BOARD OF STUDIES

Department of Electrical Engineering
Faculty of Engineering
Dayalbagh Educational Institute

LIST OF EXTERNAL EXPERTS

From Institutions

- Prof. Rakesh Mishra: IIT BHU
- Prof. R. N. Yadav, MNIT, Bhopal

From Industry

- Sh. Prashant Sethia, Cadence Design Systems
- Sh. Abhishek Nigam, HCL Technologies

OUTLINE OF PROPOSALS

1. Proposal to modify the syllabus of PEE202 (Modeling and Simulation) offered in M.Tech.
2. Proposal to float New Elective Course in B.Tech. Electrical Engineering
3. Proposal for inclusion of New Courses and Removal of some courses from B.Voc (Renewable Energy) and making credits in all semesters as 30.
4. Proposal for New Certificate Level Programme.

OUTLINE OF PROPOSALS

5. Proposal for new courses on Entrepreneurship.
6. Addition of course in Safety Management for B.Voc & M.Voc. (RE)
7. Proposal to offer Electronics and Computer Science Specialization Courses to B. Tech. (Part Time) students also, provided they meet certain minimum standards
8. Proposals to open Electives of Computer Science and Electronics specializations to Electrical Core students, provided they have studied the pre-requisites for these electives.
9. Proposal to introduce electives related to Microelectronics & VLSI in M.tech under the umbrella of Systems Engineering

1	Department/Centre proposing the course	ELECTRICAL ENGINEERING
2	Course Title (< 45 characters)	MODELING AND SIMULATION
3	L-T-P Structure	L-4+T-0+P/S-0
4	Credits	4
5	Course Number	PEE202
6	Status (category for program)	Core
7	Status vis-à-vis other courses (give course number/title)	
7.1	Overlap with any UG/ PG course of Department/ Centre	MECHANICAL ENGINEERING, CIVIL ENGINEERING, FOOTWEAR TECHNOLOGY, MATHEMATICS
7.2	Overlap with any UG/ PG course of other Department/ Centre	Yes. DBD203: Modelling and Simulation offered by Science Faculty
8	Frequency of offering	Every alternative semester
9	Faculty who will teach the course	DR GUFRAN AHMAD
10	Will the course require visiting faculty?	NO
11	Course objectives (about 50 words) indicating motivation and aims: Modeling and Simulation, or M & S as it is commonly referred, is becoming an important tool of industrial design and development and so, it is necessary to train the students in the techniques of M & S and this course is introduced with that aim to all the students across the disciplines. This course is proposed as a core course and elective as well to PG/PhD students across the disciplines with the aim o imparting basic understanding of Modeling and Simulation so that the students will find it easy to use this knowledge i profession for applying to various engineering systems and design. The aim of the course is to give an overview of the capabilities and techniques of M & S with emphasis on applications using by simulation tools such as MATLAB.	

UNIT	EXISTING	PROPOSED
I	Introduction: Modelling theory of physical systems-Definition of physical and conceptual systems. Through and across variables. Generic Models of two terminal component like dissipaters. Delay, Accumulators Postulates, concepts of QUASI power. Coupling devices-lumped models for diverse systems, Two port models for converters (Transformer, Transducers, ideal lever, gyrators, electric motor generators)	Introduction: Modelling theory of physical systems-Definition of physical and conceptual systems. State variables; Static and Dynamic systems; Hierarchy. Lumped parameter models in terms of differential and difference equations, state space model, transfer functions block diagram and sub systems, stability of transfer functions, modeling for control.
II	MODEL DEVELOPMENT AND ITS ORDER REDUCTION Model development-Model determination from input-output observation, Formulation of state models for linear lumped and time invariant systems through NETAN, NETAN Algorithm. Topological restrictions. In NETAN for two terminal and multi-terminal components, Modelling of large scale using computers. Model Order Reduction Techniques-Introduction, Dominant Eigen Value approach, Aggregation method.	MODEL DEVELOPMENT AND ITS OPTIMIZATION: Model development-Model determination from input-output observation, Formulation of state models for linear lumped and time invariant systems. Gradient based optimization techniques: Non-traditional Optimizations techniques, genetic Algorithm (GA)- Ant-Colony Optimization. Particle Swarm Optimization.

III	INTERPRETIVE STRUCTURAL MODELLING AND SYSTEM DYNAMICS METHODOLOGY Interpretive Structural modelling-Introduction, Definitions of loop, cycle, parallel lines, digraph, reachability. Model Exchange Isomorphism (MEI), Sequence of MEIs and intermediate models associated with each MEI. Develop Interpretive structural models. System Dynamics Methodology for Modelling-Introduction, principles, features, Applications of System Dynamics for Modelling and Simulation of physical and conceptual systems.	INTERPRETIVE STRUCTURAL MODELLING AND SYSTEM DYNAMICS METHODOLOGY Interpretive Structural modelling-Introduction, Definitions of loop, cycle, parallel lines, digraph, reachability. Model Exchange Isomorphism (MEI), Sequence of MEIs and intermediate models associated with each MEI. Develop Interpretive structural models. System Dynamics Methodology for Modelling-Introduction, principles, features, Applications of System Dynamics for Modelling and Simulation of physical and conceptual systems.

IV	SIMULATION: Introduction. What is continuous and discrete simulation. Why simulation, Simulation Characteristics, Numerical Methods (Eulers and Rugga Kutta) for simulating various physical systems. Introduction of PC-BASED simulation packages (MATLAB, SPICE etc.) for simulation of Electrical, Mechanical, Hydraulic, Thermal Systems.	Simulation of Engineering Systems: Introduction and it's need. Simulation of continuous and discrete processes with suitable examples from engineering problems. Monte-Carlo Simulation, Numerical Methods (Eulers and Rugga Kutta) for simulating various physical systems. Use of MATLAB as a computational tool for simulation of various Engineering problems.
V	NON-LINEAR SYSTEM SIMULATION: Introduction of Non-linear system simulation. First order continuous system. Linearization, Second order and High order systems, discrete time systems, Simulation of chaotic systems, Simulation of systems with discontinuous nonlinearity, simulation of the time delay systems. Design of simulation experiments and validation of simulation models.	NON-LINEAR SYSTEM SIMULATION: Introduction of Non-linear system simulation. First order continuous system. Linearization, Second order and High order systems, discrete time systems. Neural Network Modeling of Systems. learning algorithm, Application to complex Engineering systems and strategy for optimum output. Regression analysis.

EEM827: Course: Selected Topics in Communication Systems, Credits: 3

CO1. Understand the architecture and detailed functioning of GSM systems.

CO2. Analyze the changes that have occurred in GSM 2.5G to GSM 5G.

CO3. Get an overview of principles, devices & technologies used in Optical fibre communication systems.

CO4. Explain the working of satellite communication systems.

CO5. Familiar with IOT technologies, products & platforms.

I	**GLOBAL SYSTEM OF MOBILE COMMUNICATIONS(GSM)-BASICS: Introduction, Uplink/downlink, FDMA, GSM Bands, ARFCN, Numbering systems MSISDN, IMSI, IMEI and formats, GSM Architecture and functions of each sub system, Authentication & Encryption, TDMA, FH, Speech encoding, GSM events.**
II	**GLOBAL SYSTEM OF MOBILE COMMUNICATIONS(GSM)-ADVANCED: General Packet Radio Service (GPRS) 2.5G , Code Division Multiple Access(CDMA) -2.5G, Universal Mobile Tele Systems(UMTS) and WBCDMA -3G, 4G Long Term Evolution (LTE), Fifth Generation GSM -5G,Future trends.**
III	**OPTICAL FIBRE COMMUNICATION SYSTEMS(OFCS): Introduction, Principle of light propagation, Wavelengths used, Types of optical fibers, Types of optical fibre cables, Optical fibre communication systems (sources and Tx, detectors and Rx, optical amplifiers, switches/cross connects, optical add/drop mux, optical splitter), Benefits of OFCS, SDH, WDM, Optical transport networks (OTN) and OTH, Cable terminations, splicing ,OTDR and fault finding.**
IV	**SATELLITE COMMUNICATION SYSTEMS: Introduction, How a Satellite works, Frequencies used, Pros & cons of satellite communications, Orbits, Space subsystem (Attitude and orbit control AOC, Telemetry tracking command & monitoring TTMC, Power &Antenna, Transponders), Earth subsystem, Access techniques (FDMA, TDMA,CDMA), Indian Satellites**
V	**INTERNET OF THINGS (IOT): Introduction, Working, Structure of IOT, Knowledge management potential, Applications, IOT technologies and technological challenges, Four layer model, IOT Protocols, Future, IOT Products, IOT Platforms (GE Pafix, CISCO IOT Cloud, IBM Watson IOT, SAP IOT Cloud)**

ADDITION OF COURSE IN SAFETY MANAGEMENT FOR B.VOC & M.VOC. (RE)

UNIT –I (07 Hours): Key elements of a safety and Health Management System- Policy & commitment, Planning, Implementation and Operation, Measuring Performance, Auditing and Reviewing performance.

Initial Safety and health Management System Review, Safety and health Management System model, safety and Health policy- Developing a workplace Safety and Health Policy , Planning – safety and Health objectives and Targets, performance standards, Implementation and Operation – structure and responsibilities- management responsibilities, individual responsibilities, Safety Consultation.

UNIT -II (07 Hours) : Participation and Representation, Training , Awareness and competence, Communication- Information coming into the organization, Information Flow within the Organization, Information Flow from the Organization,: Document Control : Safety and Health Management System records: Operational Control – Workplace Precautions, Safety And Health training and Competence- Training for Safety and Health:, Identify Training Needs – Organizational Needs, job-related Needs, Individual Needs : Identify Training Objectives and Methods, Deliver Training , Evaluation and feedback, specialist Advice and Services – access to Specialist advice and services, relationships within the Organization , relationships Outside the organization , external specialist safety and safety support.

UNIT -III (07 Hours) : Risk assessment and control- the legal Basis for risk Assessment, key stages of Risk assessment and control- use trained Risk assessors, preparation and Inventory, Identify the hazards, assess the risk , identify Appropriate Action , Risk assessment records and control . A simple Risk estimation example – Hazards, remedial measures, Motivation of employees, Insurance coverage of Industrial plant & personnel.

UNIT - IV (07 Hours) : Stages in plant life and unsafe condition in factories, maintenance & safety, basics safety programming, safety department, Rules and regulation of safety department, Responsibility of management for safety in plant, safe guarding the public, Responsibility of government, social organization and public authorities. Safety activities of the ILO (International Labour Organization)

Unit V (08 hours): Site visit and evaluation of SPV rooftop plants, evaluation of Lead acid energy storage banks, evaluation of Li-ion battery banks, evaluation of redox flow batteries.

References:

Guidelines for the Establishment of Safety Management System at Construction Worksites,

Risk assessment- A Practical Guide, 1993, Institution of Occupational Safety and Health, United Kingdom

Electricity & Safety Measures

Course Credit: 4

This course on ‘Electricity and Safety Measures’ will introduce concepts of electricity, from generation to transmission to cities/ towns, to distribution up to the end user. The student will learn the elementary electrical, overview of electrical power system, Quality of electrical supply, general tools and tackle, Major substation equipment, Operation & maintenance practices for substation and transformer in the first part of this course. One shall learn importance of earthing and guidelines for providing earthing arrangements, Protection of the electrical equipment for safe use of electricity, Important electricity rules related to safety in the second part of this course. introduction to the basic safety measures, essential First-Aid measures and aspects of Disaster Management will also be covered. As a common interest course, this course helps in building up the knowledge and skill on electrical power and safety.

Course layout

Week 1: Elementary Electrical - Basics of Electricity

Week 2: Exposure to General Tools and Tackles, Testing of wiring Installation

Week 3: Electrical Power System :Overview

- Quality of Electrical supply
- Power Distribution System - Basics
- Distribution Line equipment

Week 4: Transformers

- Major Substation Equipment
- Operation & Maintenance Practices

Week 5: Earthing

Week 6: Electrical System Protection

Week 7: Important Electricity Rules Related to Safety

Week 9: Electrical Safety

Week 10: Accident Prevention & Protection

Week 11: First Aid

Week 12: Disaster Management

Books and references

IGNOU course material available at eGyankosh

Course OEE-001: Electricity & Safety Measures;

Course OEE-002; OEEL-001 of Programme “Certificate of Competency in Power Distribution” being offered by SOET, IGNOU

Block 2: Electrical Safety and Disaster Management of Course BEE-002:Energy Management,

Block 2: Operation & Maintenance of course BEE-001: Power Distribution Sector of Programme “Advanced Certificate in Power Distribution” being offered by School of Engineering & Technology(SOET), IGNOU

PROPOSALS FOR B. VOC (RENEWABLE ENERGY)

	Existing			Proposed		
Semester	Total Credits	Theory Credits	Practical Credits	Total Credits	Theory Credits	Practical Credits
I	30	17	13	30	12	18
II	30	12	18	30	12	18
III	33	18	15	30	12	18
IV	34	21	13	30	12	18
V	34	19	15	30	12	18
VI	34	11	23	30	12	18
	195	98	97	180	72	108

SEMESTER I - SOLAR PV INSTALLER (SURYAMITRA)/ SOLAR PV INSTALLER-ELECTRICAL SGJ: QP code: Q0101/Q0102		
Course Omitted	**Course Proposed**	**Syllabus**
VRE 108 Elementary Workshop Technology CREDIT:3	Introduction to SPV Technology CREDIT:3 L-3,T-0,P-0	Unit 1: Basics of Solar Energy and Electrical concepts. Basics of SPV systems and its components. Unit 2: Identification and use of different tools used for Installation. Site survey for SPV Installation and assess customer's SPV requirement. Interpretation of Drawings, Material Handling and storage of components on site. Unit 3. SPV modules, installation and mounting structure. Placement of battery and inverters as per drawing. Unit 4. Installation of Electrical components of a solar PV system. Test and commission SPV system. Maintain SPV system Unit 5. Personal health and safety at project site. Completion and handover documentation.
VRE 109 Elementary Workshop Practice CREDIT-3	SPV Installation L Lab CREDIT:3 L-0,T-0,P-3	List of Experiments 1. Identification of tools and components. 2. Site Survey and calculation of available solar energy at the site. 3. Solar Cell characterization. 4. Series parallel connection of modules. 5. Installation of panels on Ballast structure. 6. Battery basics and its connections. 7. Inverter basics and its connections 8. Installation of grid tied system along with energy meters. 9. Testing of components of SPV plant. 10. Safety drill at site.

SEMESTER III: SOLAR PV MAINTENANCE TECHNICIAN/SOLAR PV PROJECT HELPER SGJ: QP code: Q/Q0115/Q0111		
Course Omitted	**Course Proposed**	**Syllabus**
VRE 301 Thermodynamics and Heat Transfer CREDIT:3 (Required concepts are taught in Solar Thermal Systems)	**Basic Electronics Lab CREDIT:4 L-0,T-1,P-3**	**List of Experiments** 1. Familiarization with lab instruments and components. 2. Characterization of passive circuit elements. 3. Diode characteristics and DC power supply 4. Half wave and full wave rectifier circuits 5. Bipolar Junction Transistor (BJT) circuits (Inverter, CE amplifier) 6. Operational Amplifiers. 7. Logic Gates 8. Basic combinational circuits 9. Sequential Circuits
VRE 304 Engineering Materials CREDIT:3	**Required topics of this course are taught in different courses of RE like SPV Technologies, General Electrical Engg and Mechanical Engg.** **Materials characteristics and related concepts of relevant applications are taught in the respective courses like SPV Tech. & Systems, Solar Thermal Systems etc.**	

SEMESTER IV: **ASSISTANT PLANNING ENGINEER (WIND)/SITE SURVEYOR (WIND)** **SGJ: QP code: Q1201/Q1202**		
Course Omitted	**Course Proposed**	**Syllabus**
VRE 404 **Electrical Measurements** **CREDIT:3**	**Electrical Measurements & Lab** **CREDIT:3** **L-0,T-0,P-3**	**Theory to explain the underlying concepts for following experiments.** **List of Experiments** **1. Calibration and use of measuring instruments. (Micrometer, Vernier Caliper and dial gauge).** **2. Calibration of Voltmeters and ammeters using Potentiometers.** **3. Calibration of AC Energy meter at different load.** **4. Testing of Energy Meters (Single Phase Type).** **5. To study the errors in watt meters at various power factors.** **6. Determination of the current ratio and phase angle of the given CT.** **7. Measurement of power in a single phase circuit by using CT's and PT's.** **8. Measurement of Iron loss from B-H curve by using CRO.**
VRE 407 **Wind Energy conversion system** **CREDIT:3** **VRE 408** **Wind Energy Lab** **CREDIT:4**	**Wind Energy System and Lab** **CREDIT:4** **L-1,T-1,P-2**	**Theory to explain the underlying concepts for following experiments.** **List of Experiments** **1. Important parameters of Wind Energy: Cut-in speed, cut-out speed and rated speed, tip speed ratio, coefficient of power.** **2. Evaluate the efficiency of charge controller.** **3. Find out the start up speed and cut-in speed of wind turbine.** **4. Evaluate the tip speed ratio at different wind speeds.** **5. Evaluate the coefficient of performance of wind turbine.** **6. Draw the power vs wind speed curve of turbine.** **7. Draw the curve between TSR and coefficient of power.** **8. Draw the power curve of turbine at fix wind speeds.**

SEMESTER IV		
Course Omitted	**Course Proposed**	**Syllabus**
VRE 409 **Power System** **CREDIT:3**	**Introduction to Power System (Credit:2)** **L-2,T-0,P-0**	**Syllabus** **Unit 1** **Economic Aspects of Power system, Thermal Power plant, Hydro power plant, Renewable energy generation** **Unit 2** **AC distribution, Ring main and Radial system, Ferranti effect, Proximity effect** **Unit 3** **Overhead line Insulators, string efficiency, grading of insulators, cables and Earthing.** **Unit 4** **Mechanical design of transmission line, corona and surge protection devices** **Unit 5** **Introduction to Protection and switchgear**

SEMESTER V: SOLAR THERMAL PLANT INSTALLATION & MAINTENANCE TECHNICIAN/ SOLAR PV O&M ENGINEER SGJ: QP code: Q0602/Q0117		
Course Omitted	**Course Proposed**	
VRE 501 Industrial Psychology CREDIT:3	**Students gets an exposure of the same through Interaction with Industry Experts, Industrial visits and via Practical Training in respective Industries.**	
VRE 502 Managerial Eco. & Industrial Organization CREDIT:3	**Not very relevant as students are now studying courses of accounting and finance and Import Export and Licensing which provides better understanding of Managerial Economics. Business Management course provides a basic understanding of Industrial Organization which is sufficient.**	

SEMESTER V		
Course Omitted	**Course Proposed**	
VRE 503 **Linear Control Engineering** **CREDIT:3** **VRE 504** **Control Engineering Lab** **CREDIT:3**	**Control System & Lab** **Credit: 4** **L-1,T-0,P-3**	**Theory to explain the underlying concepts for following experiments.** **List of Experiment** **1. Plot the pole-zero configuration in s-plane** **2. Determine the transfer function for given closed loop system in block diagram representation** **3. Plot unit step response of a given transfer function and find delay time, rise time, peak time and peak overshoot** **4. Time response of a second order system subjected to arbitrary input.** **5. Plot root locus of a given transfer function and locate closed loop poles for different values of K** **6. Determine steady state errors of a given transfer function.** **7. P,PI&PID controllers and its application.** **8. Plot Bode plot of given transfer function. Determine the relative stability by measuring gain and phase margins** **9. Determine relative stability by Nyquist plot**

SEMESTER V		
Course Omitted	**Course Proposed**	
CRC 581	**Comparative Study of Religion**	**This course has been shifted in first year.**
VRE 509	**Safety Management CREDIT:3**	**This course will be introduced by Electrical Engg. Deptt. and can be opted by B.Voc.RE and M.Voc. RE students.**

SEMESTER VI: **BIOGAS PLANT OPERATOR/ SOLAR PV PROJECT MANAGER** **SGJ: QP code: Q6302/Q0114**	
Course Omitted	
VRE 601 **Village Industries & Entrepreneurship** **CREDIT:3**	**Entrepreneurship course is offered in first semester now.**

NEW CERTIFICATE LEVEL PROGRAM

POST GRADUATE CERTIFICATE IN INTRODUCTION TO DATA ANALYSIS

POST GRADUATE CERTIFICATE IN INTRODUCTION TO DATA ANALYSIS

Salient Points

- ✗ Industry Experts as Content Developer
- ✗ Each Course is of 4 credits.
- ✗ Two Courses per module (i.e. 8 Credits per Module)
- ✗ Total 32 credits (i.e. 4 Modules) for Certificate

- ✗ **Eligibility: Graduate with Mathematics at Inter and Degree Level**
- ✗ **STARTING SESSION: 2022-2023**

COURSE OBJECTIVES

Understand the basics of data analytics and its application in real world
Build statistical foundation for data analytics
Learn the foundations of R Programming and advanced concepts in R such as Data Structures.
Learn to use R for statistical analysis and testing, graphical analysis and regression (linear modeling)
Learn graphical representation of Data and its importance in analysing data using Tableau
Understands the foundations of Big Data and learn how to use Hadoop and Hadoop ecosystem to solve the big data problems
Understand business intelligence and learn about "Dimension Modeling", "Online Analysis Processing", "Balanced Scored Cards"

COURSES

Module	Course
1	Introduction To Data Analytics
	Statistical Foundations For Data Analytics
2	Introduction To Statistical Analysis Using R
	Data Visualization
3	Introduction To Big Data
	Foundations Of Big Data Analytics
4	Business Intelligence
	Project Work

ENTREPRENEURIAL COURSES

In-class & Online Portal

ENTREPRENEURIAL COURSES

Objective: To Lay more emphasis entrepreneurial inputs by augmenting existing curriculum

Allow students to opt for online courses that cater to individual requirements

Enable students to acquire knowledge in niche areas of entrepreneurship

1. Two courses that will be offered as electives by faculty
   a. **RDC 681 : Entrepreneurship I (2 Credits)**
      Deals with planning and developmental stages of Small Scale Industry

   b. **RDC 782 : Entrepreneurship II (3 Credits)**
      Deals with organization, management and taxation part of Entrepreneurship

ENTREPRENEURIAL COURSES FROM SWAYAM/NPTEL

Courses with total duration of at least 12 weeks be considered equivalent to one open elective course.

S.No.	Course Title	DURATION IN WEEKS	Offered on
1	Entrepreneurship Essentials	8	NPTEL
2	Business Analytics For Management Decision	12	NPTEL
3	Infrastructure Planning and Management	12	NPTEL
4	Roadmap for patent creation	8	NPTEL
5	Innovation, Business Models and Entrepreneurship	8	SWAYAM
6	Patent Drafting for beginners	4	SWAYAM
7	Patent Law For Engineers And Scientists	12	SWAYAM
8	Legal Compliance for Incorporating Startup	4	SWAYAM
9	Product design and development	4	SWAYAM

PROPOSAL TO INTRODUCE ELECTIVES IN M.TECH FOR MICROELECTRONICS & VLSI

Objective: To offer more electives in M.Tech systems Engineering to meet the emerging demand of VLSI engineers and contribute in the GoI Chip to Startup (C2S) program.

- PO-1: Identify, formulate and solve engineering problems in the field of Microelectronics and VLSI.
- PO-2: Apply knowledge, proper methodology and modern tools to analyse and solve the problems in the domain of Microelectronics and VLSI.
- PO3: To design and analyze complex VLSI/Embedded circuits critically, as well as front end and back end tools including prediction and modeling at industry standards with an understanding of the limitations.

PROPOSAL TO INTRODUCE ELECTIVES IN M.TECH FOR MICROELECTRONICS & VLSI

Three courses and a LAB that will be offered as electives by faculty

Electives	Credit
Analog CMOS Circuit	4
Semiconductor Device & Modeling	4
Digital VLSI Design	4
VLSI Circuit Design Lab	3

Note: Industry partners from Texas instrument, NXP semiconductor and Nvidia are ready to support in the program through expert lectures and TCAD Tool facilities.

THANK YOU

Department of Electrical Engineering