File Ref.No.KTU/ASST6(ACADEMIC)/536/2023

APJ Abdul Kalam Technological University
Thiruvananthapuram

Abstract

Academic - Approval of additional MOOCs - M. Tech stream EC-5 (VLSI And Embedded Systems, VLSI Design & Signal Processing, VLSI, VLSI Design, Advanced Electronics & Communication Engineering, Embedded system and VLSI)- 2022 Regulations - Sanctioned - orders issued - reg.

ACADEMIC SECTION

U.O.No. 1693/2025/KTU Thiruvananthapuram, Dated: 15.08.2025

Read:-1. The minutes of Board of Studies in Electronics and Communication Engineering dated 25.03.2025.

2. University Order No. 2146/2024/KTU dated: 02.08.2024.

ORDER

The Board of Studies (Electronics and Communication Engineering), as per reference cited 1, considered the requests submitted by affiliated colleges regarding the approval of new MOOC courses under the M.Tech 2022 Regulations.

The Board of Studies (Electronics and Communication Engineering) noted the following:

1. A request was received from the second-year M.Tech students of College of Engineering Thalassery for the approval of the NPTEL course titled "**The Joy of Computing Using Python**", a **12-week** course offered by **IIT Ropar** for the M.Tech Specialization **EC-5 (VLSI And Embedded Systems, VLSI Design & Signal Processing, VLSI, VLSI Design, Advanced Electronics & Communication Engineering, Embedded system and VLSI).**
2. A proposal was submitted by Sree Chitra Thirunal College of Engineering, recommending a list of 12 MOOC courses for the newly introduced **M.Tech programme in Automotive Electronics.** The Principals of the respective institutions have also endorsed the relevance of these courses to the curriculum. The list of MOOC Courses is attached herewith.

The Board of Studies, after due deliberations, resolved to recommend the aforementioned MOOC courses and include them in the list of MOOCs approved under M.Tech 2022 Regulations.

Vide reference cited 2 above, the Honourable Vice Chancellor may approve all the MOOC Courses recommended by the Board of Studies.

Hence, considering the matter in detail, approval is hereby accorded by the Honourable Vice Chancellor for the above listed MOOC Courses, subject to reporting to the next Academic Council.

Orders are issued accordingly.

Sd/-

Dr. VINU THOMAS *
Dean (Academic)

Copy

to:-

1. The KTU affiliated colleges
2. PS to VC/ PA to R/ CoE
3. Director/ JD/AD (Academic)
4. SO3 (Academic)
5. JD, KSAD
6. E-Governance Section

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

Ref:- 1. U.O.No. 2573/2024/KTU dated 18.09.2024

2. KTU/ASST8(ACADEMIC)/841/2023 dated 22.08.2023

As per Ref (1), the University has approved the curriculum and syllabus for the newly introduced M.Tech. program in Automotive Electronics in collaboration with industry. According to the approved curriculum, students must successfully complete a MOOC before the commencement of their fourth semester.

As per Ref (2), the list of MOOCs that students can choose from requires approval from the concerned Board of Studies (BOS). The proposed list of MOOCs is attached herewith for your consideration. Kindly review and approve the list at the earliest.

Sl. No	Name of the MOOC	Duration of the MOOC	Platform	Offering institution	Syllabus
1	Computer Vision And Image Processing - Fundamentals And Applications	12 Weeks	NPTEL	IIT Guwahati	**Week 1: Introduction to Computer Vision and Basic Concepts of Image Formation**: Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts. **Week 2: Fundamental Concepts of Image Formation**: Radiometry, Geometric Transformations, Geometric Camera Models. **Week 3: Fundamental Concepts of Image Formation**: Camera Calibration, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections. **Week 4: Image Processing Concepts**: Image Transforms. **Week 5: Image Processing Concepts**: Image Transforms, Image Enhancement. **Week 6: Image Processing Concepts**: Image Filtering, Colour Image Processing, Image Segmentation **Week 7: Image Descriptors and Features**: Texture Descriptors, Colour Features, Edges/Boundaries. **Week 8: Image Descriptors and Features**: Object Boundary and Shape Representations. **Week 9: Image Descriptors and Features**: Interest or Corner Point Detectors, Histogram of Oriented Gradients, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency **Week 10: Fundamentals of Machine Learning**: Linear Regression, Basic Concepts of Decision Functions, Elementary Statistical Decision Theory, Parameter Estimation, Clustering for Knowledge Representation, Dimension Reduction, Linear Discriminant Analysis. **Week 11: Applications of Computer Vision**: Artificial Neural Network for Pattern Classification, Convolutional Neural Networks, Autoencoders. **Week 12: Applications of Computer Vision**: Gesture Recognition, Motion Estimation and Object Tracking, Programming Assignments.

2	Deep Learning For Visual Computing	12 Weeks	NPTEL	IIT Kharagpur	**Week 1:** Introduction to Visual Computing and Neural Networks **Week 2:** Multilayer Perceptron to Deep Neural Networks with Autoencoders **Week 3:** Autoencoders for Representation Learning and MLP Initialization **Week 4:** Stacked, Sparse, Denoising Autoencoders and Ladder Training **Week 5:** Cost functions, Learning Rate Dynamics and Optimization **Week 6:** Introduction to Convolutional Neural Networks (CNN) and LeNet **Week 7:** Convolutional Autoencoders and Deep CNN (AlexNet, VGGNet) **Week 8:** Very Deep CNN for Classification (GoogLeNet, ResNet, DenseNet) **Week 9:** Computational Complexity and Transfer Learning of a Network **Week 10:**Object Localization (RCNN) and Semantic Segmentation **Week 11:**Generative Models with Adversarial Learning **Week 12:** Recurrent Neural Networks (RNN) for Video Classification
3	EV - Vehicle Dynamics and Electric Motor Drives	12 Weeks	NPTEL	IIT Delhi	**Week 01** : Introduction to Electric Vehicle **Week 02** : Vehicle Dynamics: Modelling and Simulation **Week 03** : Fundamental of Drives and Power Electronics for DC Drives **Week 04** : Modeling and Control of DC Motor Drives **Week 05** : Basics of Induction Motor and V/f Control **Week 06** : Realization of Power Electronic Converters and PWM for IM drives **Week 07** : Modelling of PMSM Drives **Week 08** : Vector Control of PMSM Drives **Week 09 :** Modeling of general cylindrical-rotor motor in stationary reference frame and concept of different rotating frames of reference; Review of PMSM and modeling of PMSM in RFO frame of reference; Sensored vector control of PMSM drive **Week 10 :** Modeling of induction motor in rotor flux-oriented reference frame: Modeling of induction motor contd; Sensored and sensor-less vector control of IM drive **Week 11 :** Discussion of BH curve for various magnetic materials; Principle of operation of switched reluctance; Various configurations of SRM and computation of step angle; Power converter realization and control of SRM; Basics of BLDC motor drive ; Power converter realization and control of SRM **Week 12 :** Case study of high-end EV; Case study contd ...Case study contd... and conclusion
4	Fundamental of Power Electronics	12 Weeks	NPTEL	IISc Bangalore	**Week 1** : Ideal switch, diode static characteristics, diode dynamic characteristics, reading the diode datasheet, thermal dissipation, heatsink design, diac and triac. **Week 2** : Bipolar junction transistor - operation, static and dynamic characteristics, loss calculation, safe operation area, reading the datasheet, parallel operation, darlington connection. **Week 3** : MOSFETs and IGBTs - operation, static and dynamic characteristics of MOSFET and IGBT, parallel operation, loss calculation and simulation.

					Week 4 : Rectifier - Capacitor filter, circuit operation and waveforms, designing the circuit, setting up for simulation in ngSpice, simulation of circuit. **Week 5** : Inrush current limiting in rectifier-capacitor filter circuits, resistor solution, thermistor solution, transformer solution, MOSFET solution, relay and contactor solution, power factor concepts and measurement of power factor for rectifier capcitor filter circuit. **Week 6** : Linear DC -DC converter or linear regulators, shunt regulator, operation, design and applications, series regulator, operation and design, improvement solutions, datasheet study. **Week 7** : DC-DC switched mode converters : Buck, Boost and buck-boost converters, operation, waveforms, equations and simulation in ngSpice. **Week 8** : Forward converter operation, waveforms, core resetting methods, simulation in ngSpice, Inductor deisgn by area product approach, Flyback converter, operation and waveforms. **Week 9** : Magnetics design, permeance, inductor value and energy storage, inductor design, transformer design area product approach, **Week 10** : Push pull, half bridge and full bridge circuits, operation and waveforms, simulation example **Week 11** : Drive circuits, BJT drive requirements, drive circuit non-isolated, drive circuits isolated, MOSFET drive requirements, drive circuit non-isolated and isolated, series snubber, shunt snubber. **Week 12** : Close loop control, current control, slope compensation for current control, single phase inverter with sinusoidal PWM, simulation example
5	Industrial Automation and Control	12 Weeks	NPTEL	IIT Kharagpur	**Module I**: Introduction; Introduction(Cont.); Architecture of Industrial Automation Systems; Architecture of Industrial Automation Systems(Cont.) **Module II**: Measurement Systems Characteristics; Measurement Systems Characteristics(Cont.); Data Acquisition Systems; Data Acquisition Systems(Cont.) **Module III**: Introduction to Automatic Control; Introduction to Automatic Control(Cont.); P-I-D Control; P-I-D Control(Cont.); PID Control Tuning; PID Control Tuning(Cont.); Feedforward Control Ratio Control; Feedforward Control Ratio Control(Cont.); Time Delay Systems and Inverse Response Systems; Time Delay Systems and Inverse Response Systems(Cont.); pecial Control Structures; Special Control Structures(Cont.); Concluding Lesson on Process Control (Self-study); Introduction to Sequence Control, PLC , RLL; Introduction to Sequence Control, PLC , RLL(Cont.); Sequence Control. Scan Cycle, Simple RLL Programs; Sequence Control. Scan Cycle, Simple RLL Programs(Cont.); Sequence Control. More RLL Elements, RLL Syntax; Sequence Control. More RLL Elements, RLL Syntax(Cont.); A Structured Design Approach to Sequence Control; A Structured Design Approach to Sequence Control(Cont.); PLC Hardware Environment; PLC Hardware Environment(Cont.) **Module IV**: Flow Control Valves; Flow Control Valves(Cont.); Hydraulic Control Systems – I; Hydraulic Control Systems - I(Cont.); Hydraulic Control Systems – II; Hydraulic Control Systems - II(Cont.); Industrial Hydraulic Circuit; Industrial Hydraulic Circuit(Cont.); Pneumatic Control Systems – I; Pneumatic Control Systems - I(Cont.); Pneumatic Systems – II; Pneumatic Systems - II(Cont.)

					Energy Savings with Variable Speed Drives; Energy Savings with Variable Speed Drives(Cont.); Introduction To CNC Machines; Introduction To CNC Machines(Cont.) **Module V**: The Fieldbus Network – I; The Fieldbus Network - I(Cont.); Higher Level Automation Systems; Higher Level Automation Systems(Cont.); Course Review and Conclusion (Self-study)
6	Modern Computer Vision	12 Weeks	NPTEL	IIT Madras	**Week 1:** Course introduction, Introduction to deep learning, Introduction to neuron **Week 2:** Multilayer perceptron (MLP), Gradient descent, Backpropagation in MLP **Week 3:** Optimization and regularization, Regularization and preprocessing, Convolutional neural network (CNN) **Week 4:** CNN properties, CNN architectures, Introduction to recurrent neural network (RNN), Encoder-Decoder models in RNN **Week 5:** Low-level vision, Spatial and frequency domain filtering, Edge detection **Week 6:** Line detection, Feature detectors, Harris corner detector **Week 7:** Blob detection, SIFT, Feature descriptors, SURF **Week 8:** Single-view geometry, 2D Geometric transformations, Camera intrinsics and extrinsics **Week 9:** Two-view stereo, Algebraic representation of epipolar geometry, Fundamental matrix computation **Week 10:** Structure from motion, Batch processing in SFM, Dense 3D reconstruction **Week 11:** Deepnets for stereo and SFM, Mid-level vision, Image segmentation **Week 12:** Deepnets for segmentation, High-level vision, Deepnets for object detection
7	Smart Grid: Basics to Advanced Technologies	12 Weeks	NPTEL	IIT Roorkee	**Week 1:** Introduction to Smart Grid-I. Introduction to Smart Grid-II. Architecture of Smart Grid system. Standards for Smart Grid system. Elements and Technologies of Smart Grid System-I **Week 2:**Elements and Technologies of Smart Grid System-II**;** Distributed Generation Resources-I**;** Distributed Generation Resources-II**;** Distributed Generation Resources-III**;** Distributed Generation Resources-IV **Week 3:** Introduction to energy storage devices**;** Different types of energy storage technologies**;** Analytical modelling of energy storage devices**;** Optimal sizing and siting of storages**;** Battery management system (BMS) **Week 4:** Wide area Monitoring Systems-I**;** Wide area Monitoring Systems-II**;** Phasor Estimation-I**;** Phasor Estimation-II**;** Digital Relays for Smart Grid Protection **Week 5:** Islanding Detection Techniques–I; Islanding Detection Techniques –II; Islanding Detection Techniques –III; Smart Grid Protection-I; Smart Grid Protection-II **Week 6:** Smart Grid Protection-III**;** Smart Grid Protection-IV**;** Modelling of storage devices**;** Modelling of DC smart grid components**;** Operation and control of AC Microgrid-I **Week 7:** Operation and control of AC Microgrid –II**;** Operation and control of DC Microgrid –I**;** Operation and control of DC Microgrid –II**;** Operation and control of AC-DC hybrid Microgrid –I**;** Operation and control of AC-DC hybrid Microgrid -II

					Week 8: Phasor measurement unit placement**;** Cyber security and resiliency**;** Virtual inertia and ancillary support**;** Demand side management of smart grid**;** Demand Response Analysis of smart grid **Week 9:** Demonstration of solar power generation**;** Demonstration of wind power generation**;** Demonstration of Battery Management System**;** Demonstration of EV charging system**;** Hierarchical control techniques in hybrid ac-dc microgrid **Week 10:** Simulation and case study of AC Microgrid**;** Simulation and case study of DC Microgrid**;** Simulation and case study of AC-DC Hybrid microgrid**;** Demonstration of parallel inverter operation in AC microgrid**;** Harmonic effects and its mitigation techniques **Week 11:** Energy management**;** Design of Smart Grid and Practical Smart Grid Case Study-I**;** Design of Smart Grid and Practical Smart Grid Case Study-II**;** System Analysis of AC/DC Smart Grid**;** Demonstration of grid-connected DC microgrid **Week 12:** Demonstration of energy management in microgrid**;** Demonstration of PHIL experimentation for symmetric and asymmetric fault analysis of grid-connected DFIG wind turbine. Demonstration of ancillary support from virtual synchronous generator**;**Demonstration on peak energy management using energy storage system. Conclusions
8	Advance Power Electronics	12 Weeks	NPTEL	IIT Delhi	**Week 1: Power Electronics Devices: An Introduction:** Advanced solid-state devices: MOSFETs, IGBT, GTO, IGCT etc. Wide band gap devices (SiC and GaN); Power modules, intelligent power modules, gating circuits. Design of snubbers; Thermal design, protection.Digital signal processors used in their control. **Week 2**: **Choppers and Non-isolated DC-DC Converters:** Choppers: Step-Down, Step-Up, Class-B, Class-C, Class-D, Class-E and Multi-Phase. Non-isolated DC-DC Converters: Buck, boost, buck-boost, Cuk, SEPIC, Zeta in DCM and CCM. **Week 3: Isolated DC-DC Converters and Power Factor Correction Converter:** Isolated DC-DC Converters: Flyback, Forward, Cuk, SEPIC, Zeta, Half Bridge, Push-Pull and Bridge in DCM and CCM. Single-phase, Single-Stage Converters (SSSSC), Power Factor Correction at AC Mains in These Converters. Applications in SMPS, UPS, Welding, Lighting and EV Charging. **Week 4: Power Quality: An Introduction:** Power Quality Monitoring, instrumentation and regulations. Static Series and Shunt Power Electronics Voltage Quality Controllers; Modern Arrangement for Reduction of Voltage Fluctuation. Active Power Line Conditioner **Week 5: Multiphase Converter and HVDC Systems:** 12-Pulse Converter Based HVDC Systems. Multipulse And Multilevel VSC Based Flexible HVDC Systems. **Week 6: Improved Power Quality AC-DC Converters:**Single-Phase Improved Power Quality AC-DC Converters: Buck, Boost, Buck-Boost, PWM VSC (Voltage Source Converters), Multilevel VSCs, PWM CSC (Current Voltage Source Converters) **Week 7: Three-Phase and Multipulse Improved Power Quality AC-DC converters:** Three-Phase Improved Power Quality AC-DC converters: VSC, Multilevel VSCs, Multipulse VSCs, PWM CSC

					(Current Controlled Voltage Source Converters). Multipulse AC-DC Converters: Diode and Thyristor-Based Converters **Week 8: Multilevel Inverter: Introduction**: Multilevel Inverter and its Control. Detailed PWM Analysis for Multilevel Inverter. Modular Multilevel Converter **Week 9: Multilevel Inverter Drive:** Multilevel Inverter Fed Induction Motor Drive. Harmonic Suppression and Modulation technique for Multipulse Converter Fed Multilevel Inverter-Based IM Drive. Power Quality Improvement in Multi-Pulse Converter Fed Multilevel Inverter Based Induction Motor Drives. **Week 10: Resonant Converter:** Analysis and principle of operation of Resonant Converter. Series and Parallel Resonant Inverters. Zero Voltage Switching Resonant Converters. Zero Current Switching Resonant Converter. Quasi Resonant and Multi Resonant DC-DC Power Converters. Phase-Controlled Resonant Converters **Week 11: Solid State Controllers for Motor Drives:** Solid State Controllers for Motor Drives: Vector Control and Direct Torque Control of Induction, Synchronous, Permanent Magnet Sine Fed, Synchronous Reluctance Motors. Permanent Magnet Brushless DC (PMLDC) Motors and Switched Reluctance Motors. **Week 12: LCI fed Synchronous Motor Drives and Power Quality Improvement of the Drive:** Introduction; LCI (Load Commutated Inverter) Fed Large Rating Synchronous Motor Drives. Energy Conservation and Power Quality Improvements in These Drives
9	Embedded Systems Design	12 Weeks	NPTEL	IIT Kharagpur	**Week 1:** Introduction to Embedded System, ASICs and ASIPs **Week 2:** Designing Single Purpose Processors and Optimization **Week 3:** Introduction to FPGAs and Synthesis **Week 4:** Verilog Hardware Description Language (Verilog HDL) **Week 5:** Microcontrollers and Power Aware Embedded System Design **Week 6:** Real Time Operating System **Week 7:** Real Time Scheduling Algorithms **Week 8:** Modelling and Specification **Week 9:** Design Synthesis **Week 10:** Digital Camera Design and Hardware Software Partitioning **Week 11:** Design Optimization **Week 12:** Simulation and Verification
10	Introduction To Industry 4.0 And Industrial	12 Weeks	NPTEL	IIT Kharagpur	**Week 1** : Introduction: Sensing & actuation, Communication-Part I, Part II, Networking-Part I, Part II **Week 2** : Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories **Week 3** : Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform

	Internet Of Things				and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis **Week 4** : Cybersecurity in Industry 4.0, Basics of Industrial IoT: Industrial Processes-Part I, Part II, Industrial Sensing & Actuation, Industrial Internet Systems. **Week 5** : IIoT-Introduction, Industrial IoT: Business Model and Referece Architerture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II. **Week 6** : Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I. **Week 7** : Industrial IoT- Layers: IIoT Communication-Part II, Part III, IIoT Networking-Part I, Part II, Part III. **Week 8** : Industrial IoT: Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science - Part I, Part II, R and Julia Programming, Data Management with Hadoop. **Week 9** : Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Industrial IoT: Security and Fog Computing: Cloud Computing in IIoT-Part I, Part II. **Week 10** : Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry. **Week 11** : Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management. **Week 12** : Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies :Case study - I : Milk Processing and Packaging Industries;Case study - II: Manufacturing Industries - Part I; Case study - III : Manufacturing Industries - Part II; Case study - IV : Student Projects - Part I; Case study - V : Student Projects - Part II; Case study - VI : Virtual Reality Lab; Case study - VII : Steel Technology Lab
11	Object Oriented System Development Using UML, Java And Patterns	12 Weeks	NPTEL	IIT Kharagpur	**Week 1:**Introduction **Week 2:**Life Cycle Models for OO Development **Week 3:**Use Case Diagram **Week 4:**Class Diagram I **Week 5:**Class Diagram II **Week 6:**Sequence Diagram **Week 7:**State chart diagram **Week 8:**Design process **Week 9:**Introduction to design patterns **Week 10:**GRASP patterns

					Week 11: GoF pattern I **Week 12:**GoF Pattern II
12	Reinforcement Learning	12 Weeks	NPTEL	IIT Madras	**Week 1** : Introduction **Week 2** : Bandit algorithms – UCB, PAC **Week 3** : Bandit algorithms –Median Elimination, Policy Gradient **Week 4** : Full RL & MDPs **Week 5** : Bellman Optimality **Week 6** : Dynamic Programming & TD Methods **Week 7** : Eligibility Traces **Week 8** : Function Approximation **Week 9** : Least Squares Methods **Week 10** : Fitted Q, DQN & Policy Gradient for Full RL **Week 11** : Hierarchical RL **Week 12** : POMDPs