MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR
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Finishing School Program (Online Internship)-2020

Name of Department	**Department of Electrical Engineering**
Module Name	**Hands on Training on Soft Computing Techniques In Engineering**
Module Coordinators	1)Dr. Himmat Singh 2)Dr. Shishir Dixit 3) Dr. Hari Mohan Dubey 4)Prof. Manoj Kumar
Module Objective and Introduction	• The main objective of this Online Finishing School /Summer Internship Program Module is to expose the participants to various soft computing techniques like Genetic Algorithm, Particle Swarm Optimization, Differential Evolution etc and to make them able to apply various soft computing techniques for solving some of the most crucial problems of Electrical Engineering, namely, Economic Load Dispatch, Reactive Power Dispatch and Optimal Placement of Flexible AC Transmission System (FACTS) devices. They will also be made familiar with the present energy scenario in Indian perspective as well as the combined active and reactive power management for maximum utilization of existing transmission structure. • The Economic Load Dispatch (ELD) is one of the key optimization issues of power system operation. Its objective is to adjust active power output of all committed generating units so that total fuel cost is minimized and operational constraints are satisfied simultaneously. The ELD problem is very complex to solve due to its large dimensions, non linear objective functions, and large numbers of operational constraints. Significant cost saving can be achieved if the scheduling of generating units is carried out optimally. • The Reactive Power Management (RPM) or Reactive Power Dispatch (RPD) or Optimal Reactive Power Control (ORPC) is one of the most important tasks for the proper operation and control of a power system. • The main objective of Reactive power (VAR) management in a power system is to identify the reactive power control variables settings such as generator voltages, transformer tap-settings and other sources of reactive power such as capacitor banks or optimally placed FACTS devices. This management of reactive power results in reduced losses, provides better voltage control, improved voltage profile, system stability & security, voltage stability, power transfer

	capability and overall system operation while satisfying the generator and system constraints. • Reactive power management is a complex combinatorial optimization problem, which involves non-linear functions having multiple local minima and non-linear and discontinuous constraints. • Reactive power management is a sub-problem of optimal power flow (OPF) problem that was first introduced by Carpentier in the 1960s. Solution of RPM problem provides the power system operator a set of control variables to minimize transmission losses and to keep bus voltage within permissible limits by rescheduling the power flows. In a power system, reactive power management plays a vital role in controlling voltage at various buses. Thus, voltage control and reactive power management are two aspects of a single activity. • Flexible AC Transmission System (FACTS) devices are the power electronics based devices which are capable of managing reactive power of the system (by injecting or absorbing the reactive power of the system) under operational constraints of a power system. These devices provide fast and flexible control and thus an alternate solution to address some of the problems of a power system including RPM. Main objectives of FACTS technology are to increase transmission capacity allowing secure loading of the transmission up to their thermal capacities, to enable better utilization of available generation and to control the outages from spreading to wider areas. However, the huge financial investment is required in installation of these devices; the optimal location and sizing of these devices are intensively investigated with some suitable optimization techniques. • A number of conventional optimization techniques like Gradient method, Interior point method, Goal attainment method, Linear programming, Non-linear Programming and Quadratic Programming have been proposed for solving ELD and RPD problems, but due to non-differential, non-linear, multi-modal and non-convex properties of these problems, most of the conventional optimization techniques sometimes converge to a local optimum. • Also, these techniques are sensitive to initial points. On the other hand, population based soft computing techniques/ evolutionary computing (EC) techniques are proved to be promising for solving various engineering optimization problems.
Module Content	• Energy Scenario in India • Introduction of Reactive Power Dispatch • Importance of Reactive power

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	• Load flow Methods: Gauss-Siedel, Newton-Raphson, Fast-Decoupled method • Introduction and Need of the of FACTS Devices • Classification of FACTS Devises • Optimal Placement of FACTS Devices • Future role of High Power Electronics Converters in Power Systems • Introduction and Importance of Economic Load Dispatch • Traditional optimization techniques • Gradient method, Interior point method, Goal attainment method, Linear programming, Non-linear Programming and Quadratic Programming • Introduction to Evolutionary Computing Techniques • Genetic Algorithm • Differential Evolution • Particle Swarm Optimization • Hands on Training • Quiz /Assessment during and at the end of Session
Module Methodology	Implementation and verification using MATLAB
Module Outcome/ Impact	• After completing this Online Finishing School Program, the participating students will have a complete vision of real-time power systems including planning, operation and control. • They will acquire the complete knowhow of (a) Economic Load Dispatch, Reactive Power Dispatch and Optimal Placement of FACTS devices, which are the challenging problems of Practical Electrical Power Networks, and (b) Various Soft Computing techniques like Genetic Algorithm, Particle Swarm Optimization, Differential Evolution etc along with their advantages over the conventional optimization techniques. • The participants will be able to successfully apply these soft computing techniques for solving Economic Load Dispatch, Reactive Power Dispatch and Optimal Placement of FACTS devices. • As Soft computing based techniques are modern and more efficient techniques, the participating students of this module will be highly benefited in making their career in industries as well as in carrying out research.
Duration	5 Weeks (30 days)
Module Coordinator	Dr. Himmat Singh[1],Dr.Shishir Dixit[2], Dr. Hari Mohan Dubey[3] Prof. Manoj kumar[4]

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Day Wise Schedule

	Date	Day	Module Contents to be covered/Interactive Session/Assignment/Quiz/Exercises/Daily practice sheets (DPP)/Tutorial/Project etc (10:00 AM onward, 2-3 Hrs/ Day)	Faculty
Week 1	**19/05/2020**	Tue	Energy Scenario in India	Dr. Shishir Dixit
	20/05/2020	Wed	---	Dr.Himmat Singh
	21/05/2020	Thu	Introduction of Reactive Power Dispatch	Dr.Himmat Singh
	22/05/2020	Fri	--	Dr.Himmat Singh
	23/05/2020	Sat	Importance of Reactive power	Dr.Himmat Singh
	25/05/2020	Mon		
Week 2	**26/05/2020**	Tue	Load flow Methods: Gauss-Siedel, Newton-Raphson, Fast-Decoupled method	Dr.Himmat Singh
	27/05/2020	Wed	--	Dr.Himmat Singh
	28/05/2020	Thu	--	Dr.Himmat Singh
	29/05/2020	Fri	Introduction, and Need of the of FACTS Devices	Dr. Shishir Dixit
	30/05/2020	Sat	--	Dr. Shishir Dixit
	01/06/2020	Mon	Classification of FACTS Devises	Dr. Shishir Dixit
Week 3	**02/06/2020**	Tue	--	Dr. Shishir Dixit
	03/06/2020	Wed	Optimal Placement of FACTS Devices	Dr. Shishir Dixit
	04/06/2020	Thu	--	Dr. Shishir Dixit
	05/06/2020	Fri	Introduction and Importance of Economic Load Dispatch	Dr. Hari Mohan Dubey
	06/06/2020	Sat	--	Dr. Hari Mohan Dubey

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	08/06/2020	Mon	--	Dr. Hari Mohan Dubey
Week 4	**09/06/2020**	Tue	Introduction To High Power Converters	Prof. Manoj Kumar
	10/06/2020	Wed	Classifications, Power compensation	Prof. Manoj Kumar
	11/06/2020	Thu	Power Quality Improvement	Prof. Manoj Kumar
	12/06/2020	Fri	Traditional optimization techniques	Dr. Hari Mohan Dubey
	13/06/2020	Sat	Gradient method, Interior point method, Goal attainment method, Linear programming, Non-linear Programming and Quadratic Programming	Dr. Hari Mohan Dubey
	15/06/2020	Mon	Introduction to Evolutionary Computing Techniques	Dr. Hari Mohan Dubey
Week 5	**16/06/2020**	Tue	Genetic Algorithm	Dr. Hari Mohan Dubey
	17/06/2020	Wed	Differential Evolution	Dr. Himmat Singh
	18/06/2020	Thu	Particle Swarm Optimization	Dr. Hari Mohan Dubey
	19/06/2020	Fri	Hands on Training	Dr. Hari Mohan Dubey
	20/06/2020	Sat	Concluding Remarks by all Faculties	All faculty

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Eligibility and Important Instructions :-

1. The Finishing School Program/ Online Summer Internship Program is designed only for pre-final & final year students of **Electrical Engineering Department.**
2. Participants must have Laptop/Desktop with MATLAB software and also preliminary knowledge of MATLAB software.
3. The students may apply on line.
4. The Finishing School Program/ Online Summer Internship Program is free for the participants of pre-final & final year students of MITS.
5. The participants outside the Institute may also join the Program on payment basis.
6. This online module will be conducted under the Finishing School Program which will be considered equivalent to Online Internship of Pre-final year students who could not get any Internship during this situation.
7. Duration of this program will be of five weeks which is equivalent to summer Internship period as per AICTE and our Institute policy. Daily no. of hours of online training may be flexible.
8. Certificates will be issued to candidates who have attendance 75% or more and also score more than 60% in the test.

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Proposal for Finishing School Program for all Pre-Final Year and Final year Students

Name of Department	**Department of Electrical Engineering**
Module Name	**Biomedical Signal and Image Processing using MATLAB/OCTAVE Platform**
Module Coordinators	1) Dr Arun Kumar Wadhwani 2) Dr Sulochana Wadhwani 3) Prof. Punjan Dohare

Module Objective	The module is designed for the engineering students with following objectives:
	• To understand the basic signals in the field of biomedical.
	• To study origins and characteristics of some of the most commonly used biomedical signals, including ECG, EEG, evoked potentials, and EMG.
	• To understand Sources and characteristics of noise and artifacts in bio signals.
	• To understand use of bio signals in diagnosis, patient monitoring and physiological investigation.
	• To explore research domain in biomedical signal processing.
	• To understand the basics of image processing.
	• To explore the research domain in image processing which includes image manipulation, image understanding.
	• To understand the image analysis and image enhancement, image segmentation.
	• Hands on training on OCTAVE-
	  • It will teach how to use Octave to perform calculations, plot graphs, and write simple programs. This is heavily used in industry and academia, gives the user the opportunity to learn the syntax where funding and licence restrictions prevent the use of commercial packages like MATLAB.
	  • In many real-world engineering problems, the data can be expressed as matrices and vectors. It can be thought of as a very powerful, programmable, graphical calculator.
	  • Octave makes it easy to solve a wide range of numerical problems, allowing you to spend more time experimenting and thinking about the wider problem.
	This course is prepared for the engineering students with a good

	background in Signals and Systems. Students in other engineering disciplines also be able to follow this course.
Module Content	Introduction to Biomedical signal, Filtering for Removal of artifacts, Waveform Analysis, Frequency-domain Analysis, Fuzzy distance measure tool for abnormality detection, Introduction to image processing, Image analysis and image enhancement, Image segmentation using MATLAB platform.Hands-on session on OCTAVE software an open source platform (An alternative of MATLAB)
Module Methodology	The Internship is divided into three parts: - • In the 1st section, online lectures will be conducted. • In the 2nd section hands-on training will be conducted on the MATLAB/OCTAVE Platform. • In the 3rd section students will have to submit report.
Module Outcome/ Impact	On completion of this internship, students are able to: • Understand origin of bio electric signal • Know the sources of distortions in bio signals and its remedial techniques • Analyze ECG, EMG and EEG signal with characteristic feature using MATLAB • Understand the image processing and image analysis • Understand the basic learning of OCTAVE platform
Duration	5 Weeks (30 days)

Day Wise Schedule

	Date	Day	Module Contents to be covered/Interactive Session/Assignment/Quiz/Exercises/Daily practice sheets (DPP)/Tutorial/Project etc(10:00 AM onward, 2-3 Hrs/ Day)	Faculty
Week 1	**18/05/2020**	Mon	Preliminaries, Biomedical signal origin & dynamics (ECG)	Dr Arun Kumar Wadhwani
	19/05/2020	Tue	Biomedical signal origin & dynamics (EEG, EMG etc.)	Dr Arun Kumar Wadhwani
	20/05/2020	Wed	Filtering for Removal of artifacts: Statistical Preliminaries, Time domain filtering (Synchronized Averaging, Moving Average),	Dr Arun Kumar Wadhwani
	21/05/2020	Thu	Time domain filtering (Moving Average Filter to Integration, Derivative-based operator),	Dr Arun Kumar Wadhwani

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			Frequency Domain Filtering (Notch Filter), Wavelet Filter	
	22/05/2020	Fri	Event Detection: Example events (viz. P, QRS and T wave in ECG)	Dr Arun Kumar Wadhwani
	23/05/2020	Sat	Derivative based Approaches for QRS Detection Pan Tompkins Algorithm for QRS Detection	Dr Arun Kumar Wadhwani
Week 2	**26/05/2020**	Tue	Waveform Analysis: Decomposition & segmentation of EMG signals, Morphological Analysis of ECG, Correlation coefficient	Dr Arun Kumar Wadhwani
	27/05/2020	Wed	Envelop Extraction, Amplitude demodulation, Root Mean Square value, Zero-crossing rate, Turns Count, Phase count, spike duration, spike area, Form factor	Dr Arun Kumar Wadhwani
	28/05/2020	Thu	Frequency-domain Analysis: Frequency domain parameters: Median frequency	Dr Arun Kumar Wadhwani
	29/05/2020	Fri	Maximum frequency, moments of order 0,1 & 2, Quality factor, Periodogram, Averaged Periodogram,Measures derived from PSD	Arun Kumar Wadhwani
	30/05/2020	Sat	Fuzzy distance measure tool for abnormality detection, Notch filter design, Synchronized averaging	Arun Kumar Wadhwani
Week 3	**01/06/2020**	Mon	Introduction to Image processing	Prof. Punjan Dohare
	02/06/2020	Tue	Image analysis and image enhancement, Image segmentation using MATLAB platform.	Prof. Punjan Dohare
	03/06/2020	Wed	Hands on Training on OCTAVE which includes Basic operation, Navigating the GUI, Matrices and vectors	Prof. Punjan Dohare
	04/06/2020	Thu	Plotting, Linear systems, Polynomial curve fitting, Matrix transformations	Prof. Punjan Dohare
	05/06/2020	Fri	Calculus which includes Limits, sequences, and series, Numerical integration, Complex variables, Symbolic operations	Prof. Punjan Dohare
	06/06/2020	Sat	Eigenvalues and eigenvectors, Singular value decomposition	Prof. Punjan Dohare
Week 4	**08/06/2020**	Mon	Three dimensional graphs, Differential equations	Prof. Punjan Dohare
	09/06/2020	Tue	Script files: Creating and editing a script,	Prof. Punjan Dohare

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			Running and debugging scripts, Remembering previous script	
	10/06/2020	Wed	Control statements: if...else selection, switch selection, for loops and while loops	Prof. Punjan Dohare
	11/06/2020	Thu	Functions: Sine in degrees, Creating and using functions and Unit step	Prof. Punjan Dohare
	12/06/2020	Fri	Complex numbers: Plotting complex numbers and Finding roots of polynomials	Prof. Punjan Dohare
	13/06/2020	Sat	Hands on Practice: Image Processing Techniques	Prof. Punjan Dohare
Week 5	**15/06/2020**	Mon	Design of Butterworth low pass and high pass filter , derivative-based filter, Wiener filter, matched filter	Dr Sulochana Wadhwani
	16/06/2020	Tue	Implement the Pan-Tompkins method for QRS detection. RR interval and Form Factor calculations,	Dr Sulochana Wadhwani
	17/06/2020	Wed	Cross-correlation to detect alpha rhythm Half wave and full wave rectification, RMS value calculation, Turns count calculation, and Zero-crossing rate calculations	Dr Sulochana Wadhwani
	18/06/2020	Thu	Power spectrum calculations using different windows, Study the changes in the PSDs by varying window width, number of segments averaged, and type of the window used	Dr Sulochana Wadhwani
	19/06/2020	Fri	Segmentation Techniques: Hands on MATLAB	Dr Sulochana Wadhwani
	20/06/2020	Sat	Concluding Remarks by all faculties	All faculty
Module Coordinators Email Id and Mobile Number			1) Dr Arun Kumar Wadhwani- akwadhwani@mitsgwalior.in, (9131363200) 2) Dr Sulochana Wadhwani- sulochana_wadhwani@mitsgwalior.in, (9399766998) 3) Prof. Punjan Dohare- punjan@mitsgwalior.in, (8360251806)	

Eligibility and Important Instructions :-

1. The Online Finishing School Program(Online training/Internship) is designed only for Pre-final & Final Year students of Electrical Engineering Department.

2. The students may apply online.

3. The Online Finishing School Program/ Summer Internship Program is free for the participants of Pre-final & Final year students of MITS, Gwalior.

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4. The participants outside the Institute may also join the Program on payment basis.

5. This online module will be conducted under the Finishing School Program which will be considered equivalent to Online Internship of Pre-final year students who could not get any Internship during this situation.

6. Duration of this program will be of four weeks which is equivalent to summer Internship period as per AICTE and our Institute policy. Daily no. of hours of online training may be flexible.

7. Certificates will be issued to candidates who have attendance 75% or more and also score more than 60% in the test.