PHILOSOPHY OF PROJECT CENTRIC LEARNING THROUGH:

ENGINEERING DESIGN AND INNOVATION (EDI) PROJECTS

Project Based Learning:

In engineering, we study various courses like Physics, Data Structure, Electronic Device, Theory of Machines, Ergonomics, Heat and Mass Transfer, etc. In order to compliment the conceptual learning in the class, every student in a group of five must carry out at least one project per course/semester to understand the theoretical concept learned in the class and apply them in the real-life applications. **A Course Project is an example of Project based Learning**

Project Centric Learning:

In the real world in Industry various projects are undertaken as per the customer need and products are developed which cater to the market requirement. Such projects do not belong to particular engineering domain, but need multidisciplinary approach. It may also need use to latest technology and tools to:

1) Make it cost effective 2) Quality improvement 3) Performance improvement 4) Innovation 5) Additional features 6) New product development 7) New Concept. Also, the professionals working in industry need to learn various tools, technologies, review the available products, domains in which the product is applied, literature review and everything else that is required to complete the project. This is the idea of Project Centric Learning. **An ENGINEERING DESIGN AND INNOVATION (EDI) Project is an example of Project Centric Learning**

ENGINEERING DESIGN AND INNOVATION (EDI) PROJECT

In general, an EDI PROJECT is a multifaceted hands-on project assignment that serves as a culminating academic and intellectual experience for students that let students to apply what they have learned to solve a practical question or problem related to specialized area or to solve ground level problem. The engineering and technology world is changing in a disruptive manner. The new areas where the **technology** is moving are:

Artificial Intelligence	Internet of Things	Mobile/social Internet
Block Chain	Big Data	Automation
Robots	Immersive Media	Mobile Technologies
Cloud Computing	3 D Printing	CX
Energy Technology	Cyber Security	Voice Assistants
Nanotechnology	Collaborative Tech	Health Technology
Human Computer Interaction	Geo-Spatial Tech	Advanced Material
New Touch Interfaces	Wireless Power	Clean Technology
Quantum Computing	Smart Cities	Edge/Computing
Faster, Better Internet	Proximity Technology	New Screens

Using these technologies, problems in various socially relevant domains can be solved. To name a few,

- Agriculture
- Defense
- Healthcare
- Smart Cities
- Smart Energy
- Security Systems
- Automobiles
- Space
- Green Earth
- Assistive Aid
- Water Management
- Swachh Bharat

The vision of our Institute is to train students to envision areas in the above domains. The industry needs future ready engineers which would be technically strong and flexible to use the latest engineering tools under major technologies mentioned above. Some such tools are mentioned below.

- Programming (C, C++, Java, Phyton)
- Design and Modeling (MATLAB, SCILAB, Lab VIEW, Simulink)
- VLSI (Xilinx, Modelsim ,)Cadence
- System Automation (PLC , SCADA)
- PADS, ORCAD ,Eagle,Kicad
- Embedded System (AVR Studio, Arduino ,Kiel uvision)
- Computer Vision (OPENCV,MATLAB)
- Circuit Simulation (Pspice, Simulink,Workbench)

- Wired / Wireless and Ad-hoc Networking (NS-2 , Packet Tracer)
- Signal Processing (Code Composer Studio)
- CAD, CAE
- 3 D Printing
- Simulation Software

In EDI Project, a group of around **five** students should come together and address issues in the socioeconomic field i.e socially relevant areas also termed as Domain areas using appropriate **Tools and Technologies** and provide best possible solution for the same

To do so following steps are to be followed
- Team formation i.e, Project group formation (5 students /Group). Identify a group leader. **(** Project Group formation will be strictly Roll Number wise i.e Group 1 Roll No 1 to 5 then next group i.e Group 2 will have Roll no. 6 to 10 and so on..)**
- Project identification relevant to societal needs from any of Domain areas
- Identification of Technology and Tools as per the project requirement
- In consultation with the supervisor refine domain, tool and technology areas
- Identify Industry working in same domain
- Map the technologies with the project needs
- Apply the technological knowledge to design various feasible solutions
- Select best possible solution to solve a the problem
- Develop/Fabricate a working model of proposed solution
- Test and validate product performance

Students will get hands on experience through experiential learning. A student may not know the details of the domain, technology, tools therefore it is expected that they must learn it, As it is a project Centric Learning whatever that is needed for the project must be learned by the student through the best possible means available. One can Refer Books/eBooks, online literature, articles, research papers etc. Have consultation with industry, expert people, faculties in relevant areas, One can join/refer to available MOOC's courses/ You tubes to learn the needful

under the supervision of the Project Guide. In EDI Project the role of Faculty becomes a facilitator. He has to give relevant project related inputs, make the students aware of available resources, connect to domain expertise, progress monitoring, and assessment of the project group as a whole and of every individual group member.

Also, through **Design Thinking Sessions** some needful theoretical inputs will be given by the EDI project guide. Students will be also asked to give presentations on certain points.

Through EDI Project, student learning will be improved in the form of team work, connecting people, acquiring new technical skills, communication skills, design, and programming skills. Continuous Self Learning ability will get developed. It will also develop the ability and attitude to identify problem, analyse it and solve it by implementing systematic scientific methodology. This will be quite useful for students throughout their personal as well as professional life.

More details about sample Domain areas/ Technologies / Tools and Project Implementation are shared below for reference

Domain Project Areas: Awareness and identification of appropriate areas for project work such as: Agriculture, Defense, Healthcare, Smart city, Smart energy, Security Systems, Automobile, Space, Green Earth, Automobiles, Assistive Aid, Water Management, Swachh Bharat (any other socially relevant research area)

Tools: Self learning Activity Learn and use latest engineering tools as per the project need. A few are listed below

Tools in Computer Engineering:

Programming / Coding Tools :- JavaScript, Python, Java, C#, C++, PHP, **Computer Vision Tools** :- OPENCV,MATLAB), **Single board computers:** Raspberry Pi, **Neural network simulators Tools:-** Neural Lab, NEST , **Machine Learning Tools:-** Torch, TensorFlow, Data Science **Tools :-** R language programming, SQL.

Tools in Electronics and Electronics & Telecommunication Engineering:

Electronic Design Simulation Integrated Circuit Tools:- VHDL, Xilinx, Modelsim , Cadence learn, **Embedded System Tools**:- AVR Studio, Arduino ,Kiel µvision, **Circuit Simulation Tools:-**Pspice, Simulink, Workbench, Tinkercad, ThingSpeak, Proteus, CircuitPro ,**Processor based integrated circuits** :Microcontroller, electronic prototype platforms: Arduino,**Networking Tools :-** Wired / Wireless and Ad-hoc Networking NS-2 , Packet Tracer, **Signal Processing Tools:-** Code Composer Studio along with Integrated circuits

Tools in Instrumentation and Control Engineering:- **System Automation Tools**: - PLC , SCADA , PADS, ORCAD ,Eagle, Kicad,

Tools in Mechanical, Industrial, Production, Engineering:- **Engineering Design Tools:-** AutoCAD, CATIA,COMSOL Multiphysics, Solidworks, Inventor, PTC Creo **Fluid Dynamics:-** Fluent,

HyperWorks, **Finite Element/ Structural Analysis:-**Ansy's, Ansy's Free Student software Thermal Simulation:- FlowTherm, AnsysIcepak

Tools in Chemical Engineering :-

Chemical process simulator:-DSIM **-** Open Source Process Simulator, chemical simulation software:- Schrödinger.

(Any other suitable tool as per the project requirement)

Technology: Map theappropriate technology:

Emerging Technologies :- Artificial Intelligence, 5G networks, IoT, Serverless Computing, Blockchain , Virtual reality (VR)/Augmented reality (AR), Drone, Quantum Computing, Robotics

Interdisciplinary Technologies:- Nanotechnology, Nanomaterials, Nanoelectronics, Quantum Computing , Spintronics

Computer Technologies: - Big Data, Cloud Computing, Human Machine Interface (HMI), Cyber Security

Medical and Healthcare Technologies:- Biomedical Technology

Energy Technologies :- Solar Energy Based Technologies, Wind energy, Green energy Technologies, Energy Storage

Electronics, Communication Technologies:- Wireless, GPS, Bluetooth, Mobile/social Internet Automation, Mobile Technologies, Voice Assistants, signal processing, image processing, Machine vision, Sensors, Optoelectronics,

Other imp Technologies:- Automobile ,3 D printing

(any other technology as per the project requirement)

Project Implementation: Selection of the domain area, Literature review, Identify and finalize the Problem Statement (student in consultation with Guide), Understand and select and use the appropriate tools, Map the technologies learned with the project needs (refer available online offline Resources, books, soft materials, relevant MOOCs, consult with domain expertise) Self Learning:- learn the required tools, skill sets, acquire knowledge to do the project

Designing & Testing: Designing of project prototype based on domain areas by incorporating appropriate tools and technology, validation and Testing of the prototype to give the best possible solution

Documentation and Final Assessment : Develop and demonstrate the optimized prototype /working model of project , Documentation of project report in stipulated standard format as per the preset norms i.e. IEEE Research paper format, Present Project work at final viva voce