THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI

Department of Electronics and Communication Engineering

B.E. Electronics and Communication Engineering

Meeting on Consolidated Curriculum Review based on Feedback from Stake holders

Date: 27th May 2022

Meeting Date & Time: 27th May 2022

Meeting Venue: ECE Seminar Hall

Members Present:

Dr.B.Manimegalai	Professor	
Dr MSK Manikandan	Associate Professor	
Dr B. Yogameena	Professor	
Dr N.B. Balamurugan	Professor	
Dr.V.Vinoth Thyagarajan	Assistant Professor	
Dr.K.Vasudevan	Assistant Professor	
Dr P.G.S. Velmurugan	Associate Professor	
Dr V.R. Venkatasubramani	Assistant Professor	

Meeting Minutes

Stakeholders : Students, Course handling faculty, Alumni & Employer

Syllabus reviewed: B.E. Electronics and Communication Engineering Programme Curriculum for the students admitted from the Academic year 2022-2023 onwards

Based on the analysis of curriculum review feedback obtained from students, course handling faculty members, alumni and employers, the following points are considered for the review of curriculum of the B.E. Electronics and Communication Engineering Programme for the students admitted from the Academic year 2022-2023 onwards and will be placed in the forthcoming Board of Studies on 04th June 2022.

2022 Curriculum Revamp Write-up based on Alumni Feedback:

ECE Alumni group, 1994-1999 Batch students, initiated the 2022-23 Curriculum/Syllabus-Scheduling of Courses during December 2020. The group comprises of:

- Mr Bala Pitchandi, Senior Vice President- Engineering, VTS, USA
- Ms Dhanya, Senior Computer Vision Engineer, RetailNext, SanJose, CA
- Ms Pavithra, Advanced Software Engineer, Zebra Technologies, NY
- Mr Jude Prakash, Director, Software Engineering, Juniper Networks, Bangalore
- Mr Muthukumar, Principal Member of Technical Staff, Oracle
- Ms Muthulakshmi, Software Architect, Cadence Design Systems, Boston, MA
- Ms Ramya, Senior Software Engineer, Qualcomm, CA
- Mr Yogesh, Principal Engineer / Director, Cisco, North Carolina

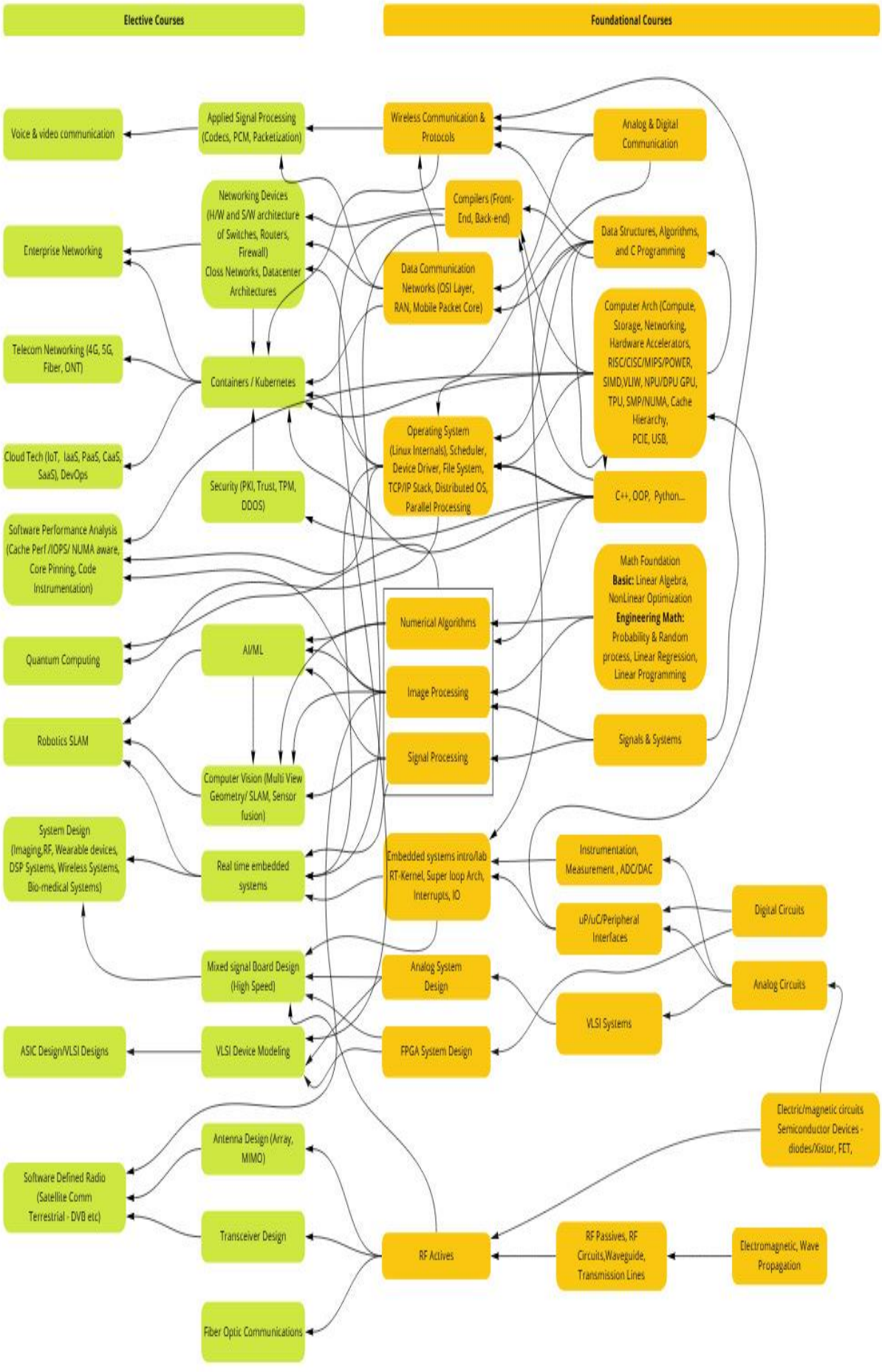
A Syllabus team was formed comprising of:

- ECE Alumni group, 1994-1999 Batch students
- Dr. Balaji Srinivasan, Professor, Department of EE, IIT Madras
- Dr S.J. Thiruvengadam, Professor & Dean (Academics), Department of ECE, TCE, Madurai
- Dr S Rajaram, Professor & Registrar (Academics), Department of ECE, TCE, Madurai
- Dr S Md Mansoor Roomi, Professor, Department of ECE, TCE, Madurai

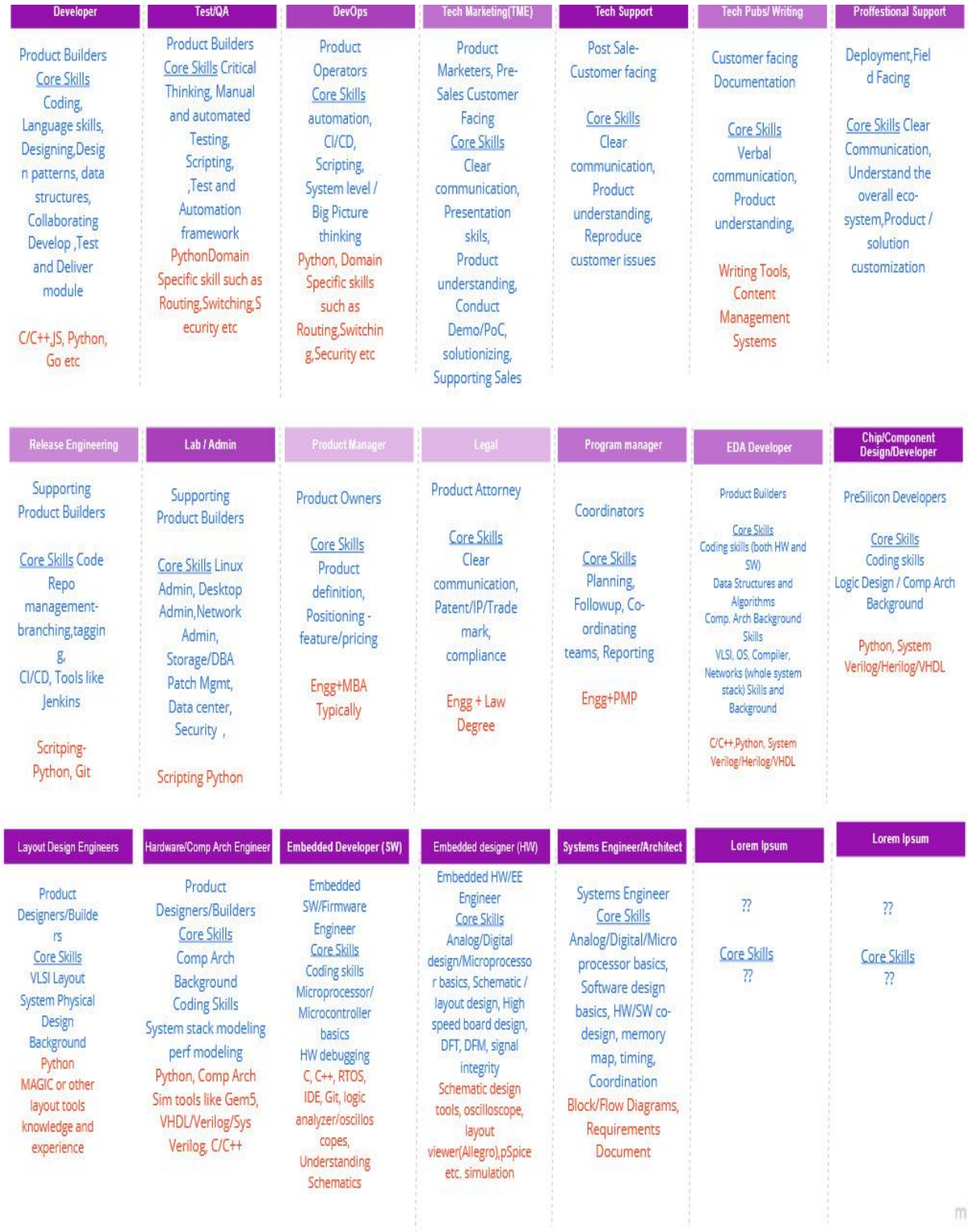
The guidelines followed in changing the Curriculum are:

- The curriculum should align with the expectations for future engineers (2026 pass out) concerning the job market, higher studies, and competitive exams.
- The number of courses in the curriculum shall be reduced substantially by increasing the credit of few courses. More theory cum practical courses shall be included compared to the existing curriculum for better understanding of the courses.
- Coding concepts shall be given due importance in certain subjects.
- CDIO course stream shall continue as it is in the existing curriculum with minor changes based on the student feedback.

Various online meetings were convened during the weekends for curriculum revision. The main objective of the meeting was to identify stream of courses that an ECE engineer has to study in order to be efficient and viable in the future Job market, competitive exams and in pursuing higher studies. Future Thrust areas and the foundational course were identified as shown in the leftmost side and in the right side of the figure given below. Mapping was done from the foundation courses to advanced courses (elective) considering various deliberations into account.


Elective Courses
Foundational Courses
Voice & video communication
Applied Signal Processing (Codecs, PCM, Packetization)
Wireless Communication & Protocols
Analog & Digital Communication
Networking Devices (H/W and S/W architecture of Switches, Routers, Firewall) Closs Networks, Datacenter Architectures
Compilers (Front-End, Back-end)
Enterprise Networking
Data Structures, Algorithms, and C Programming
Data Communication Networks (OSI Layer, RAN, Mobile Packet Core)
Computer Arch (Compute, Storage, Networking, Hardware Accelerators, RISC/CISC/MIPS/POWER, SIMD,VLIW, NPU/DPU GPU, TPU, SMP/NUMA, Cache Hierarchy, PCIE, USB,
Telecom Networking (4G, 5G, Fiber, ONT)
Containers / Kubernetes
Operating System (Linux Internals), Scheduler, Device Driver, File System, TCP/IP Stack, Distributed OS, Parallel Processing
Cloud Tech (IoT, IaaS, PaaS, CaaS, SaaS), DevOps
Security (PKI, Trust, TPM, DDOS)
C++, OOP, Python...
Software Performance Analysis (Cache Perf /IOPS/ NUMA aware, Core Pinning, Code Instrumentation)
Math Foundation
Basic: Linear Algebra, NonLinear Optimization
Engineering Math: Probability & Random process, Linear Regression, Linear Programming
Numerical Algorithms
Quantum Computing
AI/ML
Image Processing
Robotics SLAM
Signals & Systems
Signal Processing
Computer Vision (Multi View Geometry/ SLAM, Sensor fusion)
System Design (Imaging,RF, Wearable devices, DSP Systems, Wireless Systems, Bio-medical Systems)
Embedded systems intro/lab RT-Kernel, Super loop Arch, Interrupts, IO
Instrumentation, Measurement , ADC/DAC
Real time embedded systems
uP/uC/Peripheral Interfaces
Digital Circuits
Mixed signal Board Design (High Speed)
Analog System Design
Analog Circuits
VLSI Systems
ASIC Design/VLSI Designs
VLSI Device Modeling
FPGA System Design
Electric/magnetic circuits Semiconductor Devices - diodes/Xistor, FET,
Antenna Design (Array, MIMO)
Software Defined Radio (Satellite Comm Terrestrial - DVB etc)
Transceiver Design
RF Actives
RF Passives, RF Circuits,Waveguide, Transmission Lines
Electromagnetic, Wave Propagation
Fiber Optic Communications
miro

The skills that have to be acquired for various Job perspective is identified and a part is shown in the figure below.



A graph with ‘Technical Knowledge’ in the x-axis and ‘personal, professional, system building and interpersonal skills’ in the y-axis is formed as shown in the figure below. The details are as follows

- Technical knowledge Foundation courses were identified and located in the Bottom left square.
- More advance Technical knowledge courses were put in the Bottom right square.
- Courses that inculcate ’personal, professional, system building and interpersonal skills’ were placed in the Top left square.
- Finally, the courses the cater the need of both, Technical knowledge and Skills, are put in the Top right square.

Interpersonal		
	Design Thinking, Engineering Exploration, Lateral Thinking, Project Management, Lab Projects	AI/ML, Computer Vision, Real Time Embedded Systems, ASIC Designs, High Speed & Mixed Signal System Design, Networking & Security, Video & Voice Commn, Quantum Computing, Software Performance Analysis, Robotics, Complete System Design (Imaging, RF, Wearable, DSP, Bio-Medical), SDR, Cloud Computing, Compiler Design, Applied Signal Processing, Space Networking, GPU Programming
	Digital Circuits, Analog Circuits, Electric Circuits, Semiconductor Devices, Math Foundation, C, Data Structures, Algorithms, uP/uC, Electromagnetic Waves, Signals & Systems, Instrumentation	C++, OOP, Python, Computer Arch, Analog/Digital Commn, Signal Processing, Image Processing, Embedded Systems, Data Communication Networks, Wireless Protocols, FPGA, VLSI, Analog Systems, RF Actives, RF Circuits, Passives, Numerical Algorithms, OS, Compilers, System Software, Engineering Math (Data Science, Linear Algebra, Statistics)Transceiver/Antenna Design, Fiber Optics,

Tech Knowledge

Subsequently, this 4-sqaure graph is converted into a 9-square graph to investigate and group the courses at an improved level to get a better picture. The same is shown in the figure below.

Based on the above-mentioned process, a 'new Scheduling of Courses' was formed. An online meeting was conducted in which all the ECE faculty members participated along with the 'Syllabus team' give suggestions to make the 'new Scheduling of Courses', still better. Eventually, a Meritorious Alumni Group was formed via WhatsApp, in which the 'new Scheduling of Courses' was floated to get the diversified suggestions.

Various department meetings were conducted to discuss on the suggestions collected and appropriate refinement were carried out to derive at the Draft - 'Scheduling of courses' that was displayed in the BoS meeting on 18th December 2021. The highlights are as follows:

- There will be no lab course in the core category, separately. Rather, it is integrated into theory course namely 'Theory cum practical' course.
- A coding proficiency course in almost every semester forming a separate stream in column-7.
- Introduction of 'Electronics and Telecom Systems' course in the first semester to give a broader picture of ECE to students.
- There is a thought that 'spatial intelligence' course shall replace 'Engineering graphics' course.
- There is thought that 'Electronic Devices Topics' shall dominate in the first semester 'Physics'. Therefore, no separate course on Devices is required.
- Integration of 'signals & systems' and 'control systems' into a single core course
- 'Discrete-time Signal Processing' course shall include topics on Random process
- Introduction of the following core courses:
    - Optical and Wireless Communication
    - Sensors and Instrumentation
    - Mixed Signal Integrated Circuits

Also, a mapping is formed between the 'Elective identified' and the 'electives in the existing syllabi to study the gap.

Action taken based on the feedback review for curriculum review:

Based on the feedback, a 'new Scheduling of Courses' is formed. Various department meetings were conducted to discuss on the suggestions collected and appropriate refinement were carried out to derive at the 'new Scheduling of courses'. Major changes in Curriculum / syllabus are listed below:

No.	Stake holder Suggestions	Semester*	Major Updates in Curriculum / syllabus
1.	**Alumni, Students, Faculty**: Compared to the existing 2018 curriculum, more theory cum practical courses shall be included.	II - VI	There will be no lab course in the core category, separately. Rather, it is integrated into theory course namely 'Theory cum practical' course.
2.	**Alumni, Students:** Coding courses shall be given due importance	I-VI	A coding proficiency course is introduced in almost every semester forming a separate stream
3.	**Students:** Programming courses can be offered in the first year	I-II	The course 'Problem Solving using Computers' is offered in first semester. The course 'Python Programming' shall be offered in second semester
4.	**Alumni, Faculty:** Introduction of 'Electronics and Telecom Systems' course in the first semester to give a broader picture of ECE to students.	I	Engineering Exploration course gives a broader picture of ECE to students
5.	**Alumni, Faculty, Employer:**	I, III, V-	CDIO course stream continue as it is in

	CDIO course stream shall continue as it is in the existing curriculum	VIII	the existing 2018 curriculum with minor changes. Team member's personal commitments is ensured in each Review of CDIO courses such as Design Thinking, Projects.
6.	**Alumni:** Optical and Wireless Communication course shall be a mandatory course in the Curriculum	VII	Optical and Wireless Communication course is a mandatory course in VII semester.
7.	**Alumni:** Sensors and Instrumentation course shall be a mandatory course in the Curriculum	V	Sensors and Instrumentation course is a mandatory course in V semester.
8.	**Alumni:** Mixed Signal Integrated Circuits course shall be a mandatory course in the Curriculum	IV	Mixed Signal Circuit Design course is a mandatory course in VII semester.
9.	**Alumni:** 'Discrete-time Signal Processing' course shall include topics on Random process	IV	Topics on Random process shall be included in the syllabus of 'Discrete-time Signal Processing' course
10.	**Alumni, Employer:** Collaborations with professors in higher learning institution has to be improved with respect to course handling and projects	-	Adjunct faculties from higher learning institutes shall be facilitated for handling classes to enhance the complex engineering problem solving ability.
11.	**Alumni, Employer:** Industry internship/field experience for students has to be encouraged	II, IV, VI, VIII	Industry internship has been made mandatory in the curriculum. Students meet the customers and visit small scale industries in person for the Project development in the Design thinking Course and Engineering Design Project course.

Other activities for Curriculum Enrichment:

- PPAC meetings are conducted periodically (6 months) to analyse the programme performance and the same is presented in the forthcoming Board of Studies Meeting.
- Encourage students to take up TCE MOOCS, Coursera and NPTEL online certification courses.
- Encourage students to take up industry supported courses handled by industry experts.
- Four Broad Areas have been identified to fit-in the courses for B.E (ECE) programme, based on the faculty competence, Job potential, Modern, and Relevance. The areas shall focus on specific skill sets:
    - Electronic Products and Systems
    - Wireless and Optical Communications
    - Secure Communication / Cyber Physical System
    - AI in communication, vision and health-care

VR Venkatachalam
BoS Coordinator

Program Coordinator

HoD

To be circulated among Faculty members