MITS Kochi
Muthoot Institute of Technology and Science (Autonomous)

B. TECH

ELECTRICAL & ELECTRONICS ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER 3

2025 REGULATION

MITS Kochi
Muthoot Institute of Technology and Science (Autonomous)

B. TECH

ELECTRICAL & ELECTRONICS ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER 3

2025 REGULATION

SEMESTER 3

CURRICULUM

SLOT	COURSE CATEGORY	COURSE CODE	COURSE NAME	L	T	J	P	S	C
A	BST	B250802/MA300A	Mathematics for Electrical Science - 3	3	1	0	0	2	3
B	PCE	B250003/EE310B	Measurements and Instrumentation	3	1	0	3	5	6
C	PCE	B250003/EE310C	Analog Electronics	3	1	0	3	5	6
D	PCB	B250003/EE320D	Digital Electronics	2	1	1	0	4	4
E	EST	B250902/CN300E	Introduction to Artificial Intelligence and Data Science	3	0	0	0	5	4
F	HMT	B250908/CN900F	Management for Engineers	3	0	0	0	1	2
M	M		Minor	3	1	0	0	4	4

(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work, C- Credit)

COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-1-0-0-2**	**VERSION**	**25/0**	**CREDITS**	**3**
(L-Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Teamwork)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250802/ MA300A	Mathematics for Electrical Science -3	Basic Science - Theory
PRE-REQUISITE		
• Sound knowledge in calculus of single variable and multi-variable functions • Basic knowledge in complex numbers		

TEACHING AND ASSESSMENT SCHEME												
Teaching Scheme / Week					**Hours / Semester**	**Credit**	**Examination Scheme**					
							Theory			**Practical**			**Total**
L	**T**	**J**	**P**	**S**	**90**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
3	1	0	0	2		3	40	60	100	-	-	-	100
***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*												

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Partial Differential Equations	Introduction to partial differential equations, formation of partial differential equations, Method of separation of variables, Vibrations of a stretched string - wave Equation, Solutions of one-dimensional wave equation using method of separation of variables and problems, One dimensional Heat equation, Solutions of One-Dimensional Heat equation - A long insulated rod with ends at zero temperatures.	12
2	Fourier Transforms	Fourier Integral theorem, Fourier Cosine and Sine integrals, Fourier Transform and its inverse, Properties of Fourier Transforms, Convolution theorem for Fourier Transforms, Parseval's identity for Fourier Transforms.	10
3	Complex Differentiation	Complex Function, Limit, Continuity, Derivative, Analytic functions, Cauchy-Riemann Equations (without proof), Laplace's Equations, Harmonic functions, Finding harmonic conjugate, Introduction to convergence and divergence of sequences and series, Taylor series and Maclaurin series, Laurent's theorem (statement only), Singularities and Zeros – Isolated Singularity, Poles, Essential Singularities, Removable singularities, Zeros of Analytic functions – Poles and Zeros.	11
4	Complex Integration	Line integrals in the complex plane (Definition & Basic properties), First evaluation method, second evaluation method, Cauchy's integral theorem on simply connected domain and multiply connected domain (without proof), Independence of path, Cauchy's Integral formula (without proof), Formulas for Residues, Residue theorem (without proof).	12

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	B S Grewal	Khanna Publishers,44th edition,2017
2	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons,10th edition, 2016

Reference			
Sl. No.	Title of Book	Author	Publication
1	Advanced Engineering Mathematics	H.C Taneja	I.K. International publishing House Pvt. Ltd, 2014.
2	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education, 39th Edition, 2023
3	Engineering Mathematics	Babu Ram	Dorling Kindersley (India) Pvt. Ltd, 2010
4	Complex Analysis	Dennis G. Zill & Patrick D. Shanahan, Jones & Bartlett,	3rd Edition, 2015
5	Fast Fourier Transform - Algorithms and Applications	K.R. Rao, Do Nyeon Kim, & Jae Jeong Hwang	Springer, 1st Edition, 2011

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-1-0-3-5**	**VERSION**	**25/0**	**CREDITS**	**6**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250003 / EE310B	Measurements and Instrumentation	Program Core - Lab Embedded Theory
PRE-REQUISITE		
B250906/CN100D: Introduction to Electrical and Electronics Engineering		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					**Hours / Semester**	**Credit**	**Examination Scheme**						
							Theory			**Practical**			**Total**
L	**T**	**J**	**P**	**S**	**180**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
3	1	0	3	5		6	25	40	65	15	20	35	100
***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Basics of Measurements & Analog Instruments	Functional elements, Static characteristics, Errors, Moving Coil & Moving Iron instruments, Range extension.	10
2	Measurement of Circuit Parameters & Magnetic Measurements	Flux meters, BH Curve, Resistance Measurement (Wheatstone/Kelvin), AC Bridges (Maxwell, Schering, Wien), Earth Resistance.	12
3	Power, Energy & Digital Metering	Dynamometer Wattmeter, 2-Wattmeter method, Induction Energy meter, Instrument Transformers (CT/PT), Introduction to Digital/Smart meters.	11
4	Transducers & Modern Instrumentation	Sensors (Temperature, Flow, Strain), DAS, CRO, DSO, Virtual Instrumentation, IoT in measurements.	12

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	A course in Electrical and Electronic Measurements & instrumentation	Sawhney A.K.	Dhanpat Rai. & Co
2	A course in Electrical & Electronic Measurement & Instrumentation.	J. B. Gupta	S K Kataria & Sons
3	Electronic Instrumentation	Kalsi H. S.	Tata McGraw Hill, New Delhi
4	Doebelin's Measurements Systems	E.O Doebelin and D.N Manik	McGraw Hill Education (India) Pvt. Ltd.
5	Electronic Instrumentation and Measurements	David A Bell	Oxford

Reference			
Sl. No.	Title of Book	Author	Publication
1	Electrical Measurements & Measuring Instruments	Golding E.W.	Wheeler Pub.
2	Modern Electronics Instrumentation	Cooper W.D.	Prentice Hall of India
3	Electronic Measurements & Instrumentation	Oliver & Cage	McGraw Hill
4	Principles of electrical measurement	S Tumanski	Taylor & Francis

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-1-0-3-5**	**VERSION**	**25/0**	**CREDITS**	**6**
(L-Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Teamwork)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250003/EE310C	Analog Electronics	Program Core - Lab Embedded Theory
PRE-REQUISITE		
B250906/CN100D: Introduction to Electrical and Electronics Engineering B250003/EE200E: Circuits and Networks		

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	**T**	**J**	**P**	**S**	**180**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
3	1	0	3	5		6	25	40	65	15	20	35	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	BJT Biasing circuits and modelling	**Bipolar Junction Transistors**: BJT configuration—CE characteristics—Operating point of a BJT – Factors affecting stability of Q point **Biasing circuits**: fixed bias, collector-to-base bias, voltage divider bias—Role of emitter resistance in bias stabilisation. Stability factor (Derivation of stability factors for Voltage Divider Biasing only). Numerical Problems **Modelling of BJT** - h-parameter model of BJT in CE configuration, AC equivalent circuit of CE amplifier, calculation of amplifier gains and impedances using h-parameter equivalent circuit. Numerical problems. **Field Effect Transistors**: Construction, working and characteristics of JFET and MOSFET (enhancement mode only) - JFET common drain amplifier - Design using voltage divider biasing.	13
2	Frequency response of Amplifiers, Multistage amplifiers, Power amplifiers and oscillator circuits	**Amplifier Frequency Response**: Low and high frequency response of CE amplifier. Role of coupling capacitors and emitter bypass capacitor - Internal capacitances at high-frequency operations of BJT, Miller capacitance. Gain bandwidth product. **Power amplifiers using BJT**: Class A and Class B - Conversion efficiency – derivation, Introduction to Class AB, Class C, and Class D. Distortion in power amplifiers. **Multi-stage Amplifier**: RC Coupled amplifiers – Transformer-coupled amplifiers, Darlington Pair **Feedback and Oscillator circuits** – Feedback in Amplifiers - Effect of positive and negative feedback (Voltage Series and current shunt). Oscillators: Barkhausen's criterion—RC Phase Shift Oscillator (Expression of frequency oscillation) – Wien Bridge Oscillator (Lab Only)	12
3	Basics of OPAMP circuits	**Operational Amplifiers** (Op-Amps) – Fundamental differential amplifier—Modes of operation. Properties of ideal and practical op-amps: gain, CMRR, and slew rate. Parameters of a typical op-amp IC 741. **Op-Amp Circuits**: Inverting Amplifiers - Non-inverting Amplifiers, Voltage Follower Circuit - Instrumentation Amplifiers - Summing and Difference Amplifiers - Numerical Problems Differentiator and Integrator circuits, -practical circuits, Comparators: Zero crossing and voltage level detectors, Schmitt trigger.	11

4	Filter circuits and Waveform generation using op-amp	**Active Filters**—Low pass filter – high pass filter - band pass and notch filters - Butterworth filter **Waveform generation**: Square, triangular, and ramp generator circuits using op-amps—effect of slew rate on waveform generation. **Timer 555 IC**: Internal diagram of 555 IC— Astable and monostable multi-vibrators using 555 IC-Numerical problems.	9

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Electronic Devices and Circuits	Bell D. A.,	Prentice Hall of India
2	Integrated Electronics: Analog and Digital Circuits and Systems,	Millman J. and C. C. Halkias	Tata McGraw-Hill
3	Electronic Devices and Circuit Theory	Boylestad R. L. and L. Nashelsky	Pearson Education India, 2009.
4	Electronic Principles	Malvino A. and D. J. Bates,	Tata McGraw Hill,
5	Op-Amps and Linear Integrated Circuits	Gayakward R. A.	PHI Learning Pvt. Ltd.
Reference			
Sl. No.	Title of Book	Author	Publication
1	Fundamentals of Analog Circuits	Floyd T.L	Pearson Education
2	Introductory Electronic Devices and Circuits	Robert T. Paynter	Pearson Education
3	Linear Integrated Circuits	Choudhury R.	New-Age International Publishers

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**2-1-1-0-4**	**VERSION**	**25/0**	**CREDITS**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250003/EE320D	Digital Electronics	Program Core - Project Based Learning
PRE-REQUISITE		
B250906/CN100D: Introduction to Electrical and Electronics Engineering		

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	120	C	CIA	ESE	Total	CIA	ESE	Total	
2	1	1	0	4		4	60	40	100	-	-	-	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	Number Systems, Boolean laws and theorems	**Number Systems and Codes**: Introduction- Analog vs Digital system, Number Systems and Codes – binary, octal and hexadecimal – conversions – ASCII code, Excess – 3 code, Gray code, BCD code **Signed numbers**:1's complement and 2's complement – addition and subtraction **Basic logic gates**: Basic gates and universal gates, Implementation of basic gates using Verilog **Boolean laws and theorems**: Sum of products and Product of sums forms – canonical and standard forms- De Morgan's law, Simplification of expressions using Boolean laws and theorems, K map representation and simplification (up to four variables) – pairs, quads, octets – don't care conditions, determination of prime implicants, Selection of essential prime implicants. Introduction to circuit simulators (such as LTSPICE), Implementation of basic gates and Boolean expressions.	14
2	Combinational logic design	**Adders and subtractors:** Half adder and full adder, half subtractor and full subtractor – 4-bit parallel binary adder/subtractor. **Encoders:** Parity generators and checkers – encoders, priority encoders – decoders – BCD to seven segment decoders. **Multiplexers:** Implementation of Boolean expressions using multiplexers – demultiplexers. Implementation of half adder and full adder.	12
3	Sequential logic design	Need for sequential circuits, Comparison between combinational and sequential logic, concept of memory. **Flip-Flops**: Concept of latch and flipflops - SR, JK, D and T flip-flops – timing diagram, excitation table and characteristic equation– JK Master Slave Flip-flop Implementation of flipflops using Verilog **Counters:** Up/Down counters – asynchronous counters – mod-n counters. **Synchronous counters:** Design of synchronous counters – Ring counter – Johnson Counter.	14
4	State Machines and Data Converters	State transition diagram – Moore and Mealy machines. **Digital to Analog converter:** Weighted resistor type, R-2R Ladder type – Numerical Problems. **Analog to Digital Converter**: Flash type, successive approximation type, integration type —Numerical Problems	9

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Digital Principles and Applications	Albert Paul Malvino & Donald P. Leach	4/e, 2018, Mc-GRAW Hill International Editions
2	Digital Fundamentals	T. L. Floyd	11th ed. Prentice Hall, 2017.
3	Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog	M. Morris Mano, Michael D. Ciletti	6/e, 2018 Pearson Education
4	Digital Integrated Electronics	Herbert Taub and Donald Schilling	McGraw Hill Education

Reference			
Sl. No.	Title of Book	Author	Publication
1	Digital Electronics: Fundamental Concepts and Applications.	C. E. Strangio	Prentice-Hall, Inc., 1987
2	Fundamentals of Logic Design	C. H. Roth	7th ed. Jaico Publishers, 2013.
3	An Engineering Approach to Digital Design	W. I. Fletcher	Prentice-Hall, Inc., Englewood Cliffs, NJ, 1980.
4	Digital Systems - Principles and Applications	R. J. Tocci, and N. S. Widmer	11th ed. Prentice Hall, 2010.
5	Design of Logic Systems	D. Lewin and D. Protheroe	2nd ed. Chapman & Hall, University and Professional Division, 1992.
6	Digital Principles and Design	D.D. Givone	Tata McGraw-Hill, 2003

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-0-0-0-5**	**VERSION**	**25/0**	**CREDITS**	**4**
(L-Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Teamwork)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250902/CN300E	Introduction to Artificial Intelligence and Data Science	Engineering Science - Theory

PRE-REQUISITE

- Basic knowledge of Engineering Mathematics (linear algebra, matrices, basic probability concepts)
- Fundamentals of Programming (preferably Python or any high-level language)
- Understanding of basic statistics (mean, variance, distributions)

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	**T**	**J**	**P**	**S**	**120**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
3	0	0	0	5		4	60	40	100	-	-	-	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	Foundations of AI, ML, and Data Science	Overview of AI, ML, and Data Science, Data types, Feature representation and feature engineering basics, Data preprocessing, Machine Learning workflow, Evaluation Metrics, Bias Variance Trade-off, Types of ML, Ethics in AI and data privacy.	10
2	Mathematical Foundations for Machine Learning and data science	Vectors and matrices in data representation, Matrix operations, norms, and distance/similarity measures, Orthogonality and Gram–Schmidt process, Eigenvalues and eigenvectors, Spectral decomposition and Singular Value Decomposition, Principal Component Analysis (PCA) and dimensionality reduction.	12
3	Supervised Learning and Neural Networks	Supervised learning framework and evaluation metrics, Regression and Classification concepts, Linear Regression, Logistic Regression, Introduction to Classification and Bayesian Classifiers, Support Vector Machines. Introduction to Neural Networks, Perceptron model and learning rule, Multi-Layer Perceptron (MLP) and backpropagation, Overview of Deep Learning.	13
4	Unsupervised Learning and Data Science Workflow	Unsupervised learning concepts and applications, K-means clustering and cluster evaluation, Exploratory Data Analysis (EDA) and visualization. Statistical measures: mean, variance, distributions, Maximum Likelihood Estimation (MLE), Data Science lifecycle, Tools introduction: Python, NumPy, Pandas, basic visualisation.	10

SUGGESTED LEARNING RESOURCES

Text Book

Sl. No.	Title of Book	Author	Publication
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson, 4/e
2	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer, 1/e
3	Introduction to Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly, 1/e

4	Data Science for Engineers	R. K. Jain, P. K. Singh,	McGraw Hill, 1/e
Reference			
Sl. No.	Title of Book	Author	Publication
1	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly, 3/e
2	Deep Learning	Ian Goodfellow, Yoshua MIT Press, 1/e Bengio, Aaron Courville	MIT Press, 1/e
3	The Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome Friedman	Springer, 2/e
4	Applied Linear Algebra and Matrix Analysis	Thomas S. Shores	Springer, 2/e
5	Python for Data Analysis	Wes McKinney	O'Reilly, 3/e

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-0-0-0-1**	**VERSION**	**25/0**	**CREDITS**	**2**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	**COURSE NAME**	**COURSE CATEGORY**
B250908/CN900F	Management for Engineers	Humanities and Management: Experiential Learning - Theory
PRE-REQUISITE		
NIL		

TEACHING AND ASSESSMENT SCHEME												
Teaching Scheme / Week					**Hours / Semester**	**Credit**	**Examination Scheme**					
							Theory			**Practical**		**Total**
L	**T**	**J**	**P**	**S**	**60**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
3	0	0	0	1		2	60	40	100	-	-	-	100
***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*												

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Foundations of Management and Contemporary Thinking	Evolution and Functions of Management, Planning, Organising, Controlling, Contemporary Strategy	11
2	Human Resource (HR) Management, Leadership and Organisational Behaviour	Human Resource Management, Motivation, Leadership, Organisational Behaviour, Change Management	9
3	Decisions – Making	Quantitative Techniques for Decisions, Network Diagrams – CPM, PERT	9
4	Operations, Strategy and Entrepreneurship	Operations and Quality Management, Project Management and Agile Methods	7

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Essentials of Management	Koontz, H. & Weihrich, H	McGraw Hill, 11th Edition
2	Management	Robbins, S.P. & Coulter, M	Pearson Education, 14th Edition
3	Financial Management: Theory and Practice	Prasanna Chandra	McGraw Hill, 11th Edition

Reference			
Sl. No.	Title of Book	Author	Publication
1	Blue Ocean Strategy	Kim, W.C. & Mauborgne, R.	Harvard Business Review Press, 2004
2	The Lean Start-up	Ries, E.	Crown Business, 2011
3	Change by Design	Brown, T.	Harper Business, 2019

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