

SWAMI VIVEKANAND SUBHARTI UNIVERSITY,  
MEERUT



**FACULTY OF ENGINEERING & TECHNOLOGY**

**ORDINANCE No. V-2 (B4)**

**RELATING TO COURSE CURRICULUM & SYLLABUS  
OF UG PROGRAM**

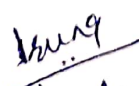
**BACHELOR OF TECHNOLOGY (B.Tech.) ECE**

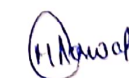
**(Effective from the Session – 2025-26)**

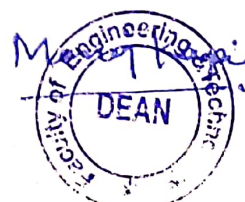
Apporved by the Academic Council of the Meeting held on 06 May 2025

Apporved by the Executive Council of the Meeting held on 28 June 2025

  
(Dr. Nikhil Rath)

  
Dr. Aruna Bansal

  
Dr. Himanshu  
Agarwal



**FACULTY OF ENGINEERING AND TECHNOLOGY  
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**

**EVALUATION SCHEME**

**Electronics and Communication Engineering**

(As per NEP 2020 and AICTE Guidelines)

**B.Tech 2<sup>nd</sup> Year/3<sup>rd</sup> Semester**

w.e.f. academic Session 2026-27

| S. NO.          | COURSE CODE         | COURSE TITLE                                              | COURSE TYPE     | TEACHING LOAD PER WEEK |   |   | MARKS |    |       |     | TOTAL MARKS | CREDIT |
|-----------------|---------------------|-----------------------------------------------------------|-----------------|------------------------|---|---|-------|----|-------|-----|-------------|--------|
|                 |                     |                                                           |                 |                        |   |   | CCA   |    |       | ESE |             |        |
|                 |                     |                                                           |                 | L                      | T | P | CT    | AT | TOTAL |     |             |        |
| THEORY SUBJECTS |                     |                                                           |                 |                        |   |   |       |    |       |     |             |        |
| 1               | UECE-301            | Electronic Devices                                        | ES              | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 2               | UECE-302            | Analog Circuits                                           | ES              | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 3               | UECE-303            | Analog and Digital Communication                          | ES              | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 4               | UECE-304            | Network Analysis and Synthesis                            | ES              | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 5               | UOE-3**<br>UAS-303  | Science Based Open Elective/<br>Mathematics-I/II          | ES/BS           | 3                      | 1 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 6               | UHU-305<br>UAS-304  | Soft Skills */<br>Environment Science*                    | AEC             | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| PRACTICALS      |                     |                                                           |                 |                        |   |   |       |    |       |     |             |        |
| 7               | UECE-351            | Electronic Devices Lab                                    | SEC             | 0                      | 0 | 2 | 10    | 5  | 15    | 35  | 50          | 1      |
| 8               | UECE352             | Analog Circuits Lab                                       | ES              | 0                      | 0 | 2 | 10    | 05 | 15    | 35  | 50          | 1      |
| 9               | UCC-351             | Internship Assessment /<br>Mini Project                   | 4 WEEKS         | -                      | - | - | -     | -  | 100   | -   | 100         | 2      |
| 10              | UVA-301/<br>UVA-302 | Introduction to<br>LABVIEW /<br>Introduction to<br>MATLAB | VAC-1/<br>VAC-2 | 0                      | 0 | 4 | -     | -  | 15    | 35  | 50          | 2      |
| 11              | UNC-301             | Disaster Management &<br>Preparedness                     | MC              | 1                      | 0 | 2 | 20    | 10 | 30    | 70  | 100         | 0      |
| TOTAL           |                     |                                                           |                 |                        |   |   |       |    |       |     | 950         | 24     |

\* - May be offered through NPTEL.

Abbreviation Used:

BS- Basic Science Course

ES: Engineering Science Course

SEC: Skill Enhancement Course

VAC: Value Added Course

AEC: Ability Enhancement Course

*(Signature)*

*(Signature)*

*Manoj Kapil*



**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**

**EVALUATION SCHEME**

**Electronics and Communication Engineering**

**(As per NEP 2020 and AICTE Guidelines)**

**B.Tech 2<sup>nd</sup> Year/3<sup>rd</sup> Semester**

**w.e.f. academic Session 2026-27**

| S. NO. | COURSE CODE       | COURSE TITLE                                     | COURSE TYPE                    | TEACHING LOAD PER WEEK |   |   | MARKS |    |       |     | TOTAL MARKS | CREDIT |
|--------|-------------------|--------------------------------------------------|--------------------------------|------------------------|---|---|-------|----|-------|-----|-------------|--------|
|        |                   |                                                  |                                |                        |   |   | CCA   |    |       | ESE |             |        |
|        |                   |                                                  |                                | L                      | T | P | CT    | AT | TOTAL |     |             |        |
|        |                   | THEORY SUBJECTS                                  |                                |                        |   |   |       |    |       |     |             |        |
| 1      | UECE-301          | Electronic Devices                               | ES                             | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 2      | UECE-302          | Analog Circuits                                  | ES                             | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 3      | UECE-303          | Analog and Digital Communication                 | ES                             | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 4      |                   | UECE-304                                         | Network Analysis and Synthesis | ES                     | 3 | 0 | 0     | 20 | 10    | 30  | 70          | 100    |
| 5      | UOE-3** /UAS-303  | Science Based Open Elective/ Mathematics-III     | ES/BS                          | 3                      | 1 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 6      | UIHU-305 /UAS-304 | Soft Skills */ Environment Science*              | AEC                            | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
|        |                   | PRACTICALS                                       |                                |                        |   |   |       |    |       |     |             |        |
| 7      | UECE-351          | Electronic Devices Lab                           | SEC                            | 0                      | 0 | 2 | 10    | 5  | 15    | 35  | 50          | 1      |
| 8      | UECE352           | Analog Circuits Lab                              | ES                             | 0                      | 0 | 2 | 10    | 05 | 15    | 35  | 50          | 1      |
| 9      | UCC-351           | Internship Assessment / Mini Project             | 4 WEEKS                        | -                      | - | - | -     | -  | 100   | -   | 100         | 2      |
| 10     | UVA-301/ UVA-302  | Introduction to LABVIEW / Introduction to MATLAB | VAC-1/ VAC-2                   | 0                      | 0 | 4 | -     | -  | 15    | 35  | 50          | 2      |
| 11     | UNC-301           | Disaster Management & Preparedness               | MC                             | 1                      | 0 | 2 | 20    | 10 | 30    | 70  | 100         | 0      |
|        |                   | TOTAL                                            |                                |                        |   |   |       |    |       |     | 950         | 24     |

\* - May be offered through NPTEL.

Abbreviation Used:

BS: Basic Science Course

ES: Engineering Science Course

SEC: Skill Enhancement Course

VAC: Value Added Course

AEC: Ability Enhancement Course

*F. H.*

*[Signature]*

*Manoj Kapil*





**FACULTY OF ENGINEERING AND TECHNOLOGY  
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**

**EVALUATION SCHEME**

**Electronics and Communication Engineering  
(As per NEP 2020 and AICTE Guidelines)**

**B.Tech 2<sup>nd</sup> Year/4<sup>th</sup> Semester**

**w.e.f. academic Session 2026-27**

| S. NO.          | COURSE CODE       | COURSE TITLE                                                               | COURSE TYPE                      | TEACHING LOAD PER WEEK |   |   | MARKS |    |       |     | TOTAL MARKS | CREDIT |
|-----------------|-------------------|----------------------------------------------------------------------------|----------------------------------|------------------------|---|---|-------|----|-------|-----|-------------|--------|
|                 |                   |                                                                            |                                  | L                      | T | P | CCA   |    |       | ESE |             |        |
|                 |                   |                                                                            |                                  |                        |   |   | CT    | AT | TOTAL |     |             |        |
| THEORY SUBJECTS |                   |                                                                            |                                  |                        |   |   |       |    |       |     |             |        |
| 1               | UECE-401          | Electromagnetic Waves                                                      | ES                               | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 2               | UECE-402          | Digital Electronics                                                        | ES                               | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 3               | UECE-403          | Microprocessor & Microcontrollers                                          | ES                               | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 4               | UECE-404          | Signals and Systems                                                        | ES                               | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 5               | UOE-4** /UAS-403  | Science Based Open Elective/ Mathematics-III                               | ES/BS                            | 3                      | 1 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 6               | UIIU-405 /UAS-404 | Soft Skills* / Environment Science*                                        | AEC                              | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| PRACTICALS      |                   |                                                                            |                                  |                        |   |   |       |    |       |     |             |        |
| 7               | UECE-452          | Digital Electronics Lab                                                    | ES                               | 0                      | 0 | 2 | 10    | 5  | 15    | 35  | 50          | 1      |
| 8               | UECE-453          | Microprocessor & Microcontroller Lab                                       | SEC                              | 0                      | 0 | 2 | 10    | 05 | 15    | 35  | 50          | 1      |
| 9               |                   | UECE-454                                                                   | Analog and Digital Communication | ES                     | 0 | 0 | 2     | 10 | 05    | 15  | 35          | 50     |
| 11              | UVA-401/ UVA-402  | Introduction to LABVIEW / Introduction to MATLAB                           | VAC-1/ VAC-2                     | 0                      | 0 | 4 | -     |    | 15    | 35  | 50          | 2      |
| 12              | UIIU-401          | Universal Human Values-II: Understanding Harmony and Ethical Human Conduct | IIS                              | 3                      | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
|                 |                   | TOTAL                                                                      |                                  |                        |   |   |       |    |       |     | 900         | 26     |

\* - May be offered through NPTEL.

Abbreviation Used:

BS: Basic Science Course

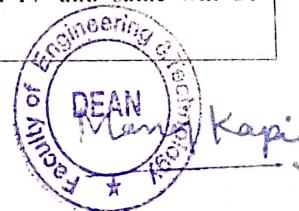
ES: Engineering Science Course

SEC: Skill Enhancement Course

VAC: Value Added Course

AEC: Ability Enhancement Course

Summer Internship (4-6 weeks) during summer break after Semester-IV and same will be assessed/evaluated in the Semester-V





## OBJECTIVES:

The course intends to provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc for performing various functions.

This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.

To provide an overview of amplifiers, feedback amplifiers and oscillators.

To gain the knowledge on existing on future analog circuits.

| Unit No. | Particulars                                                                                                                                                                                                                  | Contact Hours |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams, Effective Mass.                                                                                            | 8             |
| 2        | 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. | 8             |
| 3        | P-N junction characteristics, I-V characteristics, and small signal switching models, Avalanche breakdown, Zener diode, Schottky diode, LED, photo diode and solar cell.                                                     | 8             |
| 4        | Bipolar Junction Transistor, various configurations (such as CE, CB & CC) and their features I-V characteristics, DC biasing schemes for BJT, bias stability, Ebers -Moll model.                                             | 8             |
| 5        | Field Effect Transistor, configurations (such as CS, CD & CG), DC biasing schemes, MOSFET, I-V characteristics, MOS capacitor, C-V characteristics.                                                                          | 8             |

## Course Outcomes:

At the end of this course, students will be able to

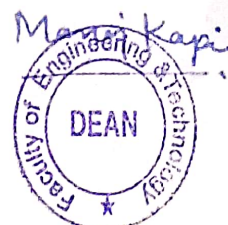
1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS Transistors for circuits and systems

## Text /Reference 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
  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. Tsididis and M. Colín, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.
  6. S.Y. Liao, "Microwave circuit Analysis and Amplifier Design", Prentice Hall 1987.
- Radmanesh, "RF and Microwave Electronics Illustrated", Pearson Education, 2004.

*F.M.*

*[Signature]*



**Course Objectives:**

- To study basic electronic components.
- To observe characteristics of electronic devices

**LIST OF EXPERIMENTS**

- Measurement & study of P-N junction diode-I-V and C-V characteristics.
- Study of Half-wave and Full-wave Rectifier.
- Measurement and study of solar cell -I-V characteristics.
- Study of Active filters.
- Study of diode as Clipper and Clamper.
- Study of Zener diode as Voltage Regulator.
- Measurement and study of Input and Output characteristics of a BJT.
- Study of CE amplifier-Current & Power gains and Input, Output Impedances.
- To study the frequency response of RC coupled amplifier.
- Measurement and study of Output characteristics of JFET.

**Course Outcomes:**

At the end of the course the students can able to

- Measure the voltage, frequency and phase of any waveform using CRO.
- Generate sine, square and triangular waveforms with required frequency and amplitude using function generator.
- Analyze the characteristics of different electronic devices such as diodes, transistors etc., and simple circuits like rectifiers, amplifiers etc.

f. (u) 



**Objectives:**

1. To understand the basic concepts of circuit analysis.
2. To understand Single Phase A.C Circuits
3. To understand Resonance concept
4. To understand magnetic circuits
5. Circuit theorems.
6. Networks topology.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Contact Hours |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Diode Circuits. Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.                                                                                                                                    | 12            |
| 2        | High frequency transistor models, frequency response of single stage and multistage amplifiers, cascade amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.                                                                                                                                                                                             | 12            |
| 3        | Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.<br>Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (V <sub>ON</sub> ), maximum usable load.<br>Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation. | 10            |
| 4        | OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision Rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.                                                                                                                                                                                                                                                                                                                                                                       | 10            |
| 5        | Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog-to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.                                                                                                                                                                                                                                                                                                                           | 10            |

**COURSE OUTCOMES:**

1. At the end of this course students will demonstrate the ability to
2. Understand the characteristics of diodes and transistors
3. Design and analyze various Rectifier and amplifier circuits
4. Design sinusoidal and non-sinusoidal oscillators
5. Understand the functioning of OP-AMP and design OP-AMP based circuits  
Design ADC and DAC

f (M)

*[Signature]*



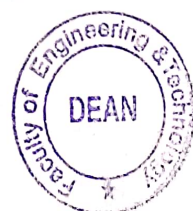


#### TEXT/REFERENCE BOOKS:

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

f (M)

Manoj Kapil



f (M)

*[Handwritten signature]*

|          |                     |          |          |
|----------|---------------------|----------|----------|
| UECE-352 | Analog Circuits Lab | 01:01:2P | 1 Credit |
|----------|---------------------|----------|----------|

### OBJECTIVES:

1. The course intends to provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc for performing various functions.
2. This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.
3. To provide an overview of amplifiers, feedback amplifiers and oscillators.
4. To gain the knowledge on existing on future analog circuits.

### EXPERIMENTS

The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include:

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.
5. A report is to be made for evaluation.

### COURSE OUTCOMES

1. Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of the devices..
2. Able to apply this knowledge to the analysis and design of basic circuits.
3. An ability to design and conduct experiments, as well as to organize, analyzes, and interprets data.
4. An ability to identify, formulates, and solves hardware engineering problems.
5. The following are the major outcomes in the part of electronic circuits and analysis.

F. M. L.

*[Signature]*

Mangy Kapil



|             |                             |          |           |
|-------------|-----------------------------|----------|-----------|
| UAS-303/403 | Engineering Mathematics-III | 3L:0T:0P | 3 Credits |
|-------------|-----------------------------|----------|-----------|

#### Course Outcomes:

On completion of course the students are able:

| CO  | CO Statement                                                                                                                                                   | Bloom's Level   |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| CO1 | Understand the concept of partial differential equation and to solve partial differential equations and analyze the concept of partial differential equations. | K1, K3, K4 & K5 |
| CO2 | Understand the concept of curve fitting, Correlation and regression.                                                                                           | K2              |
| CO3 | Understand the concept of probability to evaluate probability distributions and apply the concept of hypothesis testing                                        | K1, K2, K3 & K5 |
| CO4 | Understand the concept of transcendental and polynomial equations and interpolation                                                                            | K2              |
| CO5 | Analyze the concept the numerical differentiation and integration that are used in dealing with various engineering problems                                   | K4 & K6         |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

#### COURSE CONTENTS:

| Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contact Hours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Unit-1: Partial Differential Equations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   | 8             |
| Formation of partial differential equations, Linear and Non-Linear Partial Equations of first order, Lagrange's linear PDE, solution of first order linear and non-linear PDEs by Charpit's method, Solution of homogenous and non-homogenous linear partial differential equations of second and higher orders with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.                                            |               |
| <b>Unit-2: Statistical Techniques I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8             |
| Measures of central tendency, Measures of dispersion, Curve Fitting, Method of least squares, Fitting of straight lines, Correlation and regression analysis.                                                                                                                                                                                                                                                                                                                   |               |
| <b>Unit-3: Statistical Techniques II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        | 8             |
| <b>Probability and Distribution:</b> Introduction, Addition and multiplication law of probability, Discrete and Continuous Probability distributions: Binomial, Poisson and Normal distributions.<br><b>Sampling, Testing of Hypothesis:</b> Introduction, Sampling Theory (Small and Large), Hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Student's t-test and Chi-square test. |               |
| <b>Unit-4: Numerical Techniques - I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8             |
| Zeros of transcendental and polynomial equations using Bisection method, Regula – Falsi method and Newton – Raphson method.<br><b>Interpolation:</b> Newton's forward and backward difference formulae, Lagrange's interpolation formula and Newton's divided difference formula for unequal intervals.                                                                                                                                                                         |               |
| <b>Unit-5: Numerical Techniques - II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        | 8             |
| Numerical solution of system of linear equations by Jacobi method and Gauss- Seidel method. Numerical differentiation, Numerical integration by trapezoidal rule, Simpson's one-third and three-eighth rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's and fourth-order Runge- Kutta methods.                                                                                                                        |               |

F. M.

*[Signature]*





### Reference Books:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi.
2. Peter V. O'Neil, "Advance Engineering Mathematics", SI Edition 8th Edition, Cengage Learning, 2017.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2017.
4. S. S. Sastry, "Introductory methods of Numerical solutions", 4th Edition, Prentice Hall of India.
5. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley Publications, 1999.
6. R.K. Jain & S.R.K. Iyengar, "Numerical Methods", New Age International (P) Limited
7. James F. Epperson Mathematical Reviews "An Introduction To Numerical Methods And Analysis" Second Edition, Wiley; <https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf>
8. Introduction to Engineering Mathematics Vol. IV: H.K. Das; S. Chand Publications, New Delhi, India.
9. Probability and statistics for Engineers: Johnson, P.H.
10. R.K. Jain and S.R.K. Iyengar: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
11. D.N. Elhance, V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.

f (M)



Manoj Kapil



### Objectives:

1. To understand the fundamentals of signals and systems, frequency domain representation of signals, and different modulation techniques.
2. To review the concepts of probability and random processes, analyze the impact of noise in different modulation schemes, and examine pre-emphasis and de-emphasis techniques.
3. To gain knowledge about pulse modulation, sampling process, digital multiplexing, and noise considerations in pulse code modulation.
4. To learn about detection theory, optimum detection of signals in noise, baseband pulse transmission, and different passband digital modulation schemes.
5. To understand the tradeoffs in digital modulation, learn about optimum demodulation techniques over band-limited channels, and examine equalization, synchronization, and carrier recovery for digital modulation.

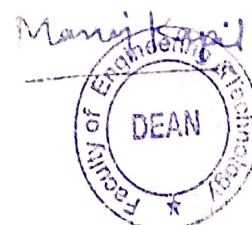
| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                           | Contact Hours |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I        | Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.                                                                                                                                      | 12            |
| II       | Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.                                                                                                                                                                 | 12            |
| III      | Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.                                                                                                                                                                             | 10            |
| IV       | Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Base band Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying. | 10            |
| V        | Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi Receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.                                                                                                                                                     | 10            |

### Course Outcomes:

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

1. Analyze the spectral characteristics of angle-modulated signals and differentiate between different amplitude and angle modulation systems.
2. Evaluate the impact of noise in different modulation schemes and assess the effectiveness of pre-emphasis and de-emphasis techniques.
3. Create a sampling process for pulse modulation and design digital multiplexers.
4. Evaluate the probability of error in coherent communication with waveforms and apply the Nyquist criterion to baseband pulse transmission.
5. Evaluate the tradeoffs in digital modulation and design optimum demodulation techniques for digital signals over band-limited channels.

*f a h*



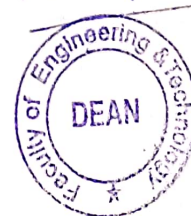
**Text/Reference Books:**

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
  2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
  3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
  4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering", John Wiley, 1965.
  5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004.
- Proakis J.G., "Digital Communications", 4th Edition, McGraw Hill, 2000.

f m



Manoj Kapil





### Objectives:

1. Understand the fundamental concepts and theories about networks.
2. Apply this knowledge to solve real-world, network-centric problems.
3. Use advanced network analysis methods and tools to visualize and analyze networks.
4. Interpret the results with respect to exploratory, quantitative and substantive questions.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                             | Contact Hours |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Node and mesh analysis, matrix approach of network containing voltage & current sources and reactances, source transformation and duality.                                                                                                                                                                                                                              | 8             |
| 2        | Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tellegen's theorem as applied to A.C. circuits.                                                                                                                                                                                                            | 8             |
| 3        | Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. Steady state response of a network to non-sinusoidal periodic inputs, Power factor, effective values.                               | 8             |
| 4        | Network function for one-port and two-port, calculation of network function for ladder and general networks, poles and zeros with restrictions for driving point functions and transform functions.<br>Two-Port Network: Introduction, Parameters, and Condition for reciprocity and symmetry, Relation between port parameters, Interconnection of two ports networks. | 8             |
| 5        | Sinusoidal response from pole-zero locations, convolution theorem, behaviour of series and parallel resonant circuits. Introduction to band pass, low pass, high pass and band reject filters.                                                                                                                                                                          | 8             |

### Course Outcomes:

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

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Apply electrical network theorems.
3. Apply Laplace transform for analysis steady state and transient behavior of network circuit.
4. Determine different network functions of Two Port network
5. Analyze the frequency response of various filters.

### Text/Reference Books

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2<sup>nd</sup> Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyam Mohan, S.P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

F. H. Kuo

*[Signature]*

Manoj Kapi



|         |                                      |                |                                                    |
|---------|--------------------------------------|----------------|----------------------------------------------------|
| UNC-301 | Disaster Management and Preparedness | L: 1 T: 0 P: 2 | 0 Credit (Equivalent to 2 Credits as per NEP-2020) |
|---------|--------------------------------------|----------------|----------------------------------------------------|

### Course Objectives

The course aims to develop awareness, knowledge, and practical skills among students to understand disaster risks, enhance preparedness, respond effectively during emergencies, and contribute to disaster risk reduction at individual, institutional, and community levels in alignment with national and global frameworks.

### Course Outcomes:

On completion of course the students are able:

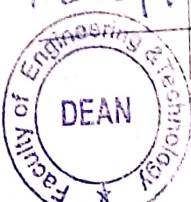
| CO  | CO Statement                                                                                    | Bloom's Level |
|-----|-------------------------------------------------------------------------------------------------|---------------|
| CO1 | Identify hazards, vulnerabilities, capacities, and disaster risks at various levels.            | K1, K2        |
| CO2 | Understand disaster management cycles and legal-institutional frameworks in India and globally. | K1, K2        |
| CO3 | Apply preparedness, mitigation, and response strategies during disasters.                       | K3            |
| CO4 | Demonstrate basic life-saving, first-aid, and emergency response skills.                        | K3            |
| CO5 | Prepare simple disaster management plans and participate in community-based DRR activities.     | K6            |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### COURSE CONTENTS:

| Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contact Hours            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Unit-1: Understanding Disaster Management and Disaster Risk Reduction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>L: 4 Hrs P: 4 Hrs</b> |
| <ul style="list-style-type: none"> <li>Basic concepts and terminology: Hazard, Vulnerability, Capacity, Exposure, Disaster, Risk</li> <li>Disaster Management vs Disaster Risk Reduction</li> <li>Hazard profile of India (regional perspective)</li> <li>Disaster Management Cycle: mitigation, preparedness, response, relief, recovery, rehabilitation</li> <li>Policy and legal frameworks: <ul style="list-style-type: none"> <li>Disaster Management Act, 2005</li> <li>National Disaster Management Policy</li> <li>State Disaster Management Acts</li> </ul> </li> <li>International frameworks: Sendai Framework, SDGs, Paris Agreement</li> <li>Role of institutions (overview): NDMA, NIDM, IMD, CWC, GSI, ISRO, SDMA, DDMA, NDRF</li> <li>Case studies of major disasters in India (minimum two)</li> </ul> |                          |
| <b>Unit-2: Preparedness, Mitigation and Response Planning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>L: 4 Hrs P: 8 Hrs</b> |
| <ul style="list-style-type: none"> <li>Framework for developing Disaster Management Plans</li> <li>Hazard, Vulnerability, Capacity and Risk (HIVCR) assessment tools: <ul style="list-style-type: none"> <li>Hazard mapping</li> <li>Transect walk</li> <li>Problem tree</li> <li>Chapatti diagram</li> </ul> </li> <li>Preparedness planning: evacuation plans, mock drills, tabletop exercises</li> <li>Disaster-specific mitigation measures</li> <li>Basics of Incident Response System (IRS)</li> <li>Role of emergency responders: NDRF, SDRF, police, fire services, armed forces, NCC, NSS</li> <li>Planning for vulnerable groups</li> </ul>                                                                                                                                                                   |                          |

*[Handwritten signatures]*

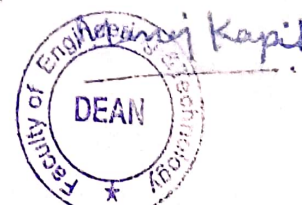
*Manoj Kapil*  


|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <ul style="list-style-type: none"> <li>Emerging technologies in DRR: <ul style="list-style-type: none"> <li>Drones, mobile apps (SAFAR, Meghdoot, UMANG, Sachet)</li> <li>Flood and weather alerts</li> <li>Social media for disaster communication</li> </ul> </li> <li>Basics of safe construction and structural &amp; non-structural safety audits</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
| <b>Unit-3: Life-Saving Skills and Public Health Preparedness</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>L: 4 Hrs P: 10 Hrs</b> |
| <ul style="list-style-type: none"> <li>First aid in disasters: <ul style="list-style-type: none"> <li>Golden hour concept</li> <li>CPR</li> <li>Burns, fractures, choking</li> <li>Animal bites (snake/dog/rabies)</li> <li>Heat-related illnesses</li> <li>Triage and stampede management</li> </ul> </li> <li>Household and personal preparedness: <ul style="list-style-type: none"> <li>72-hour emergency kit</li> <li>Safe food storage</li> <li>Water purification</li> <li>ORS usage</li> <li>WASH and IPC practices</li> </ul> </li> <li>Search and rescue basics</li> <li>Fire safety and electrical/LPG safety (fire extinguisher demonstration)</li> <li>Disaster-specific response: floods, earthquakes, landslides, cyclones, heatwaves, cold waves, pandemics, CBRN emergencies</li> <li>Psychosocial support and psychological first aid</li> <li>Public health impacts of disasters and prevention of post-disaster diseases</li> </ul> |                           |
| <b>Unit-4: Field Exposure and Community Engagement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>L: 3 Hrs P: 8 Hrs</b>  |
| <ul style="list-style-type: none"> <li>Field visits (physical/virtual): <ul style="list-style-type: none"> <li>Emergency Operations Centres</li> <li>Disaster-prone communities</li> <li>Fire stations / SDRF / NDRF units</li> </ul> </li> <li>Practical exposure: <ul style="list-style-type: none"> <li>Mock drills and simulations (multi-hazard evacuation)</li> <li>Interaction with responders and officials</li> </ul> </li> <li>Community engagement activities: <ul style="list-style-type: none"> <li>Awareness campaigns</li> <li>Street plays (nukkad natak)</li> <li>DRR clubs</li> <li>IEC material development (posters, videos, podcasts)</li> </ul> </li> <li>Project/Assignment: <ul style="list-style-type: none"> <li>Household or institutional disaster management plan</li> <li>Community-based DRR project</li> <li>Field report / reflective report</li> </ul> </li> </ul>                                                    |                           |

#### Books/Handbooks

1. Sphere Handbook for humanitarian response standards. Link: <https://spherestandards.org/handbook/>
2. Health emergency and disaster risk management framework (Health EDM), WHO. Link: [https://www.who.int/publications/i/item/9789241516181NDMA Booklets](https://www.who.int/publications/i/item/9789241516181NDMA%20Booklets)
3. AAPDA MITRA: A prime example of community-based disaster management: <https://ndma.gov.in/sites/default/files/IEC/Booklets/AAPDA%20MITRA%20A5%20BOOK%20Final.pdf>
4. DISABILITY INCLUSIVE DRR: Transformative journey towards a disability-inclusive society: <https://ndma.gov.in/sites/default/files/IEC/Booklets/Disability%20inclusive%20DRR.pdf>
5. BEATING THE HEAT: How India successfully reduces mortality due to heat waves: <https://ndma.gov.in/sites/default/files/IEC/Booklets/HeatWave%20A5%20BOOK%20Final.pdf>

f





6. PSYCHOSOCIAL CARE: Mitigating impact of disasters on mental health: <https://ndma.gov.in/sites/default/files/IEC/Booklets/Psychosocial%20A5%20Book.pdf>

7. REACHING OUT TO SAVE LIVES: How social media transformed India's readiness towards disasters: <https://ndma.gov.in/sites/default/files/IEC/Booklets/Social%20Media%20A5%20BOOK.pdf>

8. THUNDERSTORM AND LIGHTNING: Tackling weather hazards: <https://ndma.gov.in/sites/default/files/IEC/Booklets/Thunderstorm%20Lightning%20NDMA%20A5%20BOOK%20New.pdf>

#### Online courses

1. Comprehensive Disaster Risk Management Framework (CDRMF): [https://elearning.nidm.gov.in/enrol/blpayment/course\\_overview.php?id=193](https://elearning.nidm.gov.in/enrol/blpayment/course_overview.php?id=193)

2. Gender Aspects of Disaster Recovery and Reconstruction: [https://elearning.nidm.gov.in/enrol/blpayment/course\\_overview.php?id=187](https://elearning.nidm.gov.in/enrol/blpayment/course_overview.php?id=187)

3. Risk Sensitive Land Use Planning: [https://elearning.nidm.gov.in/enrol/blpayment/course\\_overview.php?id=191](https://elearning.nidm.gov.in/enrol/blpayment/course_overview.php?id=191)

4. Safe cities: [https://elearning.nidm.gov.in/enrol/blpayment/course\\_overview.php?id=197](https://elearning.nidm.gov.in/enrol/blpayment/course_overview.php?id=197)

5. Community- Based Disaster Risk Management: [https://elearning.nidm.gov.in/enrol/blpayment/course\\_overview.php?id=217](https://elearning.nidm.gov.in/enrol/blpayment/course_overview.php?id=217)

6. Climate Change and Disaster Risk: [https://elearning.nidm.gov.in/enrol/blpayment/course\\_overview.php?id=216](https://elearning.nidm.gov.in/enrol/blpayment/course_overview.php?id=216)

#### • SWAYAM and NPTEL MOOCs:

1. Disaster Recovery and Build Back Better (BBB): [https://onlinecourses.nptel.ac.in/noc22\\_ar05/preview/12](https://onlinecourses.nptel.ac.in/noc22_ar05/preview/12)

2. Climate Change and Disaster Risk Management [https://onlinecourses.swayam2.ac.in/ntr25\\_ed113/preview](https://onlinecourses.swayam2.ac.in/ntr25_ed113/preview)

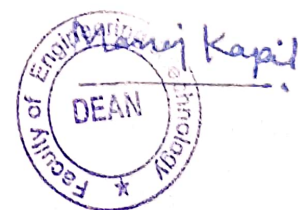
3. Disaster Management: [https://onlinecourses.swayam2.ac.in/ntr25\\_ed102/preview](https://onlinecourses.swayam2.ac.in/ntr25_ed102/preview)

4. Disaster Management: [https://onlinecourses.swayam2.ac.in/cec25\\_hs135/preview](https://onlinecourses.swayam2.ac.in/cec25_hs135/preview)

5. Disaster Risk Reduction and Management: [https://onlinecourses.swayam2.ac.in/ini25\\_hs32/preview](https://onlinecourses.swayam2.ac.in/ini25_hs32/preview)

P. H.







|              |             |          |           |
|--------------|-------------|----------|-----------|
| UIIU-305/405 | Soft Skills | 3L:0T:0P | 3 Credits |
|--------------|-------------|----------|-----------|

### Course Outcomes:

On completion of course the students are able:

| CO  | CO Statement                                                                                                                                            | Bloom's Level |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| CO1 | To understand the importance of soft skills in personal and professional contexts                                                                       | K1, K2        |
| CO2 | To apply effective communication skills in diverse situations                                                                                           | K3            |
| CO3 | To create strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading and writing.   | K4, K6        |
| CO4 | To deliver engaging presentations with confidence at work place and maintain positive relationships with peers and colleagues                           | K3, K5        |
| CO5 | To build up personal and professional traits that will make the transition from institution to workplace smoother and help them to excel in their jobs. | K6            |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### COURSE CONTENTS:

| Content                                                                                                                                                                                                                                                                                                                                                                                 | Contact Hours |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Unit-1: Introduction to Soft Skills</b>                                                                                                                                                                                                                                                                                                                                              | 8             |
| <ul style="list-style-type: none"> <li>Meaning and Aspects of Soft Skills</li> <li>Soft skills and Personality Development</li> <li>Effective Communication Skills</li> <li>Telephonic Communication Skills</li> <li>Positive Thinking</li> <li>Listening Skills, Types of Listening</li> </ul>                                                                                         |               |
| <b>Unit-2: Negotiation vs. Communication Skills</b>                                                                                                                                                                                                                                                                                                                                     | 8             |
| <ul style="list-style-type: none"> <li>Meaning and definition of Negotiation Skill</li> <li>Culture as Communication</li> <li>Classification of Communication</li> <li>Communicating without Words : Paralanguage, Proxemics, Haptics</li> <li>Meta-communication</li> <li>Organizational Communication</li> <li>Communication Breakdown</li> <li>Group Communication Skills</li> </ul> |               |
| <b>Unit-3: Advanced Writing Skills</b>                                                                                                                                                                                                                                                                                                                                                  | 8             |
| <ul style="list-style-type: none"> <li>Principles of Business Writing</li> <li>Business Letters: Format and Style, Types of Business Letter</li> <li>Writing Reports, Types of Report, Strategies for Report Writing.</li> <li>Evaluation and Organization of Data</li> </ul>                                                                                                           |               |
| <b>Unit-4: Advanced Presentation Skills</b>                                                                                                                                                                                                                                                                                                                                             | 8             |
| <ul style="list-style-type: none"> <li>Oral Presentation: Planning &amp; Preparation</li> <li>Speeches &amp; Debates, Combating Nervousness</li> <li>Patterns &amp; Methods of Presentation</li> <li>Making Effective Presentations</li> <li>Speeches for Various Occasions</li> </ul>                                                                                                  |               |



f @

|                                                                                                                                                                                                                           |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Unit-5: Work- place skills                                                                                                                                                                                                | 8 |
| <ul style="list-style-type: none"> <li>• Interviews, Planning &amp; Preparing:</li> <li>• Drafting Effective Résumé</li> <li>• Facing Job Interviews</li> <li>• Emotional Intelligence &amp; Critical Thinking</li> </ul> |   |

#### Course Objectives:

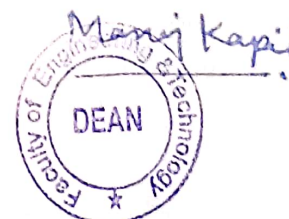
1. To understand the aspects of soft skills for personal and professional world
2. To cultivate leadership qualities and teamwork abilities in the organization.
3. To develop effective communication skills, including verbal, non-verbal, and written communication.
4. To refine presentation and public speaking skills.
5. To develop work place skills for seeking good job opportunities.

#### Books and references

1. Butterfield, Jeff. Soft Skills for Everyone. New Delhi: Cengage Learning. 2010.
2. Chauhan, G.S. and Sangeeta Sharma. Soft Skills. New Delhi: Wiley. 2016.
3. Goleman, Daniel. Working with Emotional Intelligence. London: Banton Books. 1998.
4. Hall, Calvin S. et al. Theories of Personality. New Delhi: Wiley. rpt. 2011.
5. Holtz, Shel. Corporate Conversations. New Delhi: PHI. 2007.
6. Kumar, Sanajy and Pushp Lata. Communication Skills. New Delhi: OUP. 2011.
7. Lucas, Stephen E. The Art of Public Speaking. McGraw-Hill Book Co. International Edition, 11th Ed. 2014.
8. Penrose, John M., et al. Business Communication for Managers. New Delhi: Thomson South Western. 2007.
9. Sharma, R.C. and Krishna Mohan. Business Correspondence and Report Writing. New Delhi: TMH. 2016.
10. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. New Delhi: PHI Learning. 2009, 6th Reprint 2015.
11. Thorpe, Edgar and Showick Thorpe. Winning at Interviews. Pearson Education. 2004.
12. Turk, Christopher. Effective Speaking. South Asia Division: Taylor & Francis. 1985.

F M





|             |                         |          |           |
|-------------|-------------------------|----------|-----------|
| UOE-302/402 | Automation and Robotics | 3L:0T:0P | 3 Credits |
|-------------|-------------------------|----------|-----------|

### Course Outcomes:

On completion of course the students are able:

| CO  | CO Statement                                                                                             | Bloom's Level |
|-----|----------------------------------------------------------------------------------------------------------|---------------|
| CO1 | To learn the concept of automation, its classification and terminology                                   | K1            |
| CO2 | To understand the concept of basic principles of Robots.                                                 | K2            |
| CO3 | To apply knowledge of basics of Robot Programming and robotic Applications                               | K3            |
| CO4 | To understand and analyze the basic elements of Automation in manufacturing.                             | K2, K4        |
| CO5 | Evaluate effectively about robotics engineering technologies, their workings and potential applications. | K5            |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### COURSE CONTENTS:

| Content                                                                                                                                                                                                                                                                                                                                                                                                       | Contact Hours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Unit-1: Introduction to Automation</b>                                                                                                                                                                                                                                                                                                                                                                     | 8             |
| Brief history of automation, Requirement of automation systems, classification & level of automation, Industrial Automation, benefits of Industrial Automation, closed loop & open loop system, role of automation in Industry 4.0.                                                                                                                                                                           |               |
| <b>Unit-2: Introduction to Robotics</b>                                                                                                                                                                                                                                                                                                                                                                       | 8             |
| <b>Overview:</b> History, Definition and scope of robotics, laws of robotics, classification, advantages and disadvantages of Robot, applications of robots.<br><b>Robot components:</b> Joints, links, end-effectors, degrees of freedom, brief introduction to forward and inverse kinematics.<br><b>Robot Ethics:</b> Social impact of robots in society, ethical implications of robotics and automation. |               |
| <b>Unit-3: Industrial Automation Architecture</b>                                                                                                                                                                                                                                                                                                                                                             | 8             |
| <b>Input Devices:</b> Transducers & sensors, Classification of sensors and applications.<br><b>Controllers:</b> Classification of controllers in Industrial Automation, principles of hard wire system and PLC, Types of PLC, I/O: Analog and Digital, Ladder programming for logic functions.<br><b>Actuators:</b> Basics of Hydraulic, Pneumatic and Electric actuators, merits and demerits.               |               |
| <b>Unit-4: Automation in Manufacturing</b>                                                                                                                                                                                                                                                                                                                                                                    | 8             |
| Fundamentals of Computer Integrated Manufacturing, elements of a CIM system, benefits of CIM, types of automation in production system, fundamentals of Group Technology and Flexible Manufacturing System. Types and components of FMS.                                                                                                                                                                      |               |
| <b>Unit-5: Industrial Applications</b>                                                                                                                                                                                                                                                                                                                                                                        | 8             |
| Industrial Applications of Automation and Robotics for material handling, welding, Spray painting, medical, mining, space, defence, security, domestic, entertainment.                                                                                                                                                                                                                                        |               |

*[Handwritten signature]*





## Text Books

1. Gary Dunning, "Introduction to Programmable Logic Controllers" Thomson Learning, 2001.
2. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2011.
3. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015
4. Introduction to Robotics (Mechanics and control), Niku, Wiley 2013.
5. Introduction to Robotics by S K Saha, McGraw Hill Education
6. R K Mittal and I J Nagrath, "Robotics and Control", Tata McGraw Hill, New Delhi, 2003.

## Reference books

1. Introduction to Robotics (Mechanics and control), J.J.Craig Pearson Education Asia 2002.
2. Program logic controllers, W.Bolton, Elsevier 2009.

f (M)





|             |                         |          |           |
|-------------|-------------------------|----------|-----------|
| UVA-301/401 | INTRODUCTION TO LABVIEW | 0L:0T:4P | 2 Credits |
|-------------|-------------------------|----------|-----------|

### Course Outcomes:

On completion of course the students are able:

| CO  | CO Statement                                            | Bloom's Level |
|-----|---------------------------------------------------------|---------------|
| CO1 | Describe various aspects of VI.                         | K1            |
| CO2 | Comprehend the aspects of VI.                           | K2            |
| CO3 | Apply the concepts of VI for the given logic.           | K3            |
| CO4 | Analyze the software and hardware components of VI.     | K2, K4        |
| CO5 | Develop and evaluate the given expression problem using | K5            |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### UNIT-I

**Virtual instrumentation:** Virtual instrument and traditional instrument, hardware and software in VI. VI for test, control and design, VI in engineering process, virtual instruments beyond personal computer, graphical system design using LabVIEW. **Introduction to LabVIEW:** Advantages, software environment, creating and saving VI, front panel and block diagram tool bar, palettes, controls and indicators, block diagram, data types, data flow program.

10Hrs.

### UNIT-II

**Modular programming:** Build a VI front panel and block diagram, building a connector pane, displaying sub VIs and express VIs, creating sub VIs, **Repetition and loops:** For loops, while loops, structure tunnels, terminal inside or outside loops, shift registers, feedback nodes, control timing, communication among multiple loops, local and global variables.

10Hrs.

### UNIT-III

**Arrays:** Creating one dimensional, two dimensional, multi-dimensional arrays, array initialization, deleting, inserting, replacing elements within an array, array function, auto indexing. **Structures:** Case, sequence, customizing, timed structures, formula nodes, event structures.

05Hrs.

### UNIT-IV

**Data acquisition:** Signals, signal conditioning, DAQ hardware configuration, DAQ hardware, analog inputs, outputs, counters.

05Hrs.

### UNIT-V

**Motion control:** Components, software for configuration, prototyping and development, motion controller, move types, motor amplifiers and drives, feedback devices and motion I/O.

10Hrs.

### Text Books:

1. Jerome, Jovitha, "Virtual instrumentation using LabVIEW", PHI, 1st Edition, 2010 (Unit I, II, III).
2. Gary W. Johnson, Richard Jennings, "LabVIEW Graphical Programming", MGH, 4th Edition (Unit IV).

f @




|             |                        |          |           |
|-------------|------------------------|----------|-----------|
| UVA-302/402 | INTRODUCTION TO MATLAB | 0L:0T:4P | 2 Credits |
|-------------|------------------------|----------|-----------|

### Course Outcomes:

On completion of course the students are able:

| CO  | CO Statement                                                                                                                        | Bloom's Level |
|-----|-------------------------------------------------------------------------------------------------------------------------------------|---------------|
| CO1 | To introduce the students to MATLAB as programming and scientific computing tool.                                                   | K1            |
| CO2 | To enable the students to solve basic problems and matrix operations using MATLAB.                                                  | K2            |
| CO3 | To introduce the students to basic numerical techniques to solve first order ordinary differential equations, numerical integration | K3            |
| CO4 | To familiarize the students with basic plotting tools available in MATLAB                                                           | K2, K4        |
| CO5 | To develop and evaluate the given expression /problem using                                                                         | K5            |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### UNIT I: Introduction to MATLAB Environment and Matrix Operations

- Introduction to MATLAB and its applications in engineering
- MATLAB Desktop, Command Window, Workspace, Editor
- Variables, constants, data types, operators
- Scalars, vectors, matrices, arrays
- Matrix creation and manipulation
- Built-in mathematical functions
- Input/output commands
- Working with MATLAB files (.m files)

### UNIT II: MATLAB Programming Fundamentals

- Script files and function files
- Programming logic and algorithm development
- Decision-making statements:
  - if
  - if-else
  - nested if
  - switch-case
- Looping constructs:
  - for loop
  - while loop
- Break and continue statements
- User-defined functions
- Debugging and code documentation

### UNIT III: Data Visualization and Graphics

- Introduction to graphical visualization
- 2D plotting:
  - plot()
  - subplot()
  - semilog and log-log plots
- Graph formatting:
  - titles
  - labels
  - legends



*(Handwritten signatures and initials)*



- annotations
- Multiple plots
- Bar charts, pie charts, histograms
- 3D plotting:
  - mesh
  - surf
  - contour
- Engineering data visualization techniques

#### UNIT IV: Numerical Computing and Engineering Applications

- Solution of algebraic equations
- Polynomial operations and curve fitting
- Numerical differentiation
- Numerical integration
- Interpolation techniques
- Linear algebra applications
- Solving systems of equations
- Basic optimization concepts
- Statistical analysis:
  - mean
  - median
  - standard deviation
  - regression analysis

#### UNIT V: Engineering Modeling, Simulation and Simulink

- Introduction to modeling and simulation
- Simulink environment
- Simulink blocks and libraries
- Model creation and execution
- Transfer function modeling
- Signal generation and processing
- Engineering system simulation
- Data import/export
- Mini-project development using MATLAB/Simulink

F. H. K.

*[Signature]*



|          |                       |          |           |
|----------|-----------------------|----------|-----------|
| UECE-401 | Electromagnetic Waves | 3L:0T:0P | 3 Credits |
|----------|-----------------------|----------|-----------|

#### Objectives:

- Understand The Electrostatics, Magneto statics, Maxwell's Equations EM Wave Characteristics & Transmission Lines.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contact Hours |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.                                        | 12            |
| 2        | Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.                                                                                                                                                                                                                                                                                             | 12            |
| 3        | Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.                                                                                                                                                                                                | 08            |
| 4        | Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.                                                                                                                                                                                                                   | 08            |
| 5        | Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in Rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.<br>Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, Receiving antenna, Monopole and Dipole antenna. | 10            |

#### Course Outcomes:

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

- Understand characteristics and wave propagation on high frequency transmission lines
- Carryout impedance transformation on TL
- Use sections of transmission line sections for realizing circuit elements
- Analyze wave propagation on metallic waveguides in modal form
- Understand principle of radiation and radiation characteristics of an antenna

#### Text/Reference Books:

- R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
- E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
- Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.  
David Cheng, Electromagnetics, Prentice Hall.

*[Handwritten signature]*



|          |                     |          |           |
|----------|---------------------|----------|-----------|
| UECE-402 | Digital Electronics | 3L:0T:0P | 3 Credits |
|----------|---------------------|----------|-----------|

#### Objectives:

1. To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates.
2. To design various combinational and sequential circuits.
3. To provide with an appreciation of applications for the techniques and mathematics used in this course.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contact Hours |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.                                                                 | 12            |
| 2        | Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization | 12            |
| 3        | A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J-K and types of flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(A                                                                                                                                                                                                       | 10            |
| 4        | Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter,                                                                                                                                                                | 10            |
| 5        | Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).                                                                  | 8             |

#### COURSE OUTCOMES:

1. At the end of this course, students will demonstrate the ability to
2. Understand working of logic families and logic gates.
3. Design and implement Combinational and Sequential logic circuits.
4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
5. Be able to use PLDs to implement the given logical problem.

#### TEXT/REFERENCES:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

*(Handwritten signature)*





|         |                                                                                  |          |           |
|---------|----------------------------------------------------------------------------------|----------|-----------|
| UVA-401 | UNIVERSAL HUMAN VALUES-II:<br>UNDERSTANDING HARMONY AND<br>ETHICAL HUMAN CONDUCT | 3L:0T:0P | 3 Credits |
|---------|----------------------------------------------------------------------------------|----------|-----------|

#### Course Outcomes:

On completion of course the students are able to:

| CO  | CO Statement                                                                                                                                                                                                                                                                                        | Bloom's Level |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| CO1 | Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society | K2            |
| CO2 | Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.                                                                                                                                                                         | K2, K4        |
| CO3 | Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society                                                                                                | K2            |
| CO4 | Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.                                                                                                                                                                                 | K2            |
| CO5 | Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.                                                                                                                                                   | K3, K4        |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

#### Module 1 – Introduction to Value Education

**Lecture 1:** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

**Lecture 2:** Understanding Value Education

**Tutorial 1: Practice Session PS1** Sharing about Oneself

**Lecture 3:** Self-exploration as the Process for Value Education

**Lecture 4:** Continuous Happiness and Prosperity – the Basic Human Aspirations

**Tutorial 2: Practice Session PS2** Exploring Human Consciousness

**Lecture 5:** Happiness and Prosperity – Current Scenario

**Lecture 6:** Method to Fulfill the Basic Human Aspirations

**Tutorial 3: Practice Session PS3** Exploring Natural Acceptance

#### Module 2 – Harmony in the Human Being

**Lecture 7:** Understanding Human being as the Co-existence of the Self and the Body

**Lecture 8:** Distinguishing between the Needs of the Self and the Body

**Tutorial 4: Practice Session PS4** Exploring the difference of Needs of Self and Body

**Lecture 9:** The Body as an Instrument of the Self

**Lecture 10:** Understanding Harmony in the Self

**Tutorial 5: Practice Session PS5** Exploring Sources of Imagination in the Self

**Lecture 11:** Harmony of the Self with the Body

**Lecture 12:** Programme to ensure self-regulation and Health

**Tutorial 6: Practice Session PS6** Exploring Harmony of Self with the Body

#### Module 3 – Harmony in the Family and Society

**Lecture 13:** Harmony in the Family – the Basic Unit of Human Interaction

**Lecture 14:** 'Trust' – the Foundational Value in Relationship

**Tutorial 7: Practice Session PS7** Exploring the Feeling of Trust

**Lecture 15:** 'Respect' – as the Right Evaluation

**Tutorial 8: Practice Session PS8** Exploring the Feeling of Respect

**Lecture 16:** Other Feelings, Justice in Human-to-Human Relationship

**Lecture 17:** Understanding Harmony in the Society

**Lecture 18:** Vision for the Universal Human Order

**Tutorial 9: Practice Session PS9** Exploring Systems to fulfill Human Goal

#### Module 4 – Harmony in the Nature/Existence

**Lecture 19:** Understanding Harmony in the Nature

**Lecture 20:** Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature

**Tutorial 10: Practice Session PS10** Exploring the Four Orders of Nature



**Lecture 21:** Realizing Existence as Co-existence at All Levels  
**Lecture 22:** The Holistic Perception of Harmony in Existence  
**Tutorial 11: Practice Session PS11** Exploring Co-existence in Existence

**Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics**

**Lecture 23:** Natural Acceptance of Human Values  
**Lecture 24:** Definitiveness of (Ethical) Human Conduct  
**Tutorial 12: Practice Session PS12** Exploring Ethical Human Conduct  
**Lecture 25:** A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order  
**Lecture 26:** Competence in Professional Ethics  
**Tutorial 13: Practice Session PS13** Exploring Humanistic Models in Education  
**Lecture 27:** Holistic Technologies, Production Systems and Management Models-Typical Case Studies  
**Lecture 28:** Strategies for Transition towards Value-based Life and Profession  
**Tutorial 14: Practice Session PS14** Exploring Steps of Transition towards Universal Human Order

**Guidelines and Content for Practice Sessions (Tutorials)**

In order to connect the content of the proposals with practice (living), 14 practice sessions have been designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

**Text Books:**

**Text Book and Teachers Manual**

1. The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53
3. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

A (H)



|          |                         |          |           |
|----------|-------------------------|----------|-----------|
| UECE-452 | Digital Electronics Lab | 0L:0T:2P | 1 Credits |
|----------|-------------------------|----------|-----------|

### OBJECTIVES:

Explain the elements of digital system abstractions such as digital representations of information, digital logic, Boolean algebra, state elements and finite state machine (FSMs).

Design simple digital systems based on these digital abstractions, using the "digital paradigm" including discrete sampled information.

Use the "tools of the trade": basic instruments, devices and design tools.

Work in a design team that can propose, design, successfully implement and report on a digital systems project.

### EXPERIMENTS

- 1 Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
- 2 Implementation of the given Boolean function using logic gates in both SOP and POS forms.
- 3 Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
- 4 Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
- 5 Implementation of 4x1 multiplexer using logic gates.
- 6 Implementation of 4-bit parallel adder using 7483 IC.
- 7 Design, and verify the 4-bit synchronous counter.
- 8 Design, and verify the 4-bit asynchronous counter.

### COURSE OUTCOMES

- Describe how analog signals are used to represent digital values in different logic families, including characterization of the noise margins.
- Create the appropriate truth table from a description of a combinational logic function.
- Create a gate-level implementation of a combinational logic function described by a truth table using and/or/inv gates, MUXS or ROMs, and analyze its timing behavior.
- Create a state transition diagram from a description of a sequential logic function and then convert the diagram into an implementation of a finite-state machine with the appropriate combinational and sequential components.
- Describe the operation and timing constraints for latches and registers.
- Draw a circuit diagram for a sequential logic circuit and analyze its timing properties (input setup and hold times, minimum clock period, output propagation delays).
- Discuss how to interface digital circuits with analog components (ADC, DAC, sensors, etc.).

*Handwritten signature*





|          |                                   |          |           |
|----------|-----------------------------------|----------|-----------|
| UECE-403 | Microprocessor & Microcontrollers | 3L:0T:0P | 3 Credits |
|----------|-----------------------------------|----------|-----------|

### Objectives:

1. Understand need of microprocessors, microcontrollers in development of various projects and to know complete architectural, programming, interfacing details of microprocessor-8051 microcontroller To understand Single Phase A.C Circuits

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contact Hours |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | <b>Introduction to Microprocessor:</b> Microprocessor architecture and its operations, Memory, Input & output devices, The 8085 MPU- architecture, Pins and signals, Timing Diagrams, Logic devices for interfacing, Memory interfacing, Interfacing output displays, Interfacing input devices, Memory mapped I/O.                                                                                                                                                                                            | 08            |
| 2        | <b>Basic Programming concepts:</b> Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing. Additional data transfer and 16 bit arithmetic instruction, Logic operation: rotate, compare, counter and time delays, 8085 Interrupts.                                                                                                                                | 08            |
| 3        | <b>16-bit Microprocessors (8086):</b> Architecture, Pin Description, Physical address, segmentation, memory organization, Addressing modes.<br><b>Peripheral Devices:</b> 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.                                                                                                                                                                     | 08            |
| 4        | <b>8051 Microcontroller Basics:</b> Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes.                                                                                              | 08            |
| 5        | <b>Assembly programming and instruction of 8051:</b> Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming, Programming 8051 Timers. Serial Port Programming, Interrupts Programming,<br><b>Interfacing:</b> LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation. | 08            |

### Course Outcomes: At the end of this course students will demonstrate the ability to

- a. Demonstrate the basic architecture of 8085.
- b. Illustrate the programming model of microprocessors & write program using 8085 microprocessor.
- c. Demonstrate the basics of 8086 Microprocessor and interface different external Peripheral
- d. Devices like timer, USART etc. with Microprocessor (8085/8086).
- e. Compare Microprocessors & Microcontrollers, and-comprehend the architecture of 8051 Microcontroller.

*Handwritten signature*



### Text Books:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 6th Edition, Penram International Publication (India) Pvt. Ltd., 2013
2. D. V. Hall : Microprocessors Interfacing, TMH 3rd Edition.
3. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition, 2006

### Reference Books:

1. Kenneth L. Short, "Microprocessors and programmed Logic", 2nd Ed, Pearson Education Inc., 2003
2. Barry B. Brey, "The Intel Microprocessors. 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
3. Shah Satish, "8051 Microcontrollers MCS 51 Family and its variants", Oxford, 2010

FHM

*[Signature]*



|          |                                       |          |           |
|----------|---------------------------------------|----------|-----------|
| UECE-453 | Microprocessor & Microcontrollers Lab | 0L:0T:1P | 1 Credits |
|----------|---------------------------------------|----------|-----------|

#### OBJECTIVES:

1. Discuss the major components that constitute an embedded system.
2. Implement small programs to solve well-defined problem on an embedded platform.
3. Develop familiarity with tools used to develop in an embedded environment.

#### EXPERIMENTS:

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To Generate 10KHz square wave using 8051 microcontroller.
7. To study the implementation and interfacing of LCD.
8. To study implementation and interfacing of LED.
9. To study implementation and interfacing of seven segment display.

#### COURSE OUTCOME:

1. Understand what is microcontroller.
2. Understand different components of a microcontroller and their interaction.
3. Become familiar with programming environment used to develop embedded system
4. Understand key concepts of embedded system like IO, Timer, Interrupts, interaction with peripheral devices.

f @

*[Signature]*





|          |                     |          |           |
|----------|---------------------|----------|-----------|
| UECE-404 | Signals and Systems | 3L:0T:0P | 3 Credits |
|----------|---------------------|----------|-----------|

### Objectives:

To introduce the concepts and techniques associated with the signals and systems. To minimize the logical complexity using various system responses.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contact Hours |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Definition, types of signals and their representations; continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, Rectangular pulse, sinusoidal; operations on Continuous-time and discrete-time signals (including transformations of independent variables). | 8             |
| 2        | Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.                                                                                                                                                                                        | 8             |
| 3        | Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.                                                                                                         | 7             |
| 4        | The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.                                                                                                                                                   | 9             |
| 5        | State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.                                                                                                                                              | 9             |

### Course Outcomes:

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

1. Analyze different types of signals
2. Represent continuous and discrete systems in time and frequency domain using different transforms
3. Investigate whether the system is stable
4. Sampling and Reconstruction of a signal

F R

*[Signature]*



**Text/Reference books:**

1. A.V. Oppenheim, A.S. Willsky and L.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
10. Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.

F.M.H.





### Objectives:

1. To understand modulation, demodulation techniques used in communication system, and develop the Modulation techniques used in both time and frequency domains.
2. To develop a knowledge pre-emphasis and de-emphasis circuits used in the analog communication.
3. To analyze the Signal Modulation (amplitude, frequency, and phase) and transmission techniques (base band, SSB system) will be emphasized.
4. To understand the concept of mixer, PLL, Digital phase detector and synchronous detector to develop a clear insight into the relations between the input and output ac signals in various stages of a transmitter and a Receiver of AM & FM systems.

### EXPERIMENTS

- 1 To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
- 2 To study amplitude demodulation by linear diode detector
- 3 To study frequency modulation and determine its modulation factor
- 4 To study PLL 565 as frequency demodulator.
- 5 To study sampling and Reconstruction of Pulse Amplitude modulation system.
- 6 To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne Receiver.
- 7 To study Pulse Amplitude Modulation
  - a. using switching method
  - b. by sample and hold circuit
- 8 To demodulate the obtained PAM signal by 2nd order LPF.
- 9 To study Pulse Width Modulation and Pulse Position Modulation.
- 10 Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
- 11 Study of Phase shift keying modulator and demodulator
- 12 Design and implement an FM radio Receiver in 88-108 MHz.
- 13 Study of single bit error detection and correction using Hamming code.

### Course Outcomes

1. Should be able to explain modulation and demodulation technique techniques in various communications.
2. Should be able to understand the operations of different types of detectors.
3. Should be able to analyze the signal transmission and Receiving fundamental concepts.
4. Should be able to describe the operation of Multiplexing techniques.

*(Signature)*

*(Signature)*





**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**  
**STUDY & EVALUATION SCHEME**

**B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING**

**YEAR 3<sup>RD</sup>, SEMESTER-V**

| S. NO.          | COURSE CODE              | COURSE TITLE                                                  | COURSE TYPE | TEACHING LOAD PER WEEK |    |    | MARKS |    |       | ESE | TOTAL MARKS | CREDIT |
|-----------------|--------------------------|---------------------------------------------------------------|-------------|------------------------|----|----|-------|----|-------|-----|-------------|--------|
|                 |                          |                                                               |             |                        |    |    | CCA   |    |       |     |             |        |
|                 |                          |                                                               |             | L                      | T  | P  | CT    | AT | TOTAL |     |             |        |
| THEORY SUBJECTS |                          |                                                               |             |                        |    |    |       |    |       |     |             |        |
| 1               | KECE-501                 | Antenna & Wave Propagation                                    | PCC         | 3                      | 0  | 0  | 20    | 10 | 30    | 70  | 100         | 3      |
| 2               | KECE-502                 | Computer Architecture                                         | PCC         | 3                      | 0  | 0  | 20    | 10 | 30    | 70  | 100         | 3      |
| 3               | KECE-503                 | Information Theory and Coding                                 | PCC         | 3                      | 0  | 0  | 20    | 10 | 30    | 70  | 100         | 3      |
| 4               | KECE-511-S to KECE-514-S | Departmental Elective-I * (Bucket of 4 courses from SWAYAM)   | PE          | 3                      | 0  | 0  | 20    | 10 | 30    | -   | 70          | 3      |
| 5               | KECE-521                 | Control System(Departmental elective -II)                     | PE          | 3                      | 0  | 0  | 20    | 10 | 30    | -   | 70          | 3      |
| 6               | KMC-501/502              | Constitution of India/Essence of Indian Traditional Knowledge | MC          | 3                      | 0  | 0  | 20    | 10 | 30    | 70  | 100         | 2      |
| PRACTICALS      |                          |                                                               |             |                        |    |    |       |    |       |     |             |        |
| 7               | KECE-552                 | Computer Architecture Lab                                     | PCC         | 0                      | 0  | 2  | 10    | 05 | 15    | 35  | 50          | 1      |
| 8               | KECE-554                 | Control system Lab                                            | PCC         | 0                      | 0  | 2  | 10    | 05 | 15    | 35  | 50          | 1      |
| 9               | KECE-551                 | Mini Project - I                                              | PEC         | 0                      | 0  | 4  | --    | -- | 50    | --  | 50          | 2      |
| 10              | KCC-551                  | Internship Assessment                                         | 4 WEEKS     | --                     | -- | -- | --    | -- | 50    | --  | 50          | 1      |
|                 |                          | TOTAL                                                         |             |                        |    |    |       |    |       |     | 800         | 22     |

L- Lecture

T- Tutorial

P- Practical

CT- Cumulative Test

AT - Attendance

CCA- Continuation Comprehensive Assessment

ESE- End Semester Examination

*(Signature)*



**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**

**STUDY & EVALUATION SCHEME**

**B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING**

**YEAR 3<sup>RD</sup>, SEMESTER-VI**

| S. NO. | COURSE CODE                 | COURSE TITLE                                                         | COURS E TYPE | TEACHIN G LOAD PER WEEK |   |   | MARKS |    |       |     | TOTAL MARKS | CREDIT |
|--------|-----------------------------|----------------------------------------------------------------------|--------------|-------------------------|---|---|-------|----|-------|-----|-------------|--------|
|        |                             |                                                                      |              |                         |   |   | CCA   |    |       | ESE |             |        |
|        |                             |                                                                      |              | L                       | T | P | CT    | AT | TOTAL |     |             |        |
|        |                             | THEORY SUBJECTS                                                      |              |                         |   |   |       |    |       |     |             |        |
| 1      | KECE-601                    | Digital System Processing                                            | PCC          | 3                       | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 2      | KECE-602                    | Microwave and Radar                                                  | PCC          | 3                       | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 3      | KECE-611-S to<br>KECE-614-S | Departmental Elective-III *<br><br>(Bucket of 4 courses from SWAYAM) | PE           | 3                       | 0 | 0 | 20    | 10 | 30    | -   | 70          | 3      |
| 4      | KECE 603                    | Wireless communication                                               | PCC          | 3                       | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 5      | KOE-6**                     | Idea to Business Model                                               | OE-1         | 3                       | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 3      |
| 6      | KMC-601/602                 | Constitution of India/Essence of Indian Traditional Knowledge        | MC           | 3                       | 0 | 0 | 20    | 10 | 30    | 70  | 100         | 2      |
|        |                             | PRACTICALS                                                           |              |                         |   |   |       |    |       |     |             |        |
| 7      | KECE-651                    | Digital System Processing lab                                        | PCC          | 0                       | 0 | 2 | 10    | 05 | 15    | 35  | 50          | 1      |
| 8      | KECE-656                    | Electronics Measurement Lab                                          | PEC          | 0                       | 0 | 4 | 10    | 05 | 15    | 35  | 50          | 1      |
| 9      | KECE-654                    | Mini Project - II                                                    | PCC          | 0                       | 0 | 4 | 10    | 05 | 15    | 35  | 50          | 1      |
| 10     | KECE-655                    | Seminar                                                              | PCC          |                         |   |   |       |    | 50    |     | 50          | 1      |
|        |                             | TOTAL                                                                |              |                         |   |   |       |    |       |     | 800         | 21     |

L- Lecture

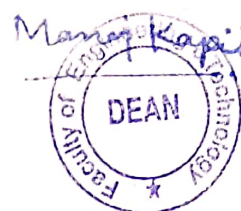
T- Tutorial

P- Practical

CT- Cumulative Test

AT - Attendance

CCA- Continuation Comprehensive Assessment



*Handwritten signature*

**Department of Electronics & Communication Engineering**

1- Subject Code: KECCE-501

Course Title: Antenna &amp; Wave Propagation

2- Contact Hours: L: 3 T: 0 P: 0

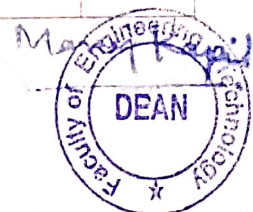
3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

**Objectives:**

1. Understand The basic antenna parameters, radiation Intensity, dipoles, Antenna Design and its Characteristic Properties

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contact Hours |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Antennas Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) $\Omega_A$ , Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.                                                                                                                                                                                                | 05            |
| 2        | Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Nonuniform Amplitude Distributions. General Considerations.                                                                                                                                                                             | 08            |
| 3        | Electric Dipoles, Thin Linear Antennas and Arrays of Dipoles and Apertures: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of $\lambda/2$ Antenna, Array of Two Driven $\lambda/2$ Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long- Wire Antennas, folded Dipole Antennas.                                                                                         | 08            |
| 4        | The Loop Antenna: Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas, Reflector Antennas: Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors | 09            |
| 5        | Ground Wave Propagation: Plane Earth Reflection, Space Wave and Surface Wave, Space Wave Propagation: Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth, Sky wave Propagation: Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics                                          | 10            |



### Course Outcomes:

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

- Understand characteristics and wave propagation on high frequency transmission lines.
- Carryout impedance transformation on TL.
- Use sections of transmission line sections for realizing circuit elements.
- Analyze wave propagation on metallic waveguides in modal form.
- Understand principle of radiation and radiation characteristics of an antenna.

### Text/Reference Books:

1. A. R. Harish, M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press
2. Edward Conrad Jordan and Keith George Balmain, "Electromagnetic Waves and Radiating Systems", PHI
3. R.L. Yadava, Electromagnetic Waves, Khanna Publishing House, Delhi.
4. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill.

F HA  
[Signature]



## Department of Electronics & Communication Engineering

1- Subject Code: KECE-502

Course Title: Computer Architecture

2- Contact Hours: L: 3 T: 0 P: 0

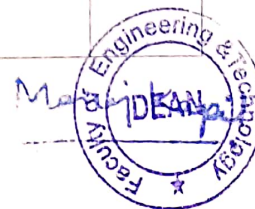
3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

### Objectives:

- Computer Types.
- Fixed and Floating point Representation
- Arithmetic operations
- Register Transfer Language
- Micro programmed Control
- Algorithms
- The Memory System
- Input – Output Organization
- Pipeline and Vector Processing
- Multiprocessors

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                  | Contact Hours |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.                                                                                | 08            |
| 2        | Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers                                                                     | 08            |
| 3        | Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.           | 08            |
| 4        | Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.                                          | 08            |
| 5        | Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces. | 08            |



## Course Outcomes

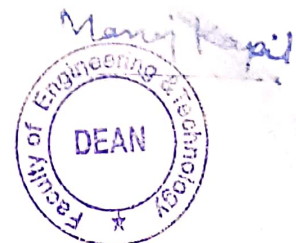
At the end of this course students will demonstrate the ability to

- Study of the basic structure and operation of a digital computer system.
- Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floatingpoint arithmetic operations.
- Implementation of control unit techniques and the concept of Pipelining.
- Understanding the hierarchical memory system, cache memories and virtual memory.
- Understanding the different ways of communicating with I/O devices and standard I/O interfaces.

## Text/Reference Books:

1. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006

*[Handwritten signature]*





## Department of Electronics & Communication Engineering

1- Subject Code: KECE-503

Course Title: Information Theory & Coding

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

### Objectives:

1. To provide an insight into the concept of information in the context of communication theory and its significance in the design of communication receivers.
2. To explore in detail, the calculations of channel capacity to support error-free transmission and also, the most commonly used source coding and channel coding algorithms.
3. To encourage and train to design coding schemes for data compression and error correction, and they will also get an overall perspective of how this impacts the design of an optimum communication receiver.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                        | Contact Hours |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I        | <b>Entropy:</b> Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Fano's Inequality.                                                  | 8             |
| II       | <b>Asymptotic Equipartition Property:</b> Asymptotic Equipartition Property Theorem.<br><b>Consequences of the AEP:</b> Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Optimality of Huffman Codes, Shannon-Fano-Elias Coding. | 8             |
| III      | <b>Channel Capacity:</b> Channel Capacity for Various Binary Channels, Symmetric Channels, Properties of Channel Capacity, Preview of Channel Coding Theorem, Jointly Typical Sequences, Channel Coding Theorem, Channel capacity Theorem.                                                                                                                                                                         | 8             |
| IV       | <b>Block Codes:</b> Introduction to block codes, Single-parity check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes.<br><b>Linear Block codes:</b> Definition of linear Block Codes, Generator matrices, Standard array, Parity-check matrices, Error detection and correction.                                  | 8             |
| V        | <b>Convolution codes:</b> Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi Algorithm, Binary Cycle Codes, BCH codes, RS codes, Golay codes.                                                                                                                                       | 8             |

### Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Explain each block involved in digital communication thoroughly with applications.
2. Apply the knowledge of basic concepts of probability and entropies to analyze the behavior of a communication system.
3. Analyze the use of source coding and evaluating all the techniques of source coding.
4. Examine the significance of channel coding and evaluating all available techniques.



5. Examine various error control coding techniques.

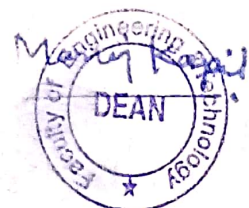
**Text Books:**

1. Bose, Information Theory, Coding and Cryptography, McGraw-Hill Education, 3<sup>rd</sup> Edition, (2016).
2. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-InterScience; 2<sup>nd</sup> edition (July 18, 2006).
3. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001).
4. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990).
5. Todd K Moon, "Error Correction Coding: Mathematical Methods and Algorithms" Wiley, 2005.

**Reference Books:**

1. Simon Haykin, "Digital communication", John Wiley.
2. Ranjan Bose, "ITC and Cryptography", Tata McGraw-Hill.
3. Roberto Togneri, Christopher J.S deSilva, "Fundamentals of Information Theory and Coding Design", CRC Press.

*[Handwritten signature]*



# Department of Electronics & Communication Engineering

1- Subject Code: KECE-521

Course Title: Control Systems

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

Objectives:

- To develop the theoretical aspects of Control systems and feedbacks.
- To present the essential knowledge to understand AC, DC servo meters.
- To analyze steady state analysis of control systems.
- To study the concepts of root locus and adding of zeros and poles

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Contact Hours |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | <b>Control System Concepts:</b> Elements of control systems, concept of open loop and closed loop systems, Examples and application of open loop and closed loop systems, Mathematical Modelling of Physical Systems (Electro Mechanical), Determination of transfer function by block diagram reduction techniques and signal flow method using Mason's gain formula, Basic Characteristics of negative feedback control systems.<br><b>Control System Components:</b> Constructional and working concept of AC & DC servomotor, synchro's, stepper motor and tachometer. | 12            |
| 2        | <b>Time Response Analysis:</b> Standard test signals, time response analysis of first and second order systems, time response specifications of second order system for unit step input, location of roots of characteristics equation and corresponding time response, steady state errors and error constants.<br><b>Basic modes of feedback control:</b> Proportional, Derivative, Integral and PID controllers, controller design using Ziegler Nichols.                                                                                                               | 12            |
| 3        | <b>Stability and Algebraic Criteria:</b> Concept of stability and its necessary conditions, Routh-Hurwitz criteria and its limitations.<br><b>Root Locus Technique:</b> Salient features of root locus plot, Procedure for plotting root locus, root contours.                                                                                                                                                                                                                                                                                                             | 10            |
| 4        | <b>Frequency Response Analysis:</b> Frequency Response analysis from transfer function model. Construction of polar and inverse polar plots.<br><b>Stability in Frequency Domain:</b> Nyquist stability criterion, Determination of gain and phase margin from Bode & Nyquist Plots, Correlation between time and Frequency Responses.                                                                                                                                                                                                                                     | 15            |
| 5        | <b>Introduction to Design:</b> The design problems and preliminary considerations of lead, lag and lead-lag compensation networks, design of closed loop systems using compensation techniques in time and frequency domains.<br><b>State Space Technique:</b> Concept of single input and multiple input and multiple output system. State-space model of physical system, conversion of state-space to transfer function model and vice-versa, State transition matrix, Concept of controllability and observability and their testing.                                  | 10            |

FAM



## Course Outcomes:

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

1. Obtain transfer functions to predict the correct operation of open loop and closed loop control systems and identify the basic elements, structures and the characteristics of feedback control systems.
2. Measure and evaluate the performance of basic control systems in time domain. Design specification for different control action.
3. Analyze the stability of linear time-invariant systems in time domain using Routh-Hurwitz criterion and root locus technique.
4. Determine the stability of linear time-invariant systems in frequency domain using Nyquist criterion and Bode plot.
5. Design different type of compensators to achieve the desired performance of control System by root locus and Bode plot method. Develop and analyze the intermediate states of the system using state space analysis.

## Text Book:

1. I. J. Nagrath & M. Gopal, "Control System Engineering", 6<sup>th</sup> Ed. New Age International Publishers, 4<sup>th</sup> Edition 2018
2. M. Gopal, "Control System Principles and Design", McGraw Hill 4<sup>th</sup> Edition
3. Ogata, "Modern Control Engineering, 5<sup>th</sup> Edition", Pearson Education, 2015
4. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", 10<sup>th</sup> Edition, McGraw Hill
5. D. Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.
6. A.K. Jairath, "Problems and solutions of Control System with Essential Theory", CBS Publishers

## Reference Books:

1. (Schaums Outlines Series) Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems", 3<sup>rd</sup> Edition, McGraw Hill, Special Indian Edition, 2010.
2. Norman S. Mise, Control System Engineering, Wiley Publishing Co.
3. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
4. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
5. Samarjit Ghosh, "Control Systems theory and Applications", Pearson Education.

F. H. B.





## Department of Electronics & Communication Engineering

1- Subject Code: KECE-552

Course Title: Computer Architecture Lab

2- Contact Hours: L: 0 T: 0 P: 2

3- Examination Duration (Hrs.): Theory 03

4- Credits: 1

### Experiments:

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

### Course Outcomes:

After this lesson, students will be able to:

- Knowledge about adder, decoder.
- Knowledge about multiplexer & flip flops.
- Designing of arithmetic logic unit.

*[Handwritten signature]*



# Department of Electronics & Communication Engineering

1- Subject Code: KECE-554

Course Title: Control System Lab

2- Contact Hours: L: 0 T: 0 P: 2

3- Examination Duration (Hrs.): Theory 03

4- Credits: 1

**Note:** The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/ S input characteristics.
7. To determine speed-torque characteristics of an ac servo motor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

## **Software based experiments (Use MATLAB software)**

11. To determine time domain response of a second order system for step input and obtains performance parameters.
12. To draw a Polar plot of an open loop transfer functions and examines the stability of the closed loop system.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' for stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfer functions and examines the stability of the closed loop system.

**Course Outcomes:** At the end of this course students will demonstrate the ability to:

1. Various Control techniques in electrical engineering.
2. Transducers for error detectors.
3. Analysis of synchros device (Transmitter and Receiver)
4. Evaluate the various specification of time domain response of a given system.
5. PID Controllers algorithms analysis.
6. Analysis Stability methods (Polar, Nyquist, Bode plot, Root Locus etc.) using MATLAB



# Department of Electronics & Communication Engineering

1- Subject Code: KECB-554

Course Title: Control System Lab

2- Contact Hours: L: 0 T: 0 P: 2

3- Examination Duration (Hrs.): Theory 03

4- Credits: 1

**Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.**

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P,PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/ S input characteristics.
7. To determine speed-torque characteristics of an ac servo motor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

## **Software based experiments (Use MATLAB software)**

11. To determine time domain response of a second order system for step input and obtains performance parameters.
12. To draw a Polar plot of an open loop transfer functions and examines the stability of the closed loop system.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfer functions and examines the stability of the closed loop system.

**Course Outcomes: At the end of this course students will demonstrate the ability to:**

1. Various Control techniques in electrical engineering.
2. Transducers for error detectors.
3. Analysis of synchros device (Transmitter and Receiver)
4. Evaluate the various specification of time domain response of a given system.
5. PID Controllers algorithms analysis.
6. Analysis Stability methods (Polar, Nyquist, Bode plot, Root Locus etc.) using MATLAB



# Department of Electronics & Communication Engineering

1- Subject Code: KECE-601

Course Title: Digital Signal Processing

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

## Objectives:

- To introduce the concepts and techniques associated with the understanding of digital signal processing. To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems.
- To gain an understanding of the significance of digital signal processing (DSP) in the fields of computing, telecommunications and other areas of Computer Science and Electronic/Electrical Engineering. To gain an appreciation of the technology and the software tools currently available and to study in detail some of the most important design techniques for DSP systems

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                      | Contact Hours |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Realization of Digital Systems: Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of $H(z)$ , example of continued fraction, realization of a ladder structure, example of a ladder realization, FIR Filter Realization: Direct & Cascade, FIR Linear Phase Realization. | 12            |
| 2        | Design of Infinite Impulse Response Digital Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters, Frequency Transformations.                                                                                                                                   | 12            |
| 3        | Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window, Finite Word length effects in digital filters.                                                                                                                                                                                            | 08            |
| 4        | DFT & FFT: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution using Circular Convolution, Decimation in Time (DIT) Algorithm, Decimation in Frequency (DIF) Algorithm.                                                                                                                                                                                                                 | 13            |
| 5        | Multirate Digital Signal Processing: Introduction, Decimation, Interpolation, Sampling rate conversion: Single and Multistage, Subband Coding of Speech signals, Quadrature mirror filters.                                                                                                                                                                                                                      |               |

## Course Outcomes:

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

- Represent signals mathematically in continuous and discrete time and frequency domain
- Get the response of an LSI system to different signals
- Design of different types of digital filters for various applications





### Text/Reference Books:

1. S.K.Mitra, Digital Signal Processing: A computer based approach, TMH
  2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
  3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.
  4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
  5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.
- D.J.DeFatta, J. G. Lucas and W.S.Hodgkiss, Digital Signal Processing, John Wiley & Sons, 1988

F.H.





# Department of Electronics & Communication Engineering

1- Subject Code: KEECE-602

Course Title: Microwave & Radar Engineering

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

## Objectives:

1. To understand the theoretical principles underlying microwave devices and networks.
2. To design microwave components such as power dividers, hybrid junctions, microwave filters, ferrite devices, and single-stage microwave transistor amplifiers.
3. To improve skills in written communication, through a project report.
4. To understand and quantify the effects of noise in microwave systems.
5. To quantify the signal and noise characteristics of microwave systems such as communication networks, radars, and radiometers, and relate this to the design process

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                         | Contact Hours |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I        | <b>Transmission Line:</b> Transmission line equations & solutions, reflection and transmission coefficient, standing wave, standing wave ratio, line impedance and admittance. Introduction to strip lines, Microstrip Transmission line (TL).<br><b>Wave Guide:</b> Rectangular Wave guide -Field Components and Parameters. TE, TM Modes, Dominant Mode, Circular Waveguides: TE, TM modes. Wave Velocities, Wave guide Cavities. | 10            |
| II       | <b>Passive microwave devices:</b> Microwave Junctions and Couplers, Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. S parameter analysis of all components.                                                                                                                        | 8             |
| III      | <b>Microwave tubes :</b> Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.                                                                                                                            | 7             |
| IV       | <b>Microwave Measurements:</b> Measurement of Insertion Loss, Frequency, Cavity Q, Dielectric Constant, Scattering Parameters, Noise Factors, Return Loss, Impedance; VSWR Metering and Measurement, High Power Measurement: Power Meters, Microwave Amplifiers.                                                                                                                                                                    | 7             |
| V        | <b>Introduction to RADAR systems:</b> RADAR Block diagram, RADAR Range equation, Probability of detection of false alarm, Integration of RADAR pulses, RADAR cross section of targets, MTI RADAR, CW RADAR.                                                                                                                                                                                                                         | 8             |

**Course Outcomes: At the end of this course students will demonstrate the ability to:**

1. Analyze various parameters and characteristics of the transmission line and waveguide and also use of wave guide component as per applications.
2. Describe, analyze and design simple microwave circuits and devices e.g couplers, Attenuators, Phase Shifter and Isolators. Student will also understand the microwave propagation in ferrites.
3. Analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves.
4. Acquire knowledge about the handling and measurement of microwave equipment.
5. Differentiate different Radars, find applications and use of its supporting systems.



**Text Books:**

1. Liao, S.Y., "Microwave Devices & Circuits", 3<sup>rd</sup> Edition, Prentice Hall of India Publication, 1995.
2. Sushrut Das, "Microwave Engineering", 1<sup>st</sup> Edition, Oxford University Publication, 2015.
3. M.I. Skolnik, "Introduction to Radar Engineering", 3<sup>rd</sup> Edition, Tata McGraw Hill Publication, 2001.

**Reference Books:**

1. A Das and S.K. Das, "Microwave Engineering", 1<sup>st</sup> Edition, Tata McGraw Hill Publication, 2000

FHM

8



## Department of Electronics & Communication Engineering

1- Subject Code: KEC6-603

Course Title: Wireless Communication

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

### Objectives:

1. Mobility: Allowing users to move freely while maintaining connectivity.
2. Convenience: Simplifying the setup and usage of devices by eliminating the need for physical connections.
3. Flexibility: Supporting a wide range of applications and devices, from mobile phones to IoT devices.
4. Scalability: Facilitating the easy addition of new devices and users to a network.
5. Cost-effectiveness: Reducing installation and maintenance costs associated with wired infrastructure.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Contact Hours |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Wireless Communication Fundamentals: Evolution of mobile radio communication fundamentals, General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization: Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modeling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modeling. | 08            |
| 2        | Spread Spectrum and Diversity: Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation.                                                                                                                                                                                                                                                                                              | 08            |
| 3        | Equalization and Multiple Access: Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC- FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.                                                                                                                                                                                                                                                                                                                                                       | 08            |
| 4        | Cellular Networks: GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology: CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 08            |

*[Handwritten signature]*





|   |                                                                                                                                                                                                                                                                |    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5 | Other Wireless Networks: Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G & 5G and concept of NGN. | 08 |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

**Course Outcomes: At the end of this course students will demonstrate the ability to:**

1. Express the basic knowledge of mobile radio & cellular communication fundamentals and their application to propagation mechanisms, path loss models and multi-path phenomenon.
2. Analyze the performance of various voice coding and diversity techniques.
3. Apply the knowledge of wireless transmission basics to understand the concepts of equalization and multiple access techniques.
4. Examine the performance of cellular systems being employed such as GSM, CDMA and LTE using various theoretical and mathematical aspects.
5. Express basic knowledge of Mobile Adhoc networks and the existing & upcoming data communication networks in wireless and mobile communication domain.

**Text Books:**

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson Publications, Second Edition.
2. Upena Dalal, "Wireless Communication and Networks", Oxford Press Publications, first edition.
3. T L Singal, "Wireless Communications", McGraw Hill Publications, 2010.

**Reference Books:**

1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.
2. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

*[Handwritten signature]*



# Department of Electronics & Communication Engineering

1- Subject Code: KECE-651

Course Title: Digital Signal Processing Lab

2- Contact Hours: L: 0 T: 0 P: 2

3- Examination Duration (Hrs.): Theory 03

4- Credits: 1

## **Course Objectives:**

- To implement Linear and Circular Convolution.
- To implement FIR and IIR filters.
- To study the architecture of DSP processor.
- To demonstrate Finite word length effect.

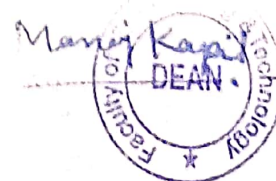
## **List of Experiments**

1. To study about DSP Processors and architecture of TMS320C6713 DSP processor.
2. Introduction to MATLAB and Code Composer Studio or its equivalent open source software.  
Introduction to Scilab Open Source Software (Using Spoken Tutorial MOOCs)
3. Write a Program for the generation of basic signals such as unit impulse, unit step, ramp, exponential, sinusoidal and cosine.
4. To study matrix multiplication using code composer studio.
5. Evaluate 4 point DFT of and IDFT of  $x(n) = 1, 0 \leq n \leq 3; 0$  elsewhere.
6. To implement FFT algorithm.
7. Verify Blackman and Hamming windowing techniques.
8. Implement IIR Butterworth analog Low Pass for a 4 KHz cut off frequency.
9. Verify Circular Convolution using code composer studio.
10. Verify Linear convolution of two sequence using code composer studio.
11. To implement Tone Generation.
12. To implement floating point arithmetic.

## **Course Outcomes:**

At the end of the course, the student should be able to:

- Carry out simulation of DSP systems.
- Demonstrate their abilities towards DSP processor based implementation of DSP systems.
- Analyze Finite word length effect on DSP systems.
- Demonstrate the applications of FFT to DSP.
- Implement adaptive filters for various applications of DSP.



# Department of Electronics & Communication Engineering

1- Subject Code: ECE-656

Course Title: Electronics Measurement Lab

2- Contact Hours: L: 0 T: 0 P: 2

3- Examination Duration (Hrs.): Theory 03

4- Credits: 1

## **Course Objectives:**

The educational objectives of this course are

1. The objective of the course is to introduce the fundamentals of Electronics Instruments and Measurement providing an in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers.
2. To address the underlying concepts and methods behind Electronics measurements.

## **List of Experiments**

1. Characteristics of resistance transducer (i) Potentiometer (ii) Strain Gauge
2. Characteristics of LVDT.
3. Characteristics of capacitive transducer (i) Variable area (ii) Variable distance.
4. Characteristics of Thermistors
5. Characteristics of RTD.
6. Characteristics of Thermocouples
7. Characteristics of LDR, PhotoDiode, and Phototransistor: (i) Variable Illumination. (ii) Linear Displacement.
8. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
9. Measurement of Capacitance by De'Sautys and Schering Bridge.
10. Measure of low resistance by Kelvin's double bridge.
11. Characteristics of diaphragm m type pressure transducer.
12. Characteristics of one Solid State sensor/Fiber optic sensor.

## **Course Outcomes:**

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

1. Design and validate DC and AC bridges.
2. Analyze the dynamic response and the calibration of few instruments.
3. Learn about various measurement devices, their characteristics, their operation and their limitations.
4. Understand statistical data analysis.
5. Understand computerized data acquisition.

*FRD*

*[Signature]*



STUDY & EVALUATION SCHEME

## B. TECH. ELECTRONICS &amp; COMMUNICATION ENGINEERING

YEAR 4<sup>TH</sup>, SEMESTER-VII

| S. NO.          | COURSE CODE  | COURSE TITLE                   | COURSE TYPE | TEACHING LOAD PER WEEK |   |    | MARKS |    |     | TOTAL MARKS | CREDIT |       |
|-----------------|--------------|--------------------------------|-------------|------------------------|---|----|-------|----|-----|-------------|--------|-------|
|                 |              |                                |             |                        |   |    | CCA   |    | ESE |             |        |       |
|                 |              |                                |             | L                      | T | P  | CT    | AT |     |             |        | TOTAL |
| THEORY SUBJECTS |              |                                |             |                        |   |    |       |    |     |             |        |       |
| 1               | KECE-711-713 | Artificial Intelligence in ECE | PEC-3       | 3                      | 0 | 0  | 20    | 10 | 30  | 70          | 100    | 3     |
| 2               | KECE-721-722 | Fiber Optic Communications     | PEC-4       | 3                      | 0 | 0  | 20    | 10 | 30  | 70          | 100    | 3     |
| 3               | KOE-7**      | Design Thinking                | OEC-3       | 3                      | 0 | 0  | 20    | 10 | 30  | 70          | 100    | 3     |
| PRACTICALS      |              |                                |             |                        |   |    |       |    |     |             |        |       |
| 5               | UECE-751     | Project Stage-I                | PCC-24      | 0                      | 0 | 10 | --    | -- | 100 | 150         | 250    | 5     |
| 6               | KCC-751      | Internship Assessment          |             | 0                      | 0 | 0  | 0     | 0  | 0   | 100         | 100    | 2     |
|                 |              | TOTAL                          |             |                        |   |    |       |    |     |             | 650    | 20    |

L- Lecture

T- Tutorial

P- Practical

CT- Cumulative Test

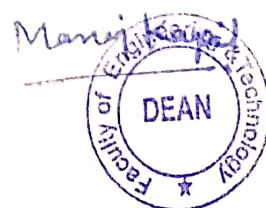
AT - Attendance

CCA- Continuation Comprehensive Assessment

ESE- End Semester Examination

*F. RA*

*[Signature]*





STUDY & EVALUATION SCHEME**B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING**YEAR 4<sup>TH</sup>, SEMESTER-VIII

| S. NO. | COURSE CODE  | COURSE TITLE                      | COURSE TYPE | TEACHING LOAD PER WEEK |   | MARKS |    |    |       |     |     | TOTAL MARKS | CREDIT |
|--------|--------------|-----------------------------------|-------------|------------------------|---|-------|----|----|-------|-----|-----|-------------|--------|
|        |              |                                   |             |                        |   | CCA   |    |    |       | ESE |     |             |        |
|        |              |                                   |             | L                      | T | P     | CT | AT | TOTAL |     |     |             |        |
|        |              | THEORY SUBJECTS                   |             |                        |   |       |    |    |       |     |     |             |        |
| 1      | KECE-811-813 | Mobile Communication and Networks | PEC-6       | 3                      | 0 | 0     | 20 | 10 | 30    | 70  | 100 | 3           |        |
| 2      | KECE-821-823 | Antennas and Propagation          | PEC-7       | 3                      | 0 | 0     | 20 | 10 | 30    | 70  | 100 | 3           |        |
| 3      | KOE-E007-008 | Open Elective-III                 | OEC-4       | 3                      | 0 | 0     | 20 | 10 | 30    | 70  | 100 | 3           |        |
| 4      | KOE-009-010  | Open Elective-IV                  | OEC-5       | 3                      | 0 | 0     | 20 | 10 | 30    | 70  | 100 | 3           |        |
|        |              | PRACTICALS                        |             |                        |   |       |    |    |       |     |     |             |        |
| 5      | KECE-851     | Project Stage-II                  | PCC-25      | 0                      | 0 | 18    |    |    | 150   | 300 | 450 | 9           |        |
|        |              | TOTAL                             |             |                        |   |       |    |    |       |     | 850 | 21          |        |

L- Lecture

T- Tutorial

P- Practical

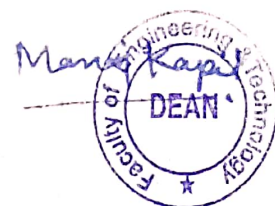
CT- Cumulative Test

AT - Attendance

CCA- Continuation Comprehensive Assessment

ESE- End Semester Examination

f m

## Department of Electronics & Communication Engineering

1- Subject Code: KECE-711

Course Title: Microwave Theory and Techniques

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

### Objectives:

Understand Microwave devices, components, their characteristics, their working, and their applications.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Contact Hours |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC. Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission. Analysis of RF and Microwave Transmission Lines- Coaxial line, Rectangular waveguide, Circular waveguide, Strip line, Micro strip line. Microwave Network Analysis- Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters. | 13            |
| 2        | Passive and Active Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator. Microwave active components: Diodes, Transistors, Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes. Microwave Tubes: Klystron, TWT, Magnetron.                                                                                                                                                                                                                                                                            | 12            |
| 3        | Microwave Design Principles- Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.                                                                                                                                                                                                                                  | 10            |
| 4        | Microwave Measurements- Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.                                                                                                                                                                                                                                                                                                    | 10            |
| 5        | Microwave Systems- Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.                                                                                                                                                                                                                                              | 12            |

### Course Outcomes:

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

*[Handwritten signatures]*



Understand various microwave system components their properties.

Appreciate that during analysis/ synthesis of microwave systems, the different mathematical treatment is required compared to general circuit analysis.

Design microwave systems for different practical application.

**Text /Reference Books:**

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house

**Department of Electronics & Communication Engineering**

1- Subject Code: KECE-721

Course Title: Fiber Optic Communications

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

**Objectives:**

To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

| Unit No. | Particulars                                                                                                                                                                                                | Contact Hours |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.                                                                 | 10            |
| 2        | Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR | 12            |
| 3        | Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical Receivers. Optical link design - BER calculation, quantum limit, power penalties.             | 10            |
| 4        | Optical switches - coupled mode analysis of directional couplers, electro-optic switches. Optical amplifiers - EDFA, Raman amplifier. WDM and DWDM systems. Principles of WDM networks.                    | 10            |
| 5        | Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and soliton based communication.                                                                       | 12            |

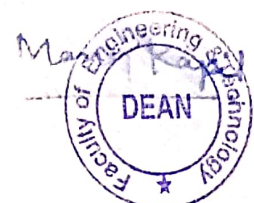
**Course Outcomes:**

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

- Understand the principles fiber-optic communication, the components and the bandwidth advantages.
- Understand the properties of the optical fibers and optical components.
- Understand operation of lasers, LEDs, and detectors .
- Analyze system performance of optical communication systems.
- Design optical networks and understand non-linear effects in optical fibers.

**Text/Reference Books:**

*[Handwritten signature]*





- J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
- T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
- J. Gowar, Optical communication systems, Prentice Hall India, 1987.
- S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
- G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
- G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
- F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).

## Department of Electronics & Communication Engineering

1- Subject Code: KECE-731

Course Title: Satellite Communications

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

Objectives:

1) Preparation for Profession: To inculcate professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach in the students.

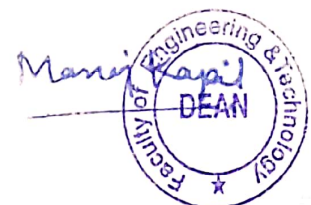
2) Develop an ability to relate engineering issues to broader social context and equip them with strong knowledge, competence and soft skills that allows them to contribute to the needs of industry, consultancy, government and academia.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                               | Contact Hours |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day. | 10            |
| 2        | Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.                                                                                                                                                                                             | 12            |
| 3        | Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift, satellite link budget.                                                                                                                                                                                           | 10            |
| 4        | Flux density and Received signal power equations, Calculation of System noise temperature for satellite Receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.                                                                                                                                                                                                                | 10            |
| 5        | Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.                                                                                                                                                                                                                            | 12            |

Course Outcomes:

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

*[Handwritten signature]*





1. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
2. State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.
3. Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.

**Text /Reference Books:**

4. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India, 2nd edition 2002
5. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009
6. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

**Department of Electronics & Communication Engineering**

1- Subject Code: KECE-005 Course Title: Entrepreneurship Development

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

**Objectives:**

1. To identify and train potential entrepreneurs.
2. To motivate the entrepreneurial instinct.
3. To develop necessary knowledge and skills among the participants.
4. To help in analysing the various options to select the most appropriate product suiting to the entrepreneur and the market.
5. To give a clear picture about the process and procedures involved in setting up an small scale Industrial unit or a bigger unit.
6. To develop and strengthen entrepreneurial quality and motivation.
7. To impart basic managerial skills and understandings to run the project efficiently and effectively.
8. To analyse the environmental issues to be addressed relating to the proposed project.
9. To develop various business related skills of marketing, quality management production, distribution and human resource management etc.
10. To make the potential entrepreneurs know about the possible risks and failures of the project and make them learn how to overcome these problems.
11. To enable the entrepreneurs to communicate clearly and effectively.
12. To develop team building, technology up-gradation, growth and above all broad vision about the business.
13. To develop a passion for integrity, honesty and industrial discipline.
14. To make him learn the basics of Industrial Laws, Factories Act and workers rights and expectations so that he can easily overcome the legal problems.
15. To formulate the detailed Project Report

*Handwritten signature and initials*



| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                           | Contact Hours |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | <b>Entrepreneurship-</b> definition. Growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry. | 10            |
| 2        | <b>Project identification-</b> assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.                                                                                       | 12            |
| 3        | <b>Accountancy-</b> Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.                                                                | 10            |
| 4        | <b>Project Planning and control:</b> The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.                                        | 10            |
| 5        | Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. 5 Role of various national and state agencies which render assistance to small scale industries.                                                                                                                                                                                         | 12            |

#### Course Outcomes:

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

1. Explain the major concepts in the functional areas of Engineering and relevant fields.  
Evaluate the legal, social, and economic environments of business.  
  
Describe the global environment of business.  
  
Describe and explain the ethical obligations and responsibilities of business.  
  
Apply decision-support tools to business decision making.  
  
Construct and present effective oral and written forms of professional communication.  
  
Apply knowledge of business concepts and functions in an integrated manner.  
  
Use specialized knowledge to solve business processes.  
  
Manage people, processes, and resources within a diverse organization.  
  
Apply knowledge of key leadership concepts in an integrated manner.  
  
Construct and present a written business plan for a prospective start-up or entrepreneurial expansion.

#### Text /Reference Books:

- Forbat, John, "Entrepreneurship" New Age International.
- Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International.
- Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

*[Handwritten signatures]*



## Department of Electronics & Communication Engineering

1- Subject Code: KECE-751

Course Title: Project stage I

2- Contact Hours: L: 0 T: 0 P: 10

3- Examination Duration (Hrs.): Theory 03

4- Credits: 5

**Objectives:** : The object of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.

### **Course Outcomes:**

- At the end of the course, students will demonstrate the ability to:

Identify and describe the problem and scope of project clearly.

Collect, analyze and present data into meaningful information using relevant tools, select, plan and execute a proper methodology in problem solving.

Work independently and ethically, present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

## Department of Electronics & Communication Engineering

1- Subject Code: KECE-722

Course Title: Understanding Harmony

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

### **Objectives:**

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

| Unit | Particulars                                                                          | Contact |
|------|--------------------------------------------------------------------------------------|---------|
|      |   |         |
|      |  |         |





| No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Hours |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1   | <b>Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</b> <ol style="list-style-type: none"> <li>1. Understanding the need, basic guidelines, content and process for Value Education</li> <li>2. Self Exploration -what is it? - its content and process; 'Natural Acceptance' and 'Experiential Validation'- as the mechanism for self exploration</li> <li>3. Continuous Happiness and Prosperity- A look at basic Human Aspirations</li> <li>4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority</li> <li>5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario</li> <li>6. Method to fulfil the above human aspirations: understanding and living in <b>harmony</b> at various levels</li> </ol>                                                                                                                                                                                                                             | 10    |
| 2   | <b>Understanding Harmony in the Human Being - Harmony in Myself!</b> <ol style="list-style-type: none"> <li>1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'</li> <li>2. Understanding the needs of Self ('I') and 'Body' - <i>Sukh</i> and <i>Suvidha</i></li> <li>3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)</li> <li>4. Understanding the characteristics and activities of 'I' and harmony in 'I'</li> <li>5. Understanding the harmony of I with the Body: <i>Sanyam</i> and <i>Swasthya</i>; correct appraisal of Physical needs, meaning of Prosperity in detail</li> <li>6. Programs to ensure <i>Sanyam</i> and <i>Swasthya</i></li> </ol>                                                                                                                                                                                                                                                                                                                                                                                        | 12    |
| 3   | <b>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</b> <ol style="list-style-type: none"> <li>1. <i>Understanding Harmony in the family – the basic unit of human interaction</i></li> <li>2. Understanding values in human-human relationship; meaning of <i>Nyaya</i> and program for its fulfillment to ensure <i>Ubhay-tripti</i>; Trust (<i>Vishwas</i>) and Respect (<i>Samman</i>) as the foundational values of relationship.</li> <li>3. Understanding the meaning of <i>Vishwas</i>; Difference between intention and competence.</li> <li>4. Understanding the meaning of <i>Samman</i>, Difference between respect and differentiation; the other salient values in relationship.</li> <li>5. Understanding the harmony in the society (society being an extension of family): <i>Samadhan</i>, <i>Samridhi</i>, <i>Abhay</i>, <i>Sah-astitva</i> as comprehensive Human Goals.</li> <li>6. Visualizing a universal harmonious order in society- Undivided Society (<i>AkhandSamaj</i>), Universal Order (<i>SarvabhaumVyawastha</i> )- from family to world family!</li> </ol> | 10    |
| 4   | <b>Understanding Harmony in the Nature and Existence - Whole existence as Co-existence</b> <ol style="list-style-type: none"> <li>1. Understanding the harmony in the Nature</li> <li>2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature</li> <li>3. Understanding Existence as Co-existence (<i>Sah-astitva</i>) of mutually interacting units in all-pervasive space. Holistic perception of harmony</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10    |

Handwritten signature and initials.



Handwritten signature: Kapil



|  |                         |  |
|--|-------------------------|--|
|  | all levels of existence |  |
|--|-------------------------|--|

#### Course Outcomes:

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.

### Department of Electronics & Communication Engineering

1- Subject Code: KECE-811

Course Title: Mobile Communication and Networks

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

#### Objectives:

- By the end of the course, the student will be able to analyze and design wireless and mobile cellular systems.
- By the end of the course, the student will have the ability to work in advanced research wireless and mobile cellular programs

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contact Hours |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards. Signal propagation-Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate. | 10            |
| 2        | Capacity of flat and frequency selective channels. Antennas- Antennas for mobile terminal-monopole antennas, PIFA, base station antennas and arrays.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12            |
| 3        | Multiple access schemes-FDMA, TDMA, CDMA and SDMA. Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10            |
| 4        | Receiver structure- Diversity Receivers- selection and MRC Receivers, RAKE Receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity- Alamouti scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10            |
| 5        | MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. Performance measures- Outage, average snr, average symbol/bit error rate. System examples- GSM, EDGE, GPRS, IS-95.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12            |



**Course Outcomes:**

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

1. Understand the working principles of the mobile communication systems.
2. Understand the relation between the user features and underlying technology.
3. Analyze mobile communication systems for improved performance

**Text /Reference Books:**

4. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
5. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
6. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
7. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
8. VK Garg & JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall, 1996.

**Department of Electronics & Communication Engineering**

1- Subject Code: KECE-821

Course Title: Antennas and Propagation

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

4- Credits: 3

**Objectives:**

- It covers all the fundamental antenna concepts.
- It deals with field equations and power and phase patterns of the point sources and array antennas.
- It gives concise description of different types of antennas.
- It explains the different types of propagation.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Contact Hours |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Fundamental Concepts- Physical concept of radiation, Radiation pattern, near-and far-field regions, Reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions. Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop. | 10            |
| 2        | Aperture and Reflector Antennas- Huygens' principle, radiation from Rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas. Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.                                                                        | 12            |
| 3        | Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of Rectangular and circular patch antennas.                                                                                                                                                                                                                                                                                                 | 10            |
| 4        | Antenna Arrays- Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.                                                                                                                                                                                                                                  | 10            |
| 5        | Basic Concepts of Smart Antennas- Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming. Different modes of Radiation.                                                                                                                                                                                                                                                                                              |               |




|  |                                            |  |
|--|--------------------------------------------|--|
|  | Wave propagation used in current practice. |  |
|--|--------------------------------------------|--|

### Course Outcomes:

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

- Understand the properties and various types of antennas.
- Analyze the properties of different types of antennas and their design.
- Operate antenna design software tools and come up with the design of the antenna of required specifications.

### Text /Reference Books:

- J.D. Kraus, Antennas, McGraw Hill, 1988.
- C.A. Balanis, Antenna Theory - Analysis and Design, John Wiley, 1982.

## Department of Electronics & Communication Engineering

1- Subject Code: KECE-007

Course Title: VLSI circuits

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

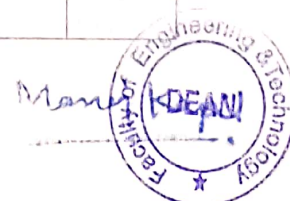
4- Credits: 3

### Objectives:

To understand the basic concepts of VLSI.

| Unit No. | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Contact Hours |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1        | Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances. | 10            |
| 2        | MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.                                                                                                                                                                                                     | 12            |
| 3        | Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviour bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.                                                                                                                        | 10            |
| 4        | Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.                                                                                                                                                                                                                    | 10            |

*(Handwritten signature)*





|   |                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5 | Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits, Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques. | 12 |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

### Course Outcomes:

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

- To use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
- To create models of moderately sized CMOS circuits that realizes specified digital functions.
- To apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
- To have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.
- To complete a significant VLSI design project having a set of objective criteria and design constraints.
- To demonstrate the fundamentals of IC technology such as various MOS fabrication technologies
- To calculate electrical properties of MOS circuits such as  $I_{ds}$  -  $V_{ds}$  relationship,  $g_m$ , figure of merit, sheet resistance, area capacitance.
- To design various gates, adders, Multipliers, Memories, using stick diagrams, layouts.
- To demonstrate semiconductor IC design such as PLA's, PAL, FPGA, CPLD's design.

### Text /Reference Books:

- Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.
- D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994. W. Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

## Department of Electronics & Communication Engineering

1- Subject Code: KECE-009 Course Title: Digital System Design Using VHDL

2- Contact Hours: L: 3 T: 0 P: 0

3- Examination Duration (Hrs.): Theory 03

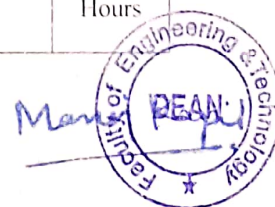
4- Credits: 3

### Objectives:

1. Concept of synthesis.
2. Basics of Verilog HDL language, including its use in synthesis of digital design.
3. Verilog HDL coding style for synthesis.
4. Design of digital systems with Verilog HDL.
5. Modeling test bench Simulation and verification of designs with Verilog HDL.
6. Industrial-standard design software for coding, synthesis and simulation.
7. Hardware implementation of digital systems on FPGA devices.

| Unit No. | Particulars | Contact Hours |
|----------|-------------|---------------|
|----------|-------------|---------------|

*[Handwritten signature]*





|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1 | Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.                                                                                                                                                                                                                                   | 9 |
| 2 | Digital System Design Automation- Abstraction Levels, System level design flow, RTL design flow, VHDL RTL Design with VHDL - Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues,<br><br>VHDL Essential Terminologies<br><br>VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration. | 7 |
| 3 | Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements.<br><br>VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predelineated Attributes.     | 7 |
| 4 | VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.                                                                                                                                                                                                                                                                                                                                      | 8 |
| 5 | Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.                                                                                                                                                                                                                                                          | 9 |

#### LEARNING OUTCOMES:

1. An ability to describe, design, simulates, and synthesizes computer hardware using the Verilog hardware description language.
2. An ability to synthesize logic and state machines using an Automatic Logic Synthesis program.
3. An ability to design finite state machines.

#### TEXT BOOKS:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Springer Publication, 2010.

#### REFERENCE BOOKS:

1. C. H. Roth, "Digital System Design using VHDL", PWS Publishing.
2. Douglas Perry, "VHDL- Programming by examples", MGH.

### Department of Electronics & Communication Engineering

1- Subject Code: KECE-851

Course Title: Project stage II

2- Contact Hours, L: 0 T: 0 P: 18



**Objectives:** The object of Project Work II is to enable the student to take up investigative study in the field of Electronics & Communication Engineering, either fully theoretical/practical or involving theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.

**Course Outcomes:**

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

- Identify and describe the problem and scope of project clearly.
- Collect, analyze and present data into meaningful information using relevant tools, select, plan and execute a proper methodology in problem solving.
- Work independently and ethically, present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

F. H. H.



