and topic is to be selected in consultation with Project Mentors, alternatively students can propose the topics.
3. The Names of the students and the topic of the Project to be submitted in the first week of the Trimester along with Name of the Mentor.
4. The first phase of the project will involve Literature Survey, feasibility study, Design and Part Implementation.
5. Student is required to submit a 1-2 pages weekly report on the work done to the mentor. Attendance will be given on the report. There would continuous evaluation based on the weekly report submitted for 50 marks.
6. Report primarily containing Literature Survey, feasibility study, Design and Part Implementation is to be submitted at the end of the Semester. (Spiral Bound Report)
7. Presentation (about 30 minutes) of the work done during the Semester to be evaluated by External Examiner and Project Mentor.

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Program:	**B. Tech. (EXTC)**			**Semester : VII**
Course :	Numerical Methods			**Code :** BTET07011
Teaching Scheme				**Evaluation Scheme**
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
2	2	0	3	Scaled to 50 Marks

Pre-requisite: Nil

Objectives:

1. To impart knowledge of numerical techniques.
2. To make students aware of various techniques to solve Engineering problems.
3. To make students aware of various solving skills by these numerical techniques

Outcomes:

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

1. Apply different methods to find roots for nonlinear equations.
2. Compute sets of linear equation and evaluate numerical solution of ordinary differential equations.
3. Apply Interpolation and curve fitting models.
4. Apply Numerical Differentiation and Integration.

Detailed Syllabus:

Unit	Description	Duration
1.	**Errors in Numerical Computations:** Types of Errors, Analysis & Estimation of Errors, Taylor's Series for Approximation of Functions, General Error Formula, Error Propagation: Stability & Condition.	**05**
2.	**Roots of Equations:** Bisection Methods, Secant Method, Method of False Position, Newton- Raphson Method, Convergence Method, Choice of Iterative Method, Engineering Applications.	**05**

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3.	**Systems of Linear Algebraic Equations:** Systems with Small Number of Equations : Graphical Method, Cramer's rule, Matrix Inversion Method, Substitution Methods, Gaussian Elimination Method, Gauss Jordan Elimination Method, Gauss Siedel Iterative Method	**05**
4.	**Curve Fitting:** Finite Difference Operators, Forward, Backward, Divided & Central Differences, Newton's Interpolation Methods, Lagrange Interpolation, Least Square Approximation.	**06**
5.	**Solution to Ordinary differential equations:** Taylor series method, Picard's method of successive approximation Runge-Kutta methods, Euler's method, Euler's predicator-corrector method, Runge-Kutta method of second order and forth order Boundary value and eigen value problems.	**05**
6.	**Numerical differentiation & Integration:** Methods based on interpolation and finite differences, Trapezoidal Rule for Numerical Integration, Simpson's 1/3 Rule, Simpson's 3/8 Rule.	**04**
	Total	**30**

Text Books:

1. Seven C. Chapra , Raymond P. Canale, Numerical Methods for Engineers, Tata McGraw Hill, 4th Edition, 2002.

Reference Books:

1. Robert J. Schilling, Sandra L. Harris, Applied Numerical Methods for Engineers (Using MATLAB and C), Thomson Asia Pte. Ltd, 1st edition, 2002.
2. S. S. Sastry, Introduction to methods of Numerical Analysis, PHI, 4th edition, 2006.
3. E. Balaguruswamy, Numerical Methods, Tata McGraw Hill Education, 1st edition, 1999.

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Term Work:

1. Minimum two assignments.
2. Minimum 10 Laboratory Experiments covering the whole syllabus, duly recorded and graded.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : Image and Video Processing (Elective – I)				**Code :** BTET07004	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of Digital Signal Processing

Objectives:

1. To understand Image basics and resolutions
2. To comprehend Image processing techniques in spatial and frequency domain
3. To design techniques for filtering images and feature extraction.
4. To develop image and video processing applications in practice.

Outcomes:

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

1. Apply spatial domain techniques for grey and color image enhancement.
2. Apply various transforms to convert and process image in frequency domain.
3. Understand various morphological operations and segmentation techniques for images.
4. Apply motion estimation techniques to video signals

Detailed Syllabus:

Unit	Description	Duration
1	**Image Fundamentals:** Basics of sampling and quantization, Representing Digital Image, Spatial and Gray level resolution, Basic relationships between pixels, RGB ,HSI, CMY and CMYK colour models	**04**
2	**Image Enhancement** **Spatial Domain:** **Point Processing-** Digital negative, contrast stretching,	**10**

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	thresholding, gray level slicing, bit plane slicing, log transformation, power law transformation. **Neighbourhood Processing:** Smoothing spatial filters, Sharpening spatial filters. **Color image enhancement:** intensity transformation and spatial filters **Frequency Domain:** 2-D DFT and its properties, Ideal, Butterworth and Gaussian Smoothing and Sharpening filters, Homomorphic filtering **Histogram processing:** Histogram equalization, histogram specification.	
3	**Image Transforms:** Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Discrete Wavelet Transform	**08**
4	**Morphological Image Processing:** Dilation, erosion, opening, closing, Hit –or-Miss transformation **Basic Morphological Algorithms**: Boundary extraction on binary images, Region filling , Skeletonization, Thinning, Thickening	**06**
4	**Image Segmentation:** **Detection of discontinuities:** Point, Line and Edge detection **Edge linking and boundary detection:** Local processing, global processing via Hough's transform, Global processing via Graph Theoretic techniques. **Thresholding** **Region based segmentation**: Region growing, region splitting and merging	**08**
6	**Fundamentals of Digital Video** **Video Formation , Perception and Representation:** Digital video sampling, temporal correlation, video frame classifications, I, P and B frames, Digital video quality measure. **Sampling of video signals:** Sampling rates, sampling in 2D and 3D, progressive and interlaced scans.	**04**
7	**Digital Video Processing Techniques** Fundamentals of motion estimation and compensation General methodologies in motion estimation: Motion	**05**

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	representation, Motion Estimation Algorithms: Exhaustive Search Block Matching, Hierarchical Block Matching Algorithm	
	Total	**45**

Text Books:

1. R.C Gonzalez and Richard Woods, Digital Image Processing, Pearson Publication, 7th Indian reprint, 3rd Edition, 2009.
2. Oge Marques, Practical Image and Video Processing using Matlab, IEEE Press, John Wiley & Sons Publication, 2011.

Reference Books:

1. Zi Nian, Li and Mark S. Drew, "Fundamentals of Multimedia", Pearson Education International,
2. Scotte Umbaugh, Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools, 2nd Ed, CRC Press, 2011.
3. Murat Tekalp, 'Digital Video Processing', Pearson, 2010.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)					**Semester : VII**
Course : Advanced Microcontrollers (Elective – I)					**Code :** BTET07005
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: knowledge of 8/16 bit Microcontroller, Microprocessor, computer organization.

Objectives:

1. To understand the core of ARM7 processor.
2. To configure external memory to ARM7.
3. To integrate and implement systems using ARM7.

Outcomes:

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

1. Explain ARM 7 architecture and programming model.
2. Implement device driver routine for LCD, RTC, TIMER, ISP.
3. Design or implement CAN, I2C bus protocols, serial and network protocols.
4. Perform the integration of user code into IDE for application.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to ARM:** Comparison between 8/16/32 bit microcontrollers Design Approaches, CISC ii. RISC, ARM Processor architecture Block Diagram, Introduction to ARM 7 / ARM 9 and ARM extensions. Instruction set, Assembly language programming. Mixed C, ARM C program address space memory model Start up program. Exception types in ARM External interrupt, software interrupts handling Abort handling, Introduction to Thumb instruction set: Introduction to ARM thumb, Thumb programmers model, ARM / Thumb inter working, ARM optimizing techniques	**07**

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2	LPC2294 Architecture overview, Memory system, map, Memory remapping, boot block, External memory controller, Pin description, pin connect block.	**08**
3	**LPC2294 Peripherals** GPIO, UART0, UART1, features, pin description, register description, architecture, programming	**10**
4	Interface of I2C, SPI, Timer 0, 1 , ADC, real time clock and Watchdog, architecture, register map, register description, programming.	**12**
5	Embedded ICE logic, Embedded Trace microcell, features, application, pin description, register description.	**08**
	Total	**45**

Text Books:

1. Steve Furber, ARM Book System On Chip, Person Education, 2nd edition, 2009.
2. Andrew Sloss, Dominic Symes, and Chris Wright, ARM System Developer's Guide **,** Margon Kaufmann Publication, 3rd edition, 2009.

Reference Books:

1. David Seal, ARM Architecture Reference Manual, 7th edition, 2007.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : Robotics (Elective – I)				**Code:** BTET07006	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Basic knowledge of Linear Algebra and Matrix.

Objectives:

1. To provide knowledge to students with the concepts and techniques in robot manipulator control.
2. To expose students to evaluate, choose and incorporate robots in engineering systems and programming of robots.
3. To understand and analyze the various applications of robots.

Outcomes:

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

1. Know the basics of Robots.
2. Apply the knowledge of vectorial mathematics and geometry for kinematics (Direct and Inverse) motion.
3. Perform trajectory planning and work space analysis for robots.
4. Use image representation for robotic movement.
5. Perform chaotic analysis for non-linear dynamics.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Robotics manipulation:** Automation and Robots, Classification, Application, Specification, Notations, Robotics and Industrial Safety.	**07**
2.	**Direct Kinematics:** Dot and cross products, Co-ordinate frames, Rotations,	**08**

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	Homogeneous Co-ordinate, D-H Algorithm, Arm equation for Two axis planar articulated robot arm, Three axis robot, Four axis robot, Five-axis robot.	
3.	**Inverse Kinematics:** General properties of solution, tool configuration vector for Two axis planar articulated robot arm, Three axis robot, Four axis robot, Five-axis robot. Inverse kinematics analysis of Two axes planar articulated robot arm, Three axis robot, and Four axis robot.	**08**
4.	**Workspace analysis and trajectory planning of Robots:** Robot work space envelops and examples, Detailed Work space analysis of two axis planar articulated robot arm, Four axis robot. Different type of motions such as Pick and place motions, Continuous path motion, interpolated motion, Straight-line motion, workspace fixtures.	**08**
5.	**Robot Vision:** Image representation and analysis, Template matching, polyhedral objects, shape analysis, Segmentation (Thresholding, region labelling) Iterative processing, Perspective transformation, Structuring Illumination, Camera calibration.	**08**
6.	**Task Planning:** Task Planner, Task level programming, Uncertainly, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion, Simulation of Planer Motion.	**06**
	Total	**45**

Text Books:

1. Fu, Gonzales and Lee, Robotics- Control, Sensing, Vision and Intelligence, McGraw Hill, 1st edition, 2008.
2. Robert Schilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India, 1990.

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Reference Books:

1. J. J. Craig, Introduction to Robotics, Pearson Education, 3rd edition, 2004.
2. Mittal and Nagrath, Robotics and Control, Tata McGraw Hill, 3rd edition,2003.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : Machine Learning (Elective - II)				**Code :** BTET07007	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of calculus and basic probability and statistics

Objectives:

1. To provide knowledge of the basic concepts of machine leaning.
2. To introduce basic theory and algorithms of machine learning to solve real world problems.

Outcomes:

After successful completion of this course, students should be able to

1. Analyze and Design simple applications of machine learning.
2. Develop optimized algorithms for supervised learning systems.
3. Develop optimized algorithms for unsupervised learning systems.
4. Apply machine learning techniques to solve classification and pattern recognition problems.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Machine Learning:** Introduction to cognitive skills, Role of machine learning in AI Introduction to different statistical tests- z-test, t-test, Pearson's correlation coefficient, Statistical Decision Theory. Components of Learning, Types of Learning Supervised, Unsupervised and Reinforcement Learning, Simple Learning Model, Understanding Data, Feature Extraction, Feature Scaling, Normalization, Hypothesis Function, Noise and Error, Learning Feasibility. Introduction to Prediction Models: Linear Models, Least Square	**08**

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	Model, Nearest Neighbour Methods, Bayesian decision theory, Bias and Variance	
2	**Linear and Logistic Regression:** Linear Regression Algorithm, Model representation, Cost Function, Gradient Descent algorithm, Linear regression with One variable, Linear regression with Multiple variable. Logistic Regression Algorithm, Hypothesis Representation, Decision Boundary, Cost function, Gradient Descent, Quadratic approximations, Regularized Logistic Regression, Multiclass Classification: One vs All	**09**
3	**Multilayer (Neuron/Perceptron) Network and Support Vector Machine:** Model Representation, Network Training: Feed Forward Algorithm, Error Back Propagation algorithm, Model Selection, Bias -Variance Trade off, Catalysts for Overfitting, Algorithm Optimization SVM: Maximum Margin Classification, Lagrange Duality, Kernels, Penalization method, Function Estimation	**12**
4	**Unsupervised Learning:** Introduction, hyperplane design, K-mean Clustering, K-Nearest Neighbour Classifier, Dimension Reduction: Principal Component Analysis, Maximum Variance Formulation, Application of PCA	**09**
5	**Application of Learning:** Applications in Speech Recognition, Computer Vision, Image Segmentation, Biomedical signal and image processing, Robotics, Biometrics etc.	**07**
	Total	**45**

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Text Books:

1. Alpaydin Ethem, "Introduction to Machine Learning", MIT Press, Edition- 3, 2014
2. Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar Foundations of Machine Leaning

Reference Books:

1. Bell, Jason, Machine Learning", Wiley, Edition – 1, 2014
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning" Springer publication

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : Introduction to Automation (Elective – II)				**Code** : BTET07008	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of basic electronics and control theory.

Objectives:

1. To provide knowledge to learn essential concepts behind control system elements and operations.
2. To expose students to the topics of process control, measurement, and instrumentation to allow applications-oriented design.

Outcomes:

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

1. Learn and apply essential concepts behind control system elements and operations in hydraulics and pneumatics automation.
2. Identify systems approach of the process control in industry and State-of-the-art coverage of computer integrated manufacturing using PLCs and flexible manufacturing systems as applicable in Industrial applications.
3. Develop skills in handling computer-based controllers.
4. Explain fundamentals of sensorics technology and modular mechatronics along with Robot technology.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Introduction to Automation** Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations.	**04**

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2.	**Introduction to Fluid Power Generating/Utilizing Elements** Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics - Linear actuator -. Reservoir capacity, heat dissipation, accumulators - standard circuit symbols, circuit (flow) analysis.	**04**
3.	**Control and Regulation Elements** Direction flow and pressure control valves-Methods of actuation, types, sizing of ports-pressure and temperature compensation, overlapped and under lapped spool valves-operating characteristics- Electro Hydraulic System, Electro Hydraulic servo valves-Different types characteristics and performance.	**06**
4.	**Hydraulics** Introduction to Hydraulics, Physical Fundamentals and principles, Hydraulic components (Pump, Valves, etc.), Basic hydraulics circuits and Electro Hydraulics, Practical examples based on simple automation tasks, types of proportional control devices- Pressure relief, Flow control, Direction control, Hydraulic symbols, Spool configurations, Selection & sizing with reference to manufacturer's data, Electrical operation, Basic electrical circuits and operation, Solenoid design, Comparison between conventional and proportional valves.	**06**
5.	**Pneumatics** Introduction to Pneumatics, Physical Fundamentals and principles of Pneumatics, Pneumatic Components (Compressor, Valves, Compressed Air), Basic hydraulics circuits and Electro Pneumatics, Practical examples based on simple automation tasks	**06**
6.	**Control schemes & controllers** On/OFF control, P, PI, PID control, related terminologies, parameter adjustments and implications Electronic P, PI & PID controller. Data acquisition, set point control, direct digital control Review of Z-transform theory and its application in digital control Digital PID algorithms	**06**

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7.	**PLC** Introduction to Automation Technology and Programming Languages (Ladder Diagram), Interface I/O modules with PLC, Working principle of relays and contactors, Area of application, Programming with Relay and PLC	**07**
8.	**Sensorics, Robotics and Mechatronics** Introduction to Sensorics Technology, Basics and Fundamentals, Functions of Inductive, Capacitive, Magnetic, Ultrasonic and Optical types of sensors, Introduction to Robot Technology Basics of Mechatronics and Modular Mechatronics.	**06**
	Total	**45**

Text Books:

1. Johnson Curtis, Process Control Instrumentation Technology, Prentice hall of India, 8th edition, 2007.
2. Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing, Pearson Education, 3rd edition, 2007.

Reference Books:

1. Dale R. Patrick and Stephen Fardo, Industrial Process Control Systems, **Thomson Delmar Learning,** 2nd edition, **2009.**
2. D. Patranabis, Principles of Process Control, , TMGH, 2nd edition, 1996.
3. Study Material from Bosch-Rexroth Automation Company.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : Multimedia Signal Compression (Elective – II)				**Code :** BTET07009	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Information Theory

Objectives:

1. To impart knowledge about Data, Image, Video and Audio compression.
2. To have conceptual understanding, and hands-on experience, of the state-of-the-art compression algorithms and approaches in Text, Image, Audio and Video.

Outcomes:

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

1. Analyse performance parameters for Data Compression.
2. Apply Text compression techniques.
3. Analyse methods of Audio compression.
4. Implement Image compression and video compression.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Data Compression** **Compression Techniques:** Loss less Compression, Lossy compression. Measure of Performance, Modelling and Coding.	**04**
2.	**Text Compression** VLC Coding, Minimum variance Huffman Coding, Extended Huffman coding, Adaptive Huffman Coding, Arithmetic Coding, Golomb Code, Dictionary Coding Techniques, LZ77,LZ78, LZW,	**10**

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	Run Length Encoding, Uniquely decodable Codes and Prefix Codes	
3.	**Audio Compression** Digital Audio, Frequency and Temporal Masking, Psychoacoustic Model, A law and μ law companding. **Lossy and Lossless Predictive Coding:** DPCM, ADPCM **MPEG Audio Coding:** Layer I, Layer II and Layer III (mp3) coding	**10**
4.	**Image Compression** **Fundamentals:** Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria **Transform Based Coding:** Discrete Cosine Transform and Karhunen Loeve Transform **Wavelet Based Coding:** Discrete Wavelet Trasnform **Binary Image Compression Standards :** JBIG **Continuous Tone Still Image Compression Standards:** JPEG Baseline, JPEG-LS, JPEG 2000	**12**
5.	**Video Compression** **Video compression based on Motion Compensation,** **Search for motion Vectors:** Sequential Search, 2D Logarithmic Search, Hierarchical Search algorithms. ITU-T H.261, H.263 standards, overview of MPEG 1, MPEG 2, MPEG 4 standards	**09**
	Total	**45**

Text Books:

1. Khalid Sayood, "Introduction to Data Compression", 3rd ed, Morgan Kaufmann, 2012.
2. Zi Nian, Li and Mark S. Drew, "Fundamentals of Multimedia", Pearson Education International, 2014.

Reference Books:

1. David Salomon, "Data Compression The Complete Reference", 4th ed. Springer, 2007
2. Yun Q. Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering", CRC Press, 2008

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Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VII**	
Course : VLSI Design and Technology (Elective – II)				**Code :** BTET07010	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Basic knowledge of solid state electronics.

Objectives:

1. To provide the foundation for state-of-the-art CMOS design.
2. To provide the basics of design and layout of CMOS VLSI circuits.
3. To study the essential physics required for understanding of VLSI circuits and VLSI design rules.
4. To expose students to simulations tools in study of CMOS logic design from transistor level schematic to layout.
5. To implement the full VLSI design flow for IC design and chip level issues.

Outcomes:

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

1. Know the IC fabrication process.
2. Know advanced VLSI CMOS design flow used in the semiconductor industry using EDA tools.
3. Determine the performance of VLSI circuits like inverters, super buffers and sequential circuits.
4. Use CAD tools to design CMOS Logic from transistor level schematic to layout using design rules.
   Explain the fundamentals of packaging and testing ICs.

Detailed Syllabus:

Unit	**Description**	**Duration**

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1.	**Fabrication of ICs:** Crystal growth, Diffusion of impurities, Ion implantation, Oxidation, CVD, Lithography, Epitaxy, Metallization and Packaging. Fabrication of NPN, PNP and lateral Transistors. Parasitic Transistor, Fabrication of IC Diodes, Resistor and capacitors, Isolation. **Field Effect Transistor:** General physical consideration, MOSFET Threshold voltage, flat band condition, threshold adjustment, linear and saturated operation, FET capacitance mobility saturation and thermal variations, Short channel effect and hot electron effects electro migration, Aluminium spikes and contact resistance.	**07**
2.	**Processing Scaling and Reliability**: Silicon gate NMOS CMOS process, silicon patterning, mask generation, active area definition, transistor formation contacts, metallization, chip packaging process limitations scaling factor of MOS circuits, scaling, functional limitations of scaling, scaling of wires and interconnections, latch up in scaled CMOS circuits, device reliability, soft errors, noise margins, lead inductance, gate oxide reliability, Polysilicon resistance and input protection.	**03**
3.	**Design rules and Layout** : The purpose of design rules, NMOS rules, CMOS design rules, passive load NMOS inverter , active load NMOS inverter, NMOS NAND & NOR gates, CMOS inverter, CMOS NAND & NOR gates, interlayer contacts, butting and buried contacts.	**06**
4.	**MOS inverters** : MOSFET aspect and inverter ratio, enhancement & depletion mode pull ups, enhancement Vs depletion mode pull ups, standard CMOS inverter, NMOS threshold voltage and inverter ratio transit and switching speed of NMOS & CMOS inverter	**07**

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5.	**Super Buffer** : CMOS & steering logic, RC delay lines, NMOS & CMOS super buffer, NMOS tri-state super buffer and PAD drivers. CMOS gates, dynamic ratio-less inverter with large capacitive buffer load, designing pass transistor logic. Dynamic CMOS design.	**08**
6.	**CMOS Digital Gates/Sequential Circuits:** NMOS and CMOS Super Buffer, Tri-State buffer and PAD Drivers, CMOS Gates, Dynamic CMOS Design, Charge Sharing, Pseudo-NMOS PMOS, Flip-Flops, Setup and Hold Time, Race Around Condition, Sequential Digital Circuits, Power Analysis and Estimation, Different Process Corners, Slow and Fast Transistors, High and Low Threshold Voltage Transistors.	**06**
7.	**CAD Tools and Methodology** Introduction to VLSI CAD tools, ASIC, Full-Custom flow, RTL-to-GDSII flow	**05**
8.	**Packaging and Testing:** Packaging of ICs. Different types of packages. Design for Testability – requirement & cost of testing, test pattern generation, fault models, test generation and methodology	**03**
	Total	**45**

Text Books:

1. Neil H. E. Weste, and KAMRAN ESHRAGHIAN, Principles of CMOS VLSI Design a System Perspective, , Addison Wesley, 3rd edition, 2003.
2. E. D Fabricius, Introduction to VLSI Design, , McGraw-Hill, 3rd edition, 1990.

Reference Books:

1. Carver Mead and Lynn Conway, Introduction to VLSI Systems, Addison-Wesley,1980
2. D. A. Pucknell, Kamran Eshraghian, Basic VLSI Design, Prentice Hall, 3rd edition. 2010.

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3. Andrew Bros, VLSI Circuits & System in Silicon, 3rd edition, McGraw Hill International Edition, 3rd edition, 1991.
4. Cadence Design Manual, Cadence Design Systems, CA, USA Publication year July 2005.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Electronics & Telecommunication (2020 – 2021)

Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Digital Voice and Broadband Communication				**Code :** BTET08001	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite Knowledge of Digital Communication and Computer networks

Objectives:

1. To provide knowledge of basic Telephony and characterise the traffic in telephone network.
2. To study various types of digital switching and signalling techniques.
3. To have an insight into the ISDN and B-ISDN.
4. To understand the need and process of transition from traditional communication networks to broadband communication networks.
5. To explore Voice over IP.
6. To explain the functionality of different building blocks of broadband technology.

Outcomes:

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

1. Explain the basic concepts of telephony.
2. Analyse and characterize the traffic in telephone network.
3. Explain the B-ISDN and signalling in telephony.
4. Discuss the Broadband Access Technologies.
5. Describe and compare the different broadband network access techniques of cable modem service, optical fiber based access, and broadband wireless access techniques of Wi-Fi and Wi-MAX networks.
6. Describes the voice coding techniques and different protocols used for VoIP.

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Detailed Syllabus:		
Unit	**Description**	**Duration**
1.	**Telephony Background:** Analogue networks, subscriber loop design, calculating resistance Limit, calculating loss limit, Transmission Impairments in Subscriber loop.	**03**
2.	**Telephone traffic theory:** Traffic characterization, arrival and holding time, Erlang formula and Tables, loss systems, lost calls, network blocking probabilities, delay systems, measurement of traffic congestion, lost calls and grade of service.	**04**
3.	**Digital switching and Synchronisation:** Voice digitization Multi channel PCM, Frame/multiframe/signalling formats, Higher order multiplexing, Line codes, Space division switching, time division switching, time space time (TST) switch, space time space (STS) switch, comparison of TST and STS switches, Blocking and Non-blocking switches. **Network Synchronization:** Need for synchronization, Methods for synchronization Timing recovery (PLL), Clock Instability, Elastic stores, Timing inaccuracies, Slips, Pulse Stuffing. **Signalling:** Types of Signalling, Channel Associated signalling, Common Channel Signalling, SS7.	**08**
4.	**Integrated service digital network (ISDN):** ISDN overview, ISDN interfaces and functions, transmission structure, **Broadband ISDN (B - ISDN):** (B - ISDNS) standards, architecture protocol reference model, B-ISDN lower layers.	**04**
5.	**The Basics of Broadband Technology:** Digital Subscriber Line (ADSL, HDSL, RADSL, VDSL, G.lite), Access network architecture (DSLAM), Modulation technologies (DMT), CAP	**05**
6.	**Voice over IP:** Voice coding, properties of speech, waveform coding, vocoding, hybrid coding, VoIP architecture, VoIP Protocols: Resource reservation protocol (RSVP), Multi Protocol Label Switching (MPLS), real time protocol (RTP), session initiation protocol (SIP). H.323 standard media gateway control protocol.	**06**

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7.	**Broadband ATM Switching & Transmission:** Broadband IP Switching over ATM, Broadband Transmission Network for LAN & WAN, SONET/ SDH	**05**
6.	**Broadband Access Technologies:** Cable Modem Service: Head end and regional network architecture, Cable Modem Termination System, CMTS, Hybrid Fiber Coax networks HFC, Cable Labs initiatives (DOCSIS. PacketCable, CableHome) Optical Fiber-based Networks: Passive Optical Network (PON) architecture (Optical line termination, optical network terminals), Standards (BPON, GPON, EPON) Fixed and Mobile WiMAX : Architecture, Standards (IEEE 802.11, 802.15, 802.16), Services Comparison of broadband access techniques	**10**
	Total	**45**

Text Books:

1. Digital Telephony - John C. Bellamy, Wiley India, 3rd edition, 2011.
2. ISDN and Broadband ISDN with Frame Relay and ATM – William Stalling., Pearson education Asia publication, 4th Edition, 2002.
3. Leonhard Korowajczuk, LTE, WiMAX and WLAN Network Design, Optimization and Performance Analysis, John Willey Publication, 1st edition, 2011.
4. Communication Networks – Alberto Leon-Garcia, Tata McGraw Hill Publication, Second edition, 2004.

Reference Books:

1. Fundamentals of Telecommunication – Roger L. Freeman, John Wiley and Sons, Inc., Publication, first edition, 1999
2. Andy Valder, Understanding telecommunication network, IET, 1st Edition 2006.
3. Telecommunications and Data Communications Handbook – Ray Horak, A John Wiley and Sons, Inc., Publication, first edition, 2007

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Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Satellite Communication and Radar				**Code :** BTET08002	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of Analog and digital communication systems, Television fundamentals, Electromagnetic wave theory.

Objectives:

1. Understand and provide knowledge of principle of Satellite communication and Radar communication.
2. To study various types and application of Radar systems for navigation and remote sensing.
3. Study of different types of satellite orbits, Orbital parameters and launching techniques, spacecraft subsystems, Multiple Access technologies and satellite systems.
4. To provide knowledge of wave propagation and satellite link design.

Outcomes:

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

1. Explain principle, frequency band, various subsystems, and multiple access techniques in Satellite communication.
2. Describe the concept of orbital parameters and launching scheme of geostationary satellites and non-geostationary satellites.
3. Discuss the parameters of wave propagation and calculate link budget.
4. Compare the functioning and applications of various Satellite and Radar systems.

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Detailed Syllabus:		
Unit	**Description**	**Duration**
1	**Satellite Communication:** General background, basic satellite system, frequency allocations for satellite services, types of satellite, system design considerations, and applications.	**02**
2	**Satellite Orbits:** Types of Orbits and their applications, Orbital Mechanics: Developing the equations of the orbit, Kepler's three laws of planetary motion, describing the orbit of a satellite, locating the satellite in the orbit, locating the satellite with respect to the Earth, orbital elements, look angle determination, orbital perturbations, launching techniques and launch vehicle, orbital effects in communications systems performance.	**04**
3	**Wave Propagation And Link Design:** Introduction , atmospheric losses, ionospheric effects, rain attenuation, other impairments, antenna polarization , polarization of satellite signals, cross polarization discrimination, ionospheric depolarization, rain depolarization, ice depolarization. Transmission losses, link power budget equation, system noise temperature, carrier to noise ratio for uplink and down link, combined uplink and downlink carrier to noise ratio, inter modulation noise.	**11**
4	**Satellite Subsystems:** Attitude and orbit control system, Telemetry, tracking command and monitoring system, power system, communication system: Single and double conversion transponder, satellite antennas, Equipment reliability and space qualification.	**06**
5	**Multiple Access Techniques:** Introduction to FDMA and TDMA, TDMA frame structure, on board processing, demand access multiple access, random access, packet radio systems and protocols, CDMA.	**05**

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6	**Satellite Systems:** **Very small aperture terminal (VSAT) systems:** Network architectures, Access control protocols. **Direct broadcast satellite (DBS) TV:** DBS-TV receiving antennas, DBS-TV receiver, Installation of DBS-TV antennas, Low noise block converter (LNBC). **Global positioning systems (GPS):** GPS position location principles, GPS segments, GPS receiver, GPS signal structure, Indian Regional Navigation Satellite System (IRNSS) architecture and frequencies.	**06**
7	**Radar System:** Introduction, Radar set, radar frequencies and Advanced radar applications. Range performance, minimum detectable signal, receiver noise, transmitter power, pulse repetition frequency, pulse duration, Radar display, Radar antenna scanning & Tracking system, Radar system losses, Radar clutters, Radar cross-section of targets: Simple Targets : Sphere, Long thin wire or Rod, flat plate and corner reflector, Cone –sphere, Effect of target shape, complex targets.	**06**
8	**Classification Of Radar Systems:** Principles, operation, performance, limitations and applications : CW radars, FMCW radar, MTI radar, Pulse Doppler radar.	**05**
	Total	**45**

Text Books:

1. Timothy Pratt, Satellite Communication, Wiley Publication, 2nd edition, 2007.
2. M. I. Skolnik, Introduction to Radar System, Mc-Graw Hill publication, 3rd edition, 2009.

Reference Books:

1. Dennis Roddy, Satellite Communication, McGraw Hill, 4th edition, 2006.
2. M Richharia, Mobile Satellite Communication – Principles and trends, Pearson, 2004.
3. Tri. T. Ha, Satellite Communication Modern, McGraw Hill Publication, 2nd edition, 2010.

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4. D K Barton, Radar system analysis, Artech House, Illustrated, edition 2007.
5. G. Kennedy, B. Davis, S.R.M. Prasanna, Electronics communication systems, 5th edition, McGraw Hill Education private ltd., 2015.
6. http://irnss.isro.gov.in/

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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<table>
<tr><td colspan="3">Program: B. Tech. (EXTC)</td><td colspan="2">Semester : VIII</td></tr>
<tr><td colspan="3">Course : Project Phase II</td><td colspan="2">Code : BTET08003</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td>Evaluation Scheme</td></tr>
<tr><td>Lecture Hours per week</td><td>Practical Hours per week</td><td>Tutorial Hours per week</td><td>Credit</td><td>Internal Continuous Assessment (ICA)
As per Institute Norms
(100 Marks)</td></tr>
<tr><td>0</td><td>8</td><td>0</td><td>4</td><td>Scaled to
100 Marks</td></tr>
<tr><td colspan="5">Pre-requisite: Project Phase I</td></tr>
<tr><td colspan="5">Objectives:
1. To be able to build/simulate circuit.
2. To be able to Test and validate the results.</td></tr>
<tr><td colspan="5">Outcomes:
After the successful completion of this course, the student will be able to
1. Implementation of the model.
2. Validate and troubleshoot the model.
3. Summarize the topic into a technical report and demonstrate the model.</td></tr>
<tr><td colspan="5">Activities to be done in phase II:</td></tr>
<tr><td colspan="5">1. The second phase of the project will involve development implementation and testing of the project.
2. Student is required to submit a 1-2 pages weekly report on the work done to the mentor. There would continuous evaluation based on the weekly report submitted.
3. Report primarily containing the entire overview of the Project from Literature Survey, Feasibility Study, Design, Analysis, Implementation, and Testing is to be submitted at the end of the Trimester. (Hard Bound Report (Golden Embossing))
4. Presentation (about 30 minutes) of the work done during the trimester to be evaluated by Internal Examiner and External Examiner.</td></tr>
</table>

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<table>
<tr><td colspan="4">Program: B. Tech. (EXTC)</td><td colspan="2">Semester : VIII</td></tr>
<tr><td colspan="4">Course : Elements of Biology</td><td colspan="2">Code : BTET08011</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="2">Evaluation Scheme</td></tr>
<tr><td>Lecture (Hours per week)</td><td>Practical (Hours per week)</td><td>Tutorial (Hours per week)</td><td>Credit</td><td>Internal Continuous Assessment (ICA) As per Institute Norms (50 marks)</td><td>Term End Examinations Theory (3 Hrs, 70 Marks)</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td><td>Scaled to 30 marks</td><td>Scaled to 70 marks</td></tr>
<tr><td colspan="6">Pre-requisite: Fundamental Knowledge of physics, chemistry and mathematics.</td></tr>
<tr><td colspan="6">Objectives:
1. To provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers.
2. To encourage engineering students to think about solving biological problems with engineering tools.</td></tr>
<tr><td colspan="6">Course Outcomes:
After completion of the course, students would be able to :
1. Convey that all forms of life have the same building blocks and yet the manifestations are diverse.
2. Identify DNA as a genetic material in the molecular basis of information transfer.
3. Classify enzymes and distinguish between different mechanisms of enzyme action.
4. Apply thermodynamic principles to biological systems.
5. Identify and classify microorganisms.</td></tr>
<tr><td colspan="6">Detailed Syllabus: (per session plan)</td></tr>
<tr><td>Unit</td><td colspan="4">Description</td><td>Duration</td></tr>
<tr><td>1.</td><td colspan="4">Introduction
Convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft.</td><td>3</td></tr>
</table>

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	Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	
2.	**Classification** Convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus	**6**
3.	**Genetics** Convey that "Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.	**6**
4.	**Biomolecules** Convey that all forms of life has the same building blocks and	**5**

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	yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	
5.	**Enzymes** Convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	**5**
6.	**Information Transfer** The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	**6**
7.	**Macromolecular analysis** How to analyses biological processes at the reductionistic level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	**5**
8.	**Metabolism** The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy Charge.	**5**
9.	**Microbiology** Concept of single celled organisms. Concept of species and	**4**

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	strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	
	Total	**45**

Text Books:

1. Arthur T. Johnson (2011) ''Biology For Engineers'' *CRC Press Taylor & Francis group*
2. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 2008, 7th edition McGraw-Hill Higher Education

Reference Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman

Term Work: As per institution norms.

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Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Embedded Systems (Elective – III)				**Code :** BTET08004	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of microprocessor, microcontrollers and basic embedded system

Objectives:

1. To provide knowledge of the basic embedded systems.
2. To understand the different inter-process communication objects used in embedded systems.
3. To understand the design concept of embedded firmware.
4. To understand basic concepts of real time operating system (RTOS).

Outcomes:

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

1. Explain the different components of embedded systems, characteristics and different application area.
2. Analyze and understand embedded firmware design and its requirements.
3. Understand the basic concept of RTOS, its requirement and design parameters.
4. Understand different embedded RTOS with the help of case studies.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Introduction to Embedded Systems** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Embedded system classifications (hardware and software requirements) , Major Application Areas, Purpose of Embedded Systems,	**09**

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	Characteristics and Quality Attributes of Embedded Systems, Memory selection for Embedded Systems (All types of memories) , Sensors and Actuators, Communication Interface (serial as well as parallel): Onboard and External Communication Interfaces (wire and wireless).	
2.	**Objects, Services , I/O and test tools** Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem, Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design using C /C++ or Cross C, their approaches and development tools with IDE. Embedded test tools, EMC and ICE.	**09**
3.	**Exceptions, Interrupts and Timers used in embedded systems** Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks (RTC), Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations. Interrupt latency, context switching, interrupt deadlines. Critical section, Inter-process communication objects: Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use, Device drivers used in embedded system: I2C bus driver code, LCD driver code, RTC driver code, and file handling.	**09**
4.	**Real Time Operating Systems** Brief History of OS, Defining RTOS, RTOS services, kernel objects, kernel services, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task/Process/Threads, tasks/process/thread States and TCB/PCB, Task/Process Operations, Structure, Synchronization, Communication and Concurrency. RTOS scheduling types, priority inversion problem, their comparison, rate monotonic and earlier deadline first scheduling.	**09**
5.	**Case Studies of RTOS** RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS,	

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	and Basic Concepts of Android OS. Implementation of android/TinyOS based applications.	**09**
	Total	**45**

Text Books:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill, 2012

Reference Books:

1. Embedded Systems - Raj Kamal, TMH., 2009
2. Embedded System Design - Frank Vahid, Tony Givargis, and John Wiley, 2010
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education, 2014

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Network Design and Planning (Elective – III)				**Code:** BTET08005	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Basic knowledge of RF, Optical Fiber and Networking.

Objectives:

1. To teach basics of RF Planning.
2. To expose students to Network Design, Management & Optimization of telecom networks.

Outcomes:

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

1. Describe the process of network planning and design.
2. Discuss the network design approach for different types of networks.
3. Design and planning of IP networks.
4. Explain the concepts of network performance and optimization.
5. Discuss the Next generation network design concepts.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Network Planning & Optimization** Planning, Design, Deployment, Capacity Planning, Management requirements, Growth Planning, Wireless Planning Commission (WPC) guidelines specific to India along with FCC regulations	**05**
2.	**Making the business case for the Network :** Evaluating requirements, Profit Driven Network, Performance standards ITU/ IEEE, cost factors, revenue and ROI.	**04**

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3.	**Network Design model :** Network objectives, Design Methodology: top-down design approach, collect design information, create design proposal, propose configuration, design review, selection and implementation, Application considerations: bandwidth requirements, performance requirements, Documenting Your Network Design.	**06**
4.	**Planning and Design of RF based Networks :** Radio Frequency Spectrum Planning, Site Engineering, Network Management – Congestion Handling, QoS norms, Network Optimization. **Wireless Personal Area Networks: Low Rate and High Rate** ZigBee Technology: Components and Network Topologies IEEE 802.15.4 Low Rate-WPAN Device Architecture : Physical layer, Data link layer, Network layer, applications IEEE 802.15.3a Ultra WideBand : FCC Guide lines and Technical requirements, UWB approach Radio Frequency Identification: Principle, RFID component and characteristics	**12**
5.	**IP Routing and Design:** IP addressing, subnetting in classful and classless addresses, IPV6 addressing. Delivery and routing of IP packets: Direct and indirect delivery, routing methods (next hop routing, network specific routing, host specific routing, default routing), static and dynamic routing.	**08**
6.	**Designing for the WAN: ATM** Traffic Descriptor and parameters, Traffic Congestion control, Traffic contract and QoS. Application: Introduction to SD-WAN Emphasis has to be given on planning and design issues.	**06**

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7.	**New Generation Network (NGN) design:** Current industry practices Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NG	**04**
	Total	**45**

Text Books:

1. Sharon Evans, Telecommunication Network Modeling, Planning & Design, IET, 1st edition, reprint 2008.
2. Behrouz A. Forouzan, Data Communication and networking, McGraw Hill publications, 5th edition, 2013
3. Vijay K. Garg, Data Communication and networking, Elsevier, 2010.
4. Monique J. Morrow, "Next Generation Networks", CISCO Press, 2007.

Reference Books:

1. Andy Valder, Understanding telecommunication networks, IET 1st edition, 2006.
2. Roger L Freeman, Telecommunications system Engineering, John Wiley, 3rd Edition, 2004.
3. Ajay R. Mishra, Fundamentals of cellular network planning & optimization, John Wiley, 1st Edition, 2004.
4. CCDA: Cisco Certified Design Associate Study Guide, 2nd Edition, 2003.
5. CCNP1: Advanced Routing Companion guide, 2nd Edition, reprint 2005.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)					**Semester :VIII**
Course : Data Encryption and Network Security (Elective - III)					**Code :** BTET08006
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Computer and communication networks

Objectives:

1. To understand requirement the data and encryption and learning the basic terms associated with encryption.
2. To teach the aspects of data security and authentication.
3. To know the internet and wireless network security.

Outcomes:

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

1. Identify the aspects of data security.
2. Use the different standards of private key encryption.
3. Apply the knowledge of number theory for public key encryption.
4. Know various techniques for message authentication.
5. Recognize various network security protocols.

Detailed Syllabus:

Unit	Description	Duration
1	**Data Encryption:** Need for Data encryption, Security of information, security attacks, confidentiality, integrity, authentication, classical techniques, Substitution ciphers, Transposition ciphers, block and stream cipher principles, Symmetric and asymmetric encryption.	**03**
2	Data Encryption Standard (DES): Data encryption standard, structure and analysis, key generation for DES, triple DES with two three keys key distribution.	**06**

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3	**Advanced Encryption Standard (AES)** Algebraic structures, GF(2^n) fields, Modular arithmetic, Fermat's and Euler's theorems Introduction, structure, round functions, key expansion	**06**
4	**Public encryption:** Primality testing, factorization, Chinese remainder theorem, discrete logarithm Principles of public key cryptosystems, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve cryptography.	**07**
5	**Message Integrity and message Authentication** Message integrity, random Oracle model, message authentication codes (MAC), hash functions, MD hash family, SHA-512, digital signatures	**08**
6	**Entity Authentication and key management** Passwords, Challenge response, zero-knowledge, biometrics Symmetric key distribution, Kerberos, Symmetric key agreement, Public key distribution, Hijacking	**05**
7	**Security at transport, network and application layers:** Need for Security of Computer Networks Transport layer security: Secure Socket Layer(SSL) IP Security: AH, ESP and SA, transport and tunnel modes. Internet Key Exchange E-mail Security: PGP and S/MIME.	**05**
8	**System Security** Users, Trust and Trusted systems, Buffer overflow and malicious software, malicious programs, worms, viruses, Intrusion detection systems, Firewalls: construction and working principals Introduction to SIEM (Security Information and Event Management) technology.	**05**
	Total	**45**

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Text Books:

1. William Stallings, Cryptography and Network Security, Pearson Education Asia Publication, 5th edition, 2013.
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay, Cryptography and Network Security, Mc Graw Hill, 2nd edition, 2013.

Reference Books:

1. Wade Trappe and Lawrence C Washington, Cryptography and Coding Theory, Pearson Education, 2nd Edition, 2012.
2. Wanbo Mao, Modern Cryptography: Theory and Practice, Pearson Education, 4th Edition, 2011.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester :VIII**	
Course : Speech Processing (Elective – IV)				**Code :** BTET08007	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of Digital signal Processing

Objectives:

1. To introduce the characteristics of Speech signals and the related time and frequency domain methods for speech and audio analysis
2. To develop time and frequency domain techniques for estimating speech parameters
3. To apply feature extraction techniques and classify speech signals.

Outcomes:

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

1. Comprehend the speech generation process and its model.
2. Apply various linear predictive coding techniques in time domain for speech processing.
3. Employ frequency domain methods for processing the speech signal.
4. Use of filtering techniques to enhance speech.
5. Apply algorithms for automatic speech and speaker recognition.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Fundamental of Speech Signals** Anatomy and physiology of Speech Organs, Speech Production Mechanism, Acoustic Phonetics, Digital Models fr speech Waveform, Representation of Speech waveform, Quasi-periodic and Quasi-stationary nature of speech signal, Need and technique of Framing and Windowing of speech signal, Different types of speech signal, Hearing organs and Mechanism of Speech Signal	**08**

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2.	**Time domain methods for speech processing** Time domain parameters of Speech signal and Extracting Methods: Short Time Energy, Average Magnitude, Zero Crossing Rate, Average magnitude difference function. Speech type Discrimination using ZCR and energy, Short time Autocorrelation function, Pitch period estimation using Auto-Correlation Function	**08**
3.	**Frequency domain method for speech processing** Review of Fourier transform, Short Time Fourier Transform, Spectrogram, Concept of True vs Convolved spectra , Pitch and formant extraction, Spectral analysis of speech using window function	**06**
4.	**Speech Enhancement** Different sources of speech degradation, Scope and approach of speech enhancement, Speech enhancement techniques: Spectral subtraction method, Re-synthesis method, Comb filter, wiener filter	**08**
5.	**Feature Extraction techniques of Speech** Linear Predictive coding: Durbins's recursive Algorithm, Cholesky algorithm, Application of LPC in pitch and formant extraction Cepstrum: Homomorphic Speech Processing, Real and Complex cepstrum, Mel scale, Mel frequency cepstral coefficients (MFCC)	**08**
6.	**Automatic speech and speaker recognition** Introduction to classifiers, Vector Quantization (VQ), Hidden Markov Model (HMM), Automatic Speech Recognition , Automatic Speaker identification and verification, Music classification	**07**
	Total	**45**

Text Books:

1. R Rabiner and S.W. Schafer, "Digital processing of speech signals", Pearson Education, 1st edition, 2006

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2. Ben gold and Nelson Morgan, "Speech and Audio signal processing", Wiley, 1st edition, 2006

Reference Books:

1. Thomas F. Quateri, "Discrete Time Speech Signal Processing: Principles and Practice", 1st edition, 2002.
2. R Rabiner and Biing, Hwang and Juan, "Digital processing of speech signals", Prentice Hall, 1st edition, 1993

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Fuzzy Logic and Neural Networks (Elective - IV)				**Code :** BTET08008	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of calculus and basic probability and statistics

Objectives:

1. To study the basic concepts of artificial neural networks, fuzzy logic systems and their applications.
2. To introduce basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.

Outcomes:

After successful completion of this course, students should be able to

1. Explain the basic concepts of artificial neural networks
2. Explain the basic theory of neural networks.
3. Formulate algorithms and apply techniques to solve various problems.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Fuzzy logic** Introduction, Fuzzy Sets, Fuzzy relations, Operations on Fuzzy Relations, Membership Functions, Fuzzification and Defuzzification, Logic and Fuzzy System, Fuzzy Arithmetic, The Extension Principle, Fuzzy Associative Memories.	**06**
2	**Fuzzy System and Applications** Decision making with Fuzzy Information, Fuzzy Classification and Pattern Recognition, Fuzzy Control System, Fuzzy Optimization.	**08**

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3	**Introduction to Neural Network** Fundamental Concepts and Models, Learning Process, Learning Rules, Single Layer Perceptron Classifier, Multilayer Feedforward Network, Single-Layer Feedback Networks.	**07**
4	**Associative Memories** Basic Concept, Linear Associator, Basic Concepts of Recurrent Autoassociative Memory, Performance Analysis of Recurrent Autoassociative Memory, Bidirectional Autoassociative Memory, Associative Memory of Spatio-temporal Patterns.	**07**
5	**Matching and Self-Organizing Networks** Hamming Net and MAXNET, Unsupervised Learning of Clusters, Counterpropagation Network, Feature Mapping, Self-Organizing Feature Maps. Cluster Discovery Network.	**07**
6	**Application of Neural Algorithms and Systems** Linear Programming and Modeling Network, Character recognition Networks, Neural Network Control Applications, Networks for Robot Kinematics, Connectionist Expert System for Medical Diagnosis, Self-Organizing Semantic Maps, Speech Recognition, Signature Verification, Human Face Recognition using Neural Networks, Neural Fuzzy Systems, and Genetic Optimization of Neural and Fuzzy Systems.	**10**
	Total	**45**

Text Books:

1. Timothy J. Ross, Fuzzy Logic with Engineering Application, Wiley, 3rd edition, 2011.
2. Simon Haykin, Neural Networks, PHI, 3rd edition, 2010.

Reference Books:

1. D. Driankov, H. Helendoorn, M. Reinfrank, An Introduction to Fuzzy Control , Narosa, 1st edition, 2001.
2. S. Rajasekaran, G. A. Vijaylakshmi Pai, Neural Network, Fuzzy Logic & Genetic Algorithms Synthesis & Application, PHI, 1st edition, 2009.

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Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Mobile Computing (Elective – IV)				**Code :** BTET08009	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Computer Communication Networks and Wireless Communication Technology

Objectives:

1. To educate students with wide knowledge base in Mobile Computing.

Outcomes:

After successful completion of this course, students will be able to

1. Understand the mobile computing architecture and its applications.
2. Know various protocols for mobile computing.
3. Compare different routing algorithms for mobile ad-hoc network.
4. Know different mobile wireless networks.

Detailed Syllabus:

Unit	Description	Duration
1.	**Overview of Mobile communication, devices and systems:** mobile communication, mobile computing and architecture, mobile devices, mobile system networks, mobile smartphones, smart mobiles, and systems, handheld devices	**04**
2.	**Wireless Medium Access Control:** specialized MAC, Hidden & Exposed Terminal, Near & Far Terminal, Collision avoidance, MACA, Polling, Inhibit sense multiple access, SAMA, Power control	**08**
3.	**Mobile IP Network Layer:** IP network layer, packet delivery and handover management, location management, registration, tunnelling and encapsulation, route optimization, Dynamic Host Configuration Protocol, VoIP, IPsec, micro mobility support	**10**

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4.	**Mobile Transport Layer:** Conventional TCP/IP, Transport layer protocol, Indirect TCP, snooping TCP, methods of Mobile TCP, Mobile TCP-layer transmission, TCP over 2.5G/3G mobile networks	**08**
5.	**Mobile ad-hoc network and Wireless Sensor Network:** MANET, routing and routing algorithms, Security in ad-hoc network, wireless sensor networks	**07**
6.	**Mobile Wireless Short Range Network:** Wireless LAN, Wireless Application Protocol, WAP 2.0, Bluetooth enabled devices network, IrDA protocols, Zigbee, RFID, WiMax	**08**
	Total	**45**

Text Books:

1. Jochen Schiller, "Mobile Communications", 2nd Edition, 2008, Pearson Education.
2. Raj Kamal," Mobile Computing",2007, Oxford University Press

Reference Books:

1. C. Sivaram Murthy and B.S.Manoj, "Adhoc Wireless Networks Architectures and Protocols", 2004, Pearson Education .
2. Kum Kum Garg,"Mobile Computing Theory and Practice", 2010, Pearson Education.
3. Asoke K Talukder and Roopa R Yavagal, "Mobile Computing Technology, Application and Service Creation", 2nd Ed., 2010, TMH.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B. Tech. (EXTC)				**Semester : VIII**	
Course : Internet of Things (Elective - IV)				**Code :** BTET08010	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Theory (3 Hrs, 70 Marks)**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**
3	2	0	4	Scaled to 70 Marks	Scaled to 30 Marks

Pre-requisite: Knowledge of embedded systems and data communication.

Objectives:

1. To provide basic knowledge of Internet of Things.
2. To understand the different communication protocols used in IoT for data communication.
3. To understand the design concept of integration framework for smart objects and IoT security.
4. To understand basic concepts of cloud services management and open IoT.

Outcomes:

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

1. Explain the different components and IoT global standardization.
2. Analyze and understand communication protocols used in IoT for web based applications.
3. Analyze the basic concept of IoT6, its design, services and applications.
4. Understand key parameters required for cloud services and open IoT.

Detailed Syllabus:

Unit	Description	Duration
1.	**The Internet of Things: An Overview** The concept of "Internet" of "Things", The Flavour of the Internet of Things, The Technology of the Internet of Things , IoT Objects, Internet of Things applications. **IoT Global standardization – State of Play** IoT related standardization for example, CEN/ISO, ETSI, IEEE, IETF, ITU-TOASIS, OGC, oneM2M, GS1, and IERC.	**07**

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2.	**Internet of Things applications:** Internet of Things strategic research and innovation directions, IoT smart X application : smart cities, smart energy and smart grid, smart mobility and transport, smart home building and infrastructure, smart factory and manufacturing, smart health, smart logistics and retail. **IoT related Internet Technology:** cloud computing, IoT semantic technology, Network and communication process, data management, security privacy and trust, Device level energy issues.	**08**
3.	**IoT protocol convergence:** Message queue telemetry transport (MQTT), Constrained Application Protocol (CoAP), Advanced Message Queuing protocol (AMQP), Java Message Service API (JMS), Data Distribution Service (DDS), Representational State Transfer (REST), Extensible Messaging and Presence Protocol (XMPP)	**08**
4.	**IoT Security and privacy framework:** Main concept and motivation of framework, Identity framework management, size and heterogeneity of the system, A policy based framework for security and privacy in IoT: Deployment scenario, policies and context switching, framework architecture, enforcement and protocols, Constrained Application Protocols.	**08**
5.	**Integration framework for heterogeneous smart objects:** Introduction, IPv6 potential, IoT6, IPv6 for IoT, IoT6 architecture, IoT6 integration with cloud and EPICS, Enabling heterogeneous integration, Scalability perspective. IoT applications: OpenIoT and iCORE: project design and implementation, execution and implementation issues, acceptance and sustainability. Smartsantander, Fitman, and OSMOSE for smart cities and manufacturing.	**08**

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6	**Cloud Service Management and IoT:** Introduction, federated cloud service management, Federated management service life Cycle, Self-management life cycle, Self-organized cloud architecture, Cloud services for internet connected objects (ICO's), Management of IoT services infrastructure and open IoT architecture. Data centers: Distributed, clustering.	**06**
	Total	**45**

Text Books:

1. Ovidiu Vermesam and Peter Friess, Internet of Things – from research and innovation to market deployment: River Publisher, 2014
2. Olivier Hersent, David Boswarthick, Omar Elloumi,The Internet of Things: Key Applications and Protocols, Wiley Publication, 2nd editions, 2012.

Reference Books:

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things- Wiley Publication, 2014
2. Peter Waher, Learning Internet of Things, Packet Publishing, January 2015.
3. Jayavardhana Gubbia, Rajkumar Buyyab, Slaven Marusic, Marimuthu Palaniswami, Research Article: Internet of Things (IoT): A vision, architectural elements, and future directions, Future Generation Computer Systems, Elsevier, 29 (2013), 1645-1660.

Term Work:

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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