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 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)

<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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